

YMCA University of Science & Technology
Sector-6, Mathura Road, Faridabad-121006 (Haryana)

Proceedings of
Two-Day National Conference on
Science in Media SIM 2012
(December 3-4, 2012)
organized by
Humanities & Applied Sciences Department

Convenor	Dr Divyajyoti Singh
Coordinator	Dr Anuradha Sharma
Organizing Secretary	Dr Maneesha Garg



Ch. Birender Singh
Member of Parliament (Rajya Sabha)
General Secretary All India Congress committee

Message

I am glad that the Humanities and Applied Sciences department of YMCA University is holding this national conference on the pertinent subject of science in media.

There was a time, when knowledge was the property of a few and exploration was a taboo; those who crossed the oceans were excommunicated. Today, media has inundated our lives, bringing every event that happens into the public domain. In the age of globalization and information technology, those who remain ignorant do so at their peril and those who choose seclusion, again take a risk.

In the contemporary times, thanks to the advance media, knowledge is at our fingertips, only we should be seeking it. From the dark ages to period of Enlightenment, the ally of humanity in this journey was science indeed. Science has liberated us from the shackles of ignorance and salvaged reason from the abysses of superstition.

Once again, I congratulate the Vice –Chancellor and the organizers on the choice of subject and am sure that this conference will be an effective platform to create synergy amongst the scientific world, industry and academia.

My best wishes for a successful and vivacious conference that the theme merits.

Birender Singh

MK Miglani, IAS (R)
Former Vice Chancellor
CCS Haryana Agriculture University & Kurukshetra University



Message

I am glad to learn that Humanities and Applied Sciences Department of YMCA University of Science and Technology, Faridabad is organizing a Two day National conference on Science in Media from December 3 2012 to December 4 2012.

It is gratifying to note that the objective of the conference is to highlight the importance of media in inculcating scientific temper and it proposes to cover a large number of topics relating to science and literature, science in multimedia, social networking sites, science fiction, the god particle, science for farmers, science for social cause etc. We have a large number of agriculture universities and agriculture research institutes, which are undertaking research studies in various areas of agricultural sciences viz agronomy, soil science, pathology, entomology, genetics, biotechnology and so on with a view to improving agricultural production and productivity. Yet, we are not able to take the research findings to cores of farmers in about six villages. Media can play vitally important role in carrying the latest scientific findings of research to the public in general and farmers in particular. I would urge the conference may discuss this aspect of role of media in reaching the farmers.

M K Miglani

Bhaskar Chatterjee, IAS(R)

Former Financial Commissioner, Haryana



Message

Science could be of value to humanity only if it is ethical. It can be terribly destructive otherwise. Media should always endorse science that creates. In this way, media can determine the destiny of humanity. If we want a better world tomorrow, media has to remind scientists and laymen that unplanned human progress can be injurious in long run. Advancements should be tempered by conservation goals.

Can media be the conscience keeper for science? Let the question remain open-ended and discussions take from there.

Science in Media- the contemporary relevance of this theme cannot be gainsaid.

Bhaskar Chaterjee

Dr Sukhbeer Singh Malik, IAS(R)

Chairman, RCF



Message

What if atoms existed unknown? And what a difference when the secrets of an atom are revealed- not to a man but to humanity. This is the power of communication. Discovery is shared knowledge, never a secret possessed by one. Human civilization could not have progressed thus far, had people been wary of sharing their scientific discoveries and findings.

In this age of patents, scientific knowledge becomes expensive; the largesse of our forefathers seems proverbial in comparison. For instance, no one claimed a patent on fire and houses in the ancient times. Western capitalism, however, has ushered in an era where media has to deal with both secrecy and publicity with respect to scientific inventions. When media performs its role responsibly, science serves humanity and works for commonweal.

I am sure that this conference will aid sharing of knowledge and active use of its findings will be made in days to come.

Sukhbeer Singh Malik

Dr. RS Dahiya
Sr Surgeon and Professor, PGIMS, Rohtak
Haryana Gyan Vigyan



Message

The cultivation of scientific temper is of utmost importance. The constitution of India directs the state to put the machinery in place required to create awareness amongst people and to educate them. In our society, superstitions have such a clout that besides fostering ignorance, many a times they lead to crime.

Science combats superstition by emphasizing reason. Media can play an effective role in meeting this agenda of science. For instance, folk songs, street plays and miracle exposure have been used with great effect to rid people of ignorance.

A lot remains to be done in this regard, but the development index of the country would improve only by endorsing scientific attitude in the people. The governments should rigorously pursue this mammoth task at regional and national levels.

The topic of this national conference appeals to me greatly but I hope that some practical solutions will be found through the two days of deliberation.

My best wishes to YMCA University, Faridabad for this endeavour.

RS Dahiya

Lt Gen KS Yadava
Vice-Chancellor, YMCAUST



Message

Science is another name for possibilities. Humans have aspired to comprehend God and science has made it possible. From Big Bang to Higgs Boson, science is an attempt to explore the limits and overcome them.

It may be asserted that Einstein's conclusions are just the starting point for researchers today and I dare say that the average scholar today is far more informed and techno –savvy than any great genius of yore. This is the gift of communication and media.

A university is a reservoir of ideas and hub of culture. This conference is being held with a view that it would help generate a current of fresh ideas and be evocative of radical perspectives on existing issues, including ethical use of science, use of nuclear power and ecological balance and significance of science in society.

I wish success to the organizers and complement the Humanities and Applied Sciences Department on this great initiative.

Karan Singh Yadava

Dr Tilak Raj

Dean, Humanities & Applied Sciences Department



Message

It is our great pleasure and privilege to host a national conference on ‘Science in Media’ which I am sure is going to be a significant event that will contribute towards a vivacious academic atmosphere. With a large number of participants, we are sure that this conference will be memorable and highly educational.

In the end I thank all the colleagues in the university and within the department for their contribution towards bringing this event to life.

Tilak Raj

SCIENCE, MEDIA AND THE INTEGRITY OF DESIGN

Nibir K. Ghosh

Head, Department of English Studies and Research at Agra College, Agra

It has been said that Man is a rational animal. All my life, I have been searching for evidence which could support this. - Bertrand Russell

In the early years of the new millennium an American Fulbright Scholar to India (2004-05) was initially bugged on seeing a cow outside the international terminal after his arrival in New Delhi for it affirmed “every clichéd idea an outsider might have had about India.” But during the course of his stay in India he was happy to observe firsthand how the nation was rapidly coming out of its distant exotic past to assert itself as a potential power in the global market. He was happy to note that Indian prowess at information technology, fueled by keen foreign investments, had destroyed the idea of the mystical, exotic, ancient India that had previously captured the world’s curiosity. Add to this testimony of hope the recent affirmative utterance of Thomas Friedman, the Pulitzer winning *New York Times* journalist, and you shall see a rejuvenated modern India in the making: “When we were young kids growing up in America, we were told to eat our vegetables at dinner and not leave them. Mothers said, ‘think of the starving children in India and finish the dinner.’ And now I tell my children: ‘Finish your homework. Think of the children in India who would make you starve, if you don’t?’”

Now contrast this utterance with the image of India that emerges from books like Aravind Adiga’s Booker winning *The White Tiger* or the Nobel Laureate V.S. Naipaul’s *An Area of Darkness* or the Oscar winning film *Slumdog Millionaire*. Notwithstanding the adulation bestowed by the Western horizon on the projection of the seamy side of India in such works of art, it is easy to comprehend why such accounts make even an ordinary Indian wince in sincere disgust. As an instance, I wish to recall the response generated in this subcontinent when Louis Malle produced his mammoth 378-minute documentary *Phantom India* (1969). Malle’s film provided occasional strong criticisms, especially of widespread poverty and bureaucratic corruption, the problematic status of women and the caste system, which although officially abolished with India’s independence from Great Britain in 1947, he found to be worse than ever 20 years later. Commenting on *Phantom India*, the maestro Satyajit Ray stated: “personally, I don’t think any film director has any right to go to a foreign country and make a documentary film about it unless a) he is absolutely thorough in his groundwork on all aspects of the country - historical, social, religious and b) he does it with genuine love. Working in a dazed state - whether in admiration or disgust - can produce nothing of value.” Ray reiterated that what was deficient in the Louis Malle’s version of India was the integrity of design which, according to him, was a requisite that validated creativity in filmmaking and in writing.

Ray’s stance makes it apparent that even while holding a mirror to reality, a writer or a filmmaker cannot and should not dispense with the imperatives of the integrity of intent and design. Though not unaware of the vulnerability of India – the poverty and the squalor, physical, social and moral – one’s refusal to see it in human and historic terms is bound to create suspicion about such integrity of design. It is true that India is too beautifully diverse a nation to be faithfully represented by one clever movie or one clever book. Nevertheless, rather than deny ourselves the jubilation or otherwise that comes with coveted Bookers, Oscars or the Nobel, we must subject the respective works to the ultimate litmus test to

determine whether in mirroring unpalatable reality they also sing of the ultimate triumph of the human spirit.

Through a collage of impressions drawn from personal experience, literary and media imprints, the presentation intends to show how unprecedented scientific advancements have revolutionized every segment of human life without necessarily impacting any visible change in the development of scientific temper i.e. application of logic and reasoning, and the avoidance of bias and preconceived notions in arriving at decisions that are valuable for the community or the nation. It would be appropriate to visualize the challenges that beset the Indian media in this age of globalization where cyberspace has literally shrunk the world in terms of both space and time.

Dr. Nibir K. Ghosh, D.Litt., is Head, Department of English Studies and Research at Agra College, Agra & Senior Fulbright Fellow at the University of Washington, Seattle, USA. He is the Chief Editor of Re-Markings (www.remarkings.com), an international biannual journal of research in English.

SCIENCE FOR FARMERS

B.S. Phogat, T.P. Singh and Kamal Kant
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Abstract

Agricultural science in India is barely hundred year old. It received major thrust after independence which resulted in phenomenal growth in agricultural production in the country. This was made possible mainly by major emphasis on agriculture in policy making, development of technology by the scientists, its transfer to the farmers and, most important of all, technology adoption and hard work by the farmers. Media, both print and electronic, played a major role in taking agricultural science to the farmers. However, the task is far from over and a much larger role of media is foreseen in meeting the challenges ahead.

Dr B.S. Phogat is Principal Scientist NBPGR, PUSA, New Delhi. He has contributed significantly to research in wheat germplasm.

TECHNOLOGY AND TRADITION INTERMIX FOR ENHANCED INNOVATION AND GREATER TECHNOLOGY ORIENTATION OF DEVELOPING SOCIETIES

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Abstract

Developing societies are replete with examples on traditional technologies and the modern society has not given much emphasis on these traditions which once, especially in the context of India, were the key instruments in the tall status of these societies. Industrial Training Institutes (ITIs) are the basic level technical skill imparting institutions in India and they are best placed to play as the link between modernity and tradition in technology. They need to

be supported in developing capacities towards serving not only as this link but also in understanding the philosophy of technological development for the context which traditional societies have championed i.e. achieving a greater balance between the sustainability and development, hence conservation in greater sense. This paper deals with some of these approaches that may be adopted and hence greater technology orientation and innovation can be achieved and may be providing a new alternative to technology development process. Technology orientation of the society and innovation are the key parameters for achieving science and technology leadership in today's world.

SOCIAL MEDIA & CYBER LAWS

Jeetender Gupta
Advocate, Delhi High Court

Abstract

'The next world war, if and whenever it happens, is not likely to be fought on battle grounds, but over cyber space and stock markets.'

While the Internet is increasingly embracing our lives, the cyberspace is also converting into a haven for entirely new breed of criminals. Viruses, Bogus schemes, Money offers, Hacking and Phishing are still crimes of the past. Copyright and Intellectual Property Rights (IPR), Defamation, Hacktivism, Espionage, Cyber Bullying & Cyber Terrorism are some of the new and larger challenges. And when it comes to National Security & Integrity, cyberspace should remain a zero tolerance zone.

A small rumour spread over social networking sites like facebook and twitter can create panic, jeopardize lives of thousands in no time or even lead to riots and loss of lives over a text, an image or an offensive video. While the Govt of India is having a tough time controlling these, we remain vulnerable to cyberspace and require a cyber army to handle such threats.

A series of recent arrests of apparently harmless citizens over violation of Information Technology Act 2000, especially its controversial section 66A has triggered a big national debate. Demands to scrap the section or to suitably amend it are being raised all over the country. Some from legal fraternity feel that the section is in violation of several provisions of the Constitution especially freedom of speech and expression.

Can we leave the cyber space unregulated to variety of cyber threats? Have our law makers really erred in legislating the Act and its sections? Is the freedom of speech and expression really absolute? Are our police personnel trained enough to effectively implement the provisions of the act? Our entire nation needs loud thinking.

There is a growing global concern over the possibility of a cyber terrorist attack with "catastrophic consequences". Achieving security of Nations, its people and businesses, without compromising the openness or encroaching upon the freedom of speech and expression remains the new global challenge.

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Functions of nanostructure phosphors in future technology

Dhirendra Kumar Sharma, Krishna Institute of Engineering and Technology, Ghaziabad, India
Anuradha Sharma, YMCA University of Science and Technology, Faridabad, India

Abstract—In 21st century it is observed that field of nano phosphors materials are hugely significant and dynamic. There has been a great agreement of interest for nanoscale electronic and photonic applications i.e. flat panel displays including plasma display panels, field emission displays and electroluminescence displays. In all displays panels, phosphors are the key materials and became a very interesting research topic. The oxide- based phosphors with excellent thermal and chemical stability have received increasing concentration. Phosphors materials are generally synthesized by chemical methods. Chemical precipitation, sol gel, reaction in micro emulsions and chemical vapour synthesis are commonly used techniques for fabrications of nanophosphors. These methods are simple, economical and environmentally mild. Nano - crystalline form exhibit different electrical, optical and structural properties to those in bulk form. There are so many reasons for this remarkable difference in their nano versus bulk form i.e. quantum confinement effect, increased relative surface area etc.

Index Terms— Phosphors, electroluminescence

I. INTRODUCTION

Nanostructured materials reveal different structural, optical and electronic properties as compared to those in the bulk form. Nanoparticles in general, have nearly half of their atoms contained in two top monolayers, which make their optical and electrical properties highly sensitive. Synthesize and study of nanostructured materials have become a major attractive interdisciplinary area of research over the past fast few decades. Recently, transition metal(TM) and rare earth ion doped II-IV semiconductor nanoparticles/ nanostructure phosphors materials have received much attention because such doping can modify and improve optical properties of II-IV semiconductor nanoparticles by large amount [1-5]. Rare-earth (RE) ions are better luminescent centres than the transition metal elements because their 4 f intrashell transitions originate at narrow and intense emission lines. Usually, semiconducting nanoparticles are known to exhibit exotic physico-chemical properties due to quantum confinement effect. Especially, nanostructure phosphors materials/ doped luminescent nanoparticles are predicted to show improved optical properties, viz., luminescence efficiency, and delay time and band edge emission with respect to particle size variation. Nanostructure phosphor materials, which has high efficiency and low degradation, is

required for the development of lighting technology and for flat panel displays such as field emission displays (FEDs) and plasma display panels (PDPs) [6, 7]. The use of oxide phosphors in place of conventional sulphide phosphors has been preferred for FED applications due to higher stability in high vacuum environment and less emission of contaminating gases [8].

Luminescent materials have opened up a number of new areas of applications such as thin film electroluminescent (TFEL) devices, optoelectronic or cathodoluminescent devices [9, 10]. RE-doped insulators are used in telecommunications, lasers, amplifiers, medical analysis, DNA markers, biosensors, light emitting diodes, etc. as well as in spintronics and photocatalyst [6, 11].

The II–VI semiconductor nanomaterials are unique host materials for doping of highly optically active impurities, and semiconductor doped with luminescence centres exhibit efficient luminescence even at room temperature [12, 13]. High quality II–VI semiconductor nanocrystals and their luminescence properties have been studied recently both experimentally and theoretically [14-18].

CdSe and CdS are the most widely studied among the II–VI semiconductor nanoparticles [14-19]. However, these materials contain toxic elements such as Cd and Se. ZnO is an environmentally friendly material and is one of the suitable candidates for practical use as a nanodevice material. Zinc oxide (ZnO) is a wide bandgap (3.3 eV) II–VI compound semiconductor with large exciton binding energy (60 meV) at room temperature. It has a stable wurtzite structure with lattice spacing, $a = 0.325$ nm and $c = 0.521$ nm. Most of the ZnO: RE³⁺ crystals have been synthesized by traditional high temperature solid state method which is energy consuming and difficult to control the particle properties [20-22]. Doping with rare earth elements leads to many interesting properties of ZnO. Different routes to obtain doped ZnO materials have been studied namely, the incorporation of rare earth metal ions into a semiconductor photocatalyst by ion implantation or by co-precipitation [23].

with lattice spacing, $a = 0.325$ nm and $c = 0.521$ nm. Most of the ZnO: RE³⁺ crystals have been synthesized by traditional high temperature solid state method which is energy consuming and difficult to control the particle properties [20-22]. Doping with rare earth elements leads to many interesting properties of ZnO.

Fabrication Methods

Chemical Precipitation Technique

Precipitation is a chemical method whereby nanoparticles

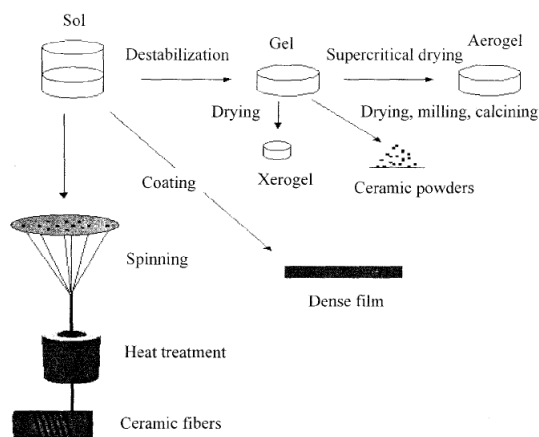
are deposited from solution. In this way, for example, metallic/ semiconductor nanoparticles can be produced. The material to be produced/ deposited is dissolved in a solvent, usually water. The addition of appropriate reagents initiates the precipitation. Either the composition of the solvent is modified in such a way that the substance to deposit then becomes less soluble or insoluble, or a new compound is formed that has a significantly lower solubility than the concentration in solution. The formation of nanoparticles proceeds step by step from crystalline/amorphous seeds (primary particles) to particulate agglomerates. It is crucial that the seed formation rate or nucleation rate, respectively, be faster than the growth rate of particles.

In a continuous precipitation process, the particle size distribution as well as the structure of the agglomerates can be fine – tuned by process engineering, i.e. by choosing both the appropriate “flow conditions” and “particle – particle interactions”

Sol-Gel Process

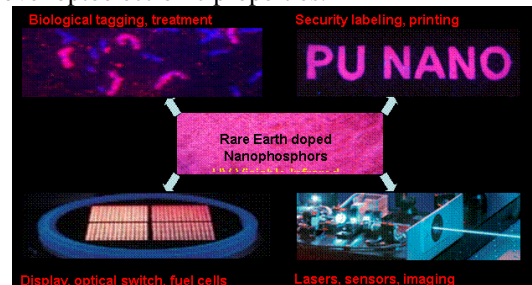
The sol-gel process is an exceptionally important wet chemical method for production of an assortment of nano-technological products such as powders, thin – coatings, aerogels and fibers.

In the first step, nano-scale colloids or nanoparticles are formed by reaction of liquid components. Subsequently, sol is converted into the gel state by one of two main methods: the molecule primarily formed in sol can either continue to grow and aggregate by chemical reaction until they form a single macromolecule filling all available space or particulate sols can coagulate until a gel is formed, which is then stabilized by electrostatic repulsion by destabilization of sols or gels, respectively, nanoparticles of defined sizes can be precipitated. One of the most promising possibilities offered by the sol- gel process is the combination of organic and inorganic components into tailor- made organically modified products. Another advantage is the simplicity of method: Production can be carried out in a test tube. On these preparation methods large numbers of research papers are reported [24-27].



Applications

Recently, nanophosphors have become a research focus in terms of both their fundamental and practical importance. They exhibit unique chemical and physical properties compared to their bulk materials. These properties are halfway between macroscopic and microscopic substances. For example, quantum confinement effect of a nanoparticle gives rise to novel optoelectronic properties.



The emission lifetime, luminescent efficiency, and concentration quenching of the phosphor strongly depends on particle size. Due to these unique properties, many potential applications in the area of optical, electrical, biological, mechanical can be developed. For example: Thin film electroluminescent devices, optoelectronic or cathodoluminescent devices, telecommunications, research and development of optical switch, biomarker, new laser, etc are under the way.

Conclusion

It is observed that field of nano structure phosphors materials are immensely booming and dynamic. Many processes such as chemical precipitation with and without capping agents, sol-gel, sol-gel with heating, microemulsion, solid state heating, chemical vapour synthesis, hydrothermal synthesis, etc. have been developed for synthesis of nanophosphors. . Due to the unique properties, these nano phosphors have many potential applications in the area of optical, electrical, biological, and mechanical.

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Corrosion of metals and polymers: a vital concern

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Abstract — Corrosion costs nearly \$4 Trillion worldwide each year. April 24, 2012 has been dedicated to raising awareness about what can be done to prevent the impact of corrosion on people, infrastructure, and the environment. Though Codes and standards on corrosion exist on the basis of physical parameters, there is little focus on performance criteria. The US is losing more than \$276 billion and India Rs 1 Lakh crore per annum on account of corrosion. The annual loss due to corrosion can be compared with that of other natural calamities like fire, floods, hurricanes, tornadoes, earthquakes and cyclones; only its impact is indirect. Corrosion destroys the objects made up of metals and their alloys but the modern world can not afford without the use of these materials. Around 80 per cent of the unscheduled shutdowns and breakdowns in industries are due to corrosion. Corrosion causes plant shut downs, waste of valuable resources, loss or contamination of products, reduction in efficiency and costly maintenance. Corrosion solutions are highly customized as standards must be created on the basis of prevailing local conditions as India is a tropical country and environment and climatic conditions differ from region to region. If this corrosion cannot be eliminated completely, industries can ensure the prevention at the design stage. Improved technology and awareness can only come through consistent research and development activities. While this has become a reality in some industries such as nuclear power, refineries, space, railways, shipping and defense, most medium and small-scale industries do not take up corrosion issues seriously or are simply not aware of them. Additionally, corrosion may lead to loss of metals and their strength which in turn can cause serious accidents, loss of manpower and human lives. Out of the total loss due to corrosion, 25 per cent of loss can be easily saved with proactive approach and protecting the system by applying protective coatings. Creating awareness and propagating knowledge about corrosion is therefore very important. Corrosion needs to be addressed by all industries. The protection of assets and environment from effects of corrosion is a must.

I. INTRODUCTION

Corrosion costs nearly \$4 Trillion worldwide each year. April 24, 2012 has been dedicated to raising awareness about what can be done to prevent the impact of corrosion on people, infrastructure, and the environment. Though Codes and standards on corrosion exist on the basis of physical parameters, there is little focus on performance criteria. The US is losing more than \$276 billion and India Rs 1 Lakh crore per annum on account of corrosion. The annual loss due to corrosion can be compared with that of other natural calamities like fire, floods, hurricanes, tornadoes, earthquakes and cyclones; only its impact is indirect. In any case, corrosion represents a tremendous economic loss and much can be done to reduce it.(Fig 1,2) [1,5].



Fig-1: Rusting in a drainage water pipeline

2. DEFINITION

Corrosion is defined as the destruction or deterioration of a material because of reaction with its environment. These materials include metals like iron, copper etc and nonmetals like ceramics, plastics, rubber etc. Corrosion can be fast or slow. Where on one hand, sensitized steel is badly attacked in hours by polythionic acid while on the other hand Railroad tracks usually show slight rusting over many years. The Famous Iron pillar in Delhi was made almost 2000 years ago and is almost as good as new. (Fig 3a, 3b)



Fig-2 Corrosion of Railings



Fig-3 (a), (b) Iron pillar in Delhi

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3.ELECTROCHEMISTRY OF CORROSION

The same metallic surface exposed to an aqueous electrolyte usually possesses sites for an oxidation (or anodic chemical reaction) that produces electrons in the metal,

and a reduction (or cathodic reaction) that consumes the electrons produced by the anodic reaction. These "sites" together make up a "corrosion cell". The anodic reaction is the dissolution of the metal to form either soluble ionic products or an insoluble compound of the metal, usually an oxide. Several cathodic reactions are possible depending on what reducible species are present in the solution. Typical reactions are the reduction of dissolved oxygen gas, or the reduction of the solvent (water) to produce hydrogen gas. Because these anodic and cathodic reactions occur simultaneously on a metal surface, they create an electrochemical cell [2,4].

The sites where the anodic and cathodic reactions take place, the anodes and the cathodes of the corrosion cell, are determined by many factors: (i) they are not necessarily fixed in location; (ii) they can be adjacent or widely separated so that, for example, if two metals are in contact, one metal can be the anode and the other the cathode, leading to galvanic corrosion of the more anodic metal; (iii) there can exist variations those sites exposed to the environment containing the lower oxygen content – differential aeration corrosion; (iv) or similarly, variations in the concentration of metal ions or other species in the environment, arising because of the spatial orientation of the corroding metal and gravity; or finally, (v) variations in the homogeneity of the metal surface, due to the presence of inclusions, different phases, grain boundaries, disturbed metal, and other causes, can lead to the establishment of anodic and cathodic sites. The flow of electrons between the corroding anodes and the non-corroding cathodes forms the corrosion current, the value of which is determined by the rate of production of electrons by the anodic reaction and their consumption by the cathodic reaction. A driving force is necessary for electrons to flow between the anodes and the cathodes. This driving force is the difference in potential between the anodic and cathodic sites which exists because each oxidation or reduction reaction has associated with it a potential determined

by the tendency for the reaction to take place spontaneously [3].

3. RUSTING

Corrosion occurs in the presence of moisture. For example when iron is exposed to moist air, it reacts with oxygen to form rust. (Fig 4)

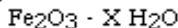
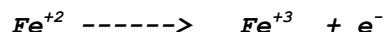


Fig-4 Rusting of Iron

The amount of water complexed with the iron (III) oxide (ferric oxide) varies as indicated by the letter "X". The amount of water present also determines the color of rust, which may vary from black to yellow to orange brown. The formation of rust is a very complex process which is thought to begin with the oxidation of iron to ferrous (iron "+2") ions.



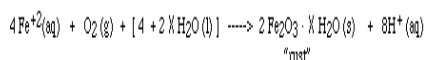
Both water and oxygen are required for the next sequence of reactions. The iron (+2) ions are further oxidized to form ferric ions (iron "+3") ions.



The electrons provided from both oxidation steps are used to reduce oxygen as shown.



The ferric ions then combine with oxygen to form ferric oxide [iron (III) oxide] which is then hydrated with varying amounts of water. The overall equation for the rust formation may be written as :



The formation of rust can occur at some distance away from the actual pitting or erosion of iron as illustrated below. This is possible because the electrons produced via the initial oxidation of iron can be conducted through the metal and the iron ions can diffuse through the water layer to another point on the metal surface where oxygen is available. This process results in an electrochemical cell in which iron serves as the anode, oxygen gas as the cathode, and the aqueous solution of ions serving as a "salt bridge" as shown below (Fig 5).

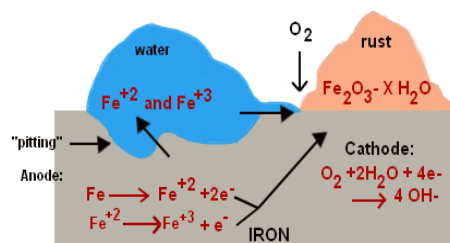


Fig-5 Mechanism of Rusting

The involvement of water accounts for the fact that rusting occurs much more rapidly in moist conditions as compared to a dry environment such as a desert. Many other factors affect the rate of corrosion. For example the presence of salt greatly enhances the rusting of metals. This is due to the fact that the dissolved salt increases the conductivity of the aqueous solution formed at the surface of the metal and enhances the rate of electrochemical corrosion. This is one reason why iron or steel tend to corrode much more quickly when exposed to salt (such as that used to melt snow or ice on roads) or moist salty air near the ocean [1-5].

4. FORMS OF CORROSION

The Table 1 below gives a detailed account of the example, corrosion testing and prevention techniques of the various forms of corrosion [1-5].

But there is another side of corrosion too. Our economy would drastically change if there was no corrosion. For example automobiles, ships, underground pipelines and home appliances would not require coatings. The stainless steel industry would essentially disappear and copper

would be used only for electrical purposes. Most metallic parts, as well as consumer products, would be made of cast iron or steel. Although corrosion is inevitable, its cost can be considerably reduced. Keeping this in

consideration Corrosion Engineering was introduced which is the application of science and art to prevent or control corrosion damage economically and safely [1-5].

TABLE 1- TESTING & PREVENTION OF CORROSION

S . N	Forms of Corrosion	Example	Corrosion Testing	Prevention
1	Galvanic Corrosion	The rusting of corrugated iron sheet, which becomes widespread when the protective zinc coating is broken and the underlying steel is attacked.	It consists of a large brass sheet with a steel nut bolted to the center of the sheet	Keep small anodes from contacting large cathodes, application of sacrificial coating, paint coatings, applying plastic, or other non-metallic barriers.
2	Pitting Corrosion	Pitting corrosion is common in passive metals above pitting potential (Ep) like Steel buried in the soil corrodes with the formation of pits.	Expose a large piece of specimen in a corrosive liquid for a fairly long period of time.	Reduce Cl ⁻ content in the electrolyte, Lower acidity of solution, lower O ₂ , Shot peen the surface. Avoid stagnant solutions in tanks, tubes, pipes & Redesign to ensure proper drainage
3	Uniform Corrosion	A piece of steel or zinc immersed in dilute sulfuric acid will normally dissolve at a uniform rate over its entire surface	A piece of steel or zinc dipped in sulphuric acid	Use thicker material for corrosion allowance, use paints or metallic coatings, cathodic & anodic protection
4	Erosion Corrosion	Characterized in appearance by grooves, gullies, waves, rounded holes, and valleys and usually exhibits a directional pattern	Spinning Disk test	Streamline the piping to reduce turbulence, control fluid velocity, using corrosion inhibitors or cathodic protection, using more resistant materials
5	Selective Leaching	Selective removal of zinc in brass alloys (dezincification)	Uniform dezincification of Brass pipe	Removing oxygen from the solution, Cathodic protection & appropriate selection of alloy
6	Stress Corrosion Cracking	Aluminum alloys crack in the presence of chlorides, mild steel cracks in the presence of alkali (boiler cracking) and nitrates, copper alloys crack in ammoniacal solutions (season cracking)	Bend Tests, Slow strain rate test	SCC is the result of a combination of three factors – a susceptible material, exposure to a corrosive environment, and tensile stresses above a threshold. Elimination any one of these factors SCC initiation becomes impossible.
7	Inter Granular Corrosion	Small amounts of iron in aluminum, wherein the solubility of iron is low, have been shown to segregate in the grain boundaries and cause intergranular corrosion	For stainless steels- Nitric acid test, Huey Test, Streicher Test & Warren Test	Use post weld heat treatment, use of low carbon grade of stainless steel.
8	Crevice Corrosion	Small volumes of stagnant solution caused by holes, gasket surfaces, lap joints, surface deposits, and crevices under bolt	Material's resistance to crevice corrosion is tested by wrapping the specimen with string, chord or rubber bands	Reduce crevices in design ,Use welding if possible instead of bolting two surfaces in contact Avoid electrolyte stagnation ,Use none-absorbent gaskets such as Teflon instead of absorbent gaskets such as fiber and wood gaskets & Cleaning to reduce local conc. of acids

5. PREVENTION OF CORROSION

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Azolla: Role in Phytoremediation of Heavy Metals

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Abstract— The environmental pollution resulting from natural resources acquisition is one of the most severe problems nowadays. Phytoremediation is a new environmental friendly and economically attractive techniques using the plants for detoxification of their substrate. It is an integrated multidisciplinary approach to the cleanup of contaminated soils and water, which combines the disciplines of plant physiology, chemistry, and soil and water microbiology. Besides numerous application of *Azolla* in agriculture, e.g. as green manure, it was found that this plant possess a huge ability for phytoremediation. *Azolla*, an aquatic pteridophyte is an ideal choice because of its high multiplication rate, global distribution, high biomass production, high protein content, its growth habitat. It is not only used by farmers as biofertilizer but is also used as feed for livestock, as green manure, bioremediation of waste water and reclamation of saline soils. Both living as well as the non-viable biomass of *Azolla* can be used for heavy metal removal from wastewater. The growing concern about environmental degradation and shrinking natural resources necessitates the use to exploit the potential of this *Azolla* -*Anabaena* association more efficiently. This paper reviews the potential of *Azolla* in environmental management.

Keywords: Green technology, Phytoremediation, Aquatic macrophyte, *Azolla*, Heavy metals.

I. INTRODUCTION

Global development, growing population and increasing urbanization has led to increase in pollution and overexploitation of the natural resources. Clean water and air are essential for life. The contamination of the environment by toxic compounds has become a worldwide problem. However the demand for a country's economic, agricultural and industrial development outweighs the demand for safe and pure environment. Accumulation of these toxic wastes into soil and water is a matter of serious concern as they enter the food chain and cause health hazards. The toxic substances include organic as well as inorganic compounds. Inorganic toxic substances that pollute environment are heavy metals, metalloids, other trace elements and radioactive materials that are added through mining processes and other geophysical modifications. Organic pollutants result partly from agricultural operations like application of herbicides, insecticides, fungicides, nematicides and numerous other applications of chemicals in everyday life.

Application of remediation approaches becomes imperative when the buildup of these toxic substances in water and soil is beyond permissible limits. Chemical processes are applied for treating the wastes, but they suffer from inherent limitations. Novel biotechnological approaches are being applied for treating wastes and these include bioremediation and phytoremediation. These are the terms used to describe those methodologies which employ living organisms to remove toxic compounds from the environment. While bioremediation refers to the use of lower organisms (algae, bacteria and fungi), phytoremediation refers to the using plants for treating polluted soil and water. Both these technologies share the advantage of in-situ application and environmental acceptability as compared to the other physico-chemical approaches [1]. While phytoremediation using higher plants is best suited for treatment and reclamation of polluted soils, use of microorganisms and small water plants is more feasible for treating aquatic systems. Aquatic plants that have been used for treating wastewater includes *Lemna*, *Azolla*, *Sesbania* etc.

The fate of toxic substances in soil and aquatic environment depends on processes like non-specific absorption, specific absorption, precipitation, dissolution, oxidation, reduction, photochemical reaction, biotic processes etc [2]. Heavy metals exposure may cause neurobehavioral disorders such as fatigue, insomnia, decreased concentration, depression, irritability, gastric symptoms, sensory symptoms, and motor symptoms. Exposure to heavy metals has been linked with developmental retardation, various cancers, kidney disorders, autoimmunity, and even death in some instances of exposure to very high concentrations. At higher levels, mercury can damage vital organs such as lungs and kidneys. Another reason that toxic heavy metals are causing potential concern is that of bioaccumulation and biomagnifications. The metals may be transferred and accumulated in the bodies of animals or human beings through the food chain, which potentially causes DNA damage and carcinogenic effects caused by their mutagenic ability [3]. Examples include Cd, Cr, and Cu, which have been associated with health effects ranging from dermatitis to various types of cancer. In addition, some metals occur in the environment as radioactive isotopes (e.g., U238, Cs137,

Pt239, and Sr90), which can greatly increase the health risk [4].

The term phytoremediation (phyto = plant and remediation = correct evil) was coined in 1991.

Phytoremediation is an emerging technology that uses various plants to degrade, extract, contain, or immobilize contaminants from soil and water. It is environment friendly, cost effective and solar driven process. It is an integrated multidisciplinary approach to the cleanup of contaminated soils and water, which combines the disciplines of plant physiology, chemistry, and soil and water microbiology. The harvested plant tissue, rich in accumulated contaminant is easily and safely processed by drying, ashing or composting. The volume of toxic waste produced as a result is just a fraction of that of many current, more invasive remediation technologies. Some metals can be reclaimed from ash or by desorption process in case of living biomass, thus reducing the generation of hazardous waste and generates recycling revenues.

A plant used for phytoremediation needs to be tolerant of the pollutants, grow rapidly with a high yield per hectare, accumulate the metal in harvestable parts, have a profuse root system and a high bioconversion factor. The bioconversion factor is the concentration of pollutant in the plant compared with that in environment. It needs to be more than 20 or above to be able to reduce contamination by 50%. The plants that accumulate high concentration of metals are called Hyperaccumulators and can accumulate 50-100 times more metal than normal plants[5]. There are about 400 species that are hyperaccumulators. *Thalpi sp.*, *Brassica sp.*, *Alyssum sp.*, *Salix*, *Populus*, *Alnus* are among the terrestrial plants and *Lemna*, *Azolla*, *Sesbania*, *Eichhornia*, *Pistia* etc. are the aquatic plants that have been used for treating wastewater. Hyperaccumulation involves adsorption, transport and translocation to areas where large quantities of metal can be stored.

MECHANISM OF PHYTOREMEDIATION

Phytoremediation can occur by the following mechanism:

1) Phytoextraction or phytoaccumulation: Phytoextraction is the removal of a contaminant from the soil, ground water or surface water by live plants. Phytoaccumulation occurs when the contaminant taken up by the plant is not degraded rapidly or completely, resulting in an accumulation in the plant.

2) Phytodegradation or phytotransformation: A contaminant can be eliminated by plant enzymes or enzyme co-factors[6;7]. Dec and Bollag describe plants that can degrade aromatic rings in the absence of

microorganisms. Polychlorinated biphenyls (PCBs) have been metabolized by sterile plant tissues. Poplar trees (*Populus* spp.) are capable of transforming trichloroethylene in soil and ground water [6,8]

3) Phytovolatilization: Phytovolatilization involves the use of plants to take up contaminants from the soil, transforming them into volatile form and transpiring them into the atmosphere. Phytovolatilization occurs as growing trees and other plants take up water and the organic and inorganic contaminants. [9].

4) Phytostabilization: Phytostabilization, also referred to as in-place inactivation, is primarily used for the remediation of soil, sediment, and sludges [10]. It is the use of plant roots to limit contaminant mobility and bioavailability in the soil. The plants primary purposes are to (1) decrease the amount of water percolating through the soil matrix, which may result in the formation of a hazardous leachate, (2) act as a barrier to prevent direct contact with the contaminated soil and prevent soil erosion and the distribution of the toxic metal to other areas. Phytostabilization can occur through the sorption, precipitation, complexation, or metal valence reduction.

5) Rhizodegradation: Rhizodegradation is a biological treatment of a contaminant by enhanced bacterial and fungal activity in the rhizosphere of certain vascular plants. The rhizosphere is a zone of increased microbial density and activity at the root/surface, and was described originally for legumes by Lorenz Hiltner in 1904 [11]. Plants and microorganisms often have symbiotic relationships making the root zone or rhizosphere an area of very active microbial activity [12,13,14,15]. Plants can moderate the geochemical environment in the rhizosphere, providing ideal conditions for bacteria and fungi to grow and degrade organic contaminants. Plant litter and root exudates provide nutrients such as nitrate and phosphate that reduce or eliminate the need for costly fertilizer additives.

6) Rhizofiltration: It is defined as the use of plants, both terrestrial and aquatic; to absorb, concentrate, and precipitate contaminants from polluted aqueous sources with low contaminant concentration in their roots.

Aquatic macrophytes have been used during the last two decades for water metal removal competing with other secondary treatments, being the principal mechanism for metal uptake adsorption through roots [18]. The aquatic floating macrophytes *Pistia stratiotes* L. (water lettuce), *Spirodela intermedia* W. Koch (duckweed) and *Lemna minor* L. (duckweed) present a high growth rate and have been used for the removal of Cd, Cr and Pb from water column [19, 20,21,22,23,24,25,26] *S. intermedia* and *L. minor* present the additional advantage of growing under varied climatic conditions. There are two general

mechanisms associated with the separation of dissolved metals from water using aquatic plant biomass. The first is the fast metabolism (within minutes) independent surface reaction that has modeled as a diffusion processes and ends when the soluble metal ions bind or sorbs to the outer cell wall of the biomass. The second is a slow metabolism (within hours or days) dependent cellular uptake that has been modeled as a mass transfer process from the outer cell wall to the cell or cell wall interior [27].

AZOLLA IN PHYTOREMEDIATION

Azolla name is derived from Greek word *azo* (to dry) and *alloyo* (to kill). It means that plant dies when it dries. The genus *Azolla* belongs to the single genus family Azollaceae [28]. The six recognizable species within the genus are grouped under two subgenera: *Euazolla* and *Rhizosperma* [29]. The four species under the sub-genus *Euazolla* are *A. filiculoides*, *A. caroliniana*, *A. mexicana* and *A. microphylla*. It is thought that these four species originated from temperate, sub-tropical and tropical regions of North and South America. Although reproductive characters provide the most useful tool for taxonomic separation but in most of the samples sporocarps are usually absent hence identification is difficult. However, Zimmerman *et al.* [30] found three of these species (*A. caroliniana*, *A. mexicana* and *A. microphylla*) to have close taxonomic affinity and similar responses to phosphorus deficiency and recommended that they be considered as a single species. The two species under sub-genus *Rhizosperma* are *A. nilotica* and *A. pinnata*. *A. nilotica* is a native of East Africa and can be found from Sudan to Mozambique. *A. pinnata* has two different varieties that vary in their distribution patterns. *A. pinnata* var. *imbricata* originates from subtropical and tropical Asia while *A. pinnata* var. *pinnata* occurs in Africa and is known as African strain.

Azolla is a free floating water fern, which occurs in the symbiotic association with N₂ fixing blue green alga *Anabaena azollae*. It has high rate of multiplication (doubling time is around 2-3 days) coupled with high potential for N₂ fixation making its biomass rich in nitrogen and protein. For this attribute it has been exploited as N- biofertilizer for rice as rice fields form an ideal environment for its growth. *Azolla* is worldwide in distribution and grows in varied conditions from dilute water bodies to polluted waterbodies [31]. It can uptake and accumulate nutrients directly from flood waters and has high affinity for P, Fe and K. It accumulates these nutrients several times more than its requirement then slowly releases these nutrients as it decomposes. Based on its capacity to

concentrate nutrients like N, P and heavy metals it has also been used for treatment of waste waters [32]

Azolla has great possibility of use in bioremediation of wastewaters and soils. There are three main aspects of use of *Azolla* in bioremediation. These areas are:

- a) For treatment of wastewaters rich in heavy metal pollutants.
- b) Treatment of domestic sewage effluents which are rich in N and P wastes.
- c) Bioremediation of saline soils.

Azolla possesses remarkable ability to absorb heavy metals such as chromium, zinc, nickel, cadmium copper and even uranium. The tolerance and concentration capacity of *Azolla* to different metal ions has been reported in earlier studies also. In 1985, Yong-Huang and Weizhen [33] from China studied tolerance of four *Azolla* species to Cu, Mn, Fe, Zn, Mo, Co, Cd etc under laboratory conditions and found that concentration capacity of *Azolla* for metals affected its growth only slightly without any detrimental effect or not at all. This suggested possible exploitation of *Azolla* in concentrating heavy metals from polluted aquatic systems. Since then many processes using *Azolla* alone or in mixed culture with other aquatic plants for treating wastewaters have been studied and developed.

The *Azolla* processes are superior to traditional methods of metal removal from effluents when:

- a) Environmental and ecological constraints exist
- b) Concentrations of metals in wastewaters are extremely low, but more than permissible limits (i.e. 1-20 ppm). At such low concentrations no chemical means of metal ion removal are effective.
- c) *Azolla* being freefloating, its biomass is very easy to harvest.

Azolla processes for heavy metal removal occur in two forms-

1. Active
2. Passive

In active process, metal removal occurs as *Azolla* plants grow in containers such as tanks or ponds containing wastewater, while in passive (biosorption) process the effluents are passed through dry *Azolla* biomass packed into filters. Both types of processes have been proved to be efficient in treating fresh,

brackish and polluted water. The possibility of using *Azolla* by active processes for purifying wastewaters has been explored earlier also where *Azolla* species in combination with other aquatic plants have been used. *Azolla* being free floating aquatic plant is best suited for growth in wastewaters than rooted aquatic plants.

In the recent past, exciting developments have occurred in the use of *Azolla* biomass for removal of heavy metals by passive processes using *Azolla* biofilters or biomatrix. The *Azolla* biomatrix can be used, not only for removal of toxic heavy metals, but also for concentration of precious metals. The distinct advantages of these processes using biomatrix are:

1. High binding capacity of *Azolla* biofilters for metals where binding to the extent of Pb-10%, Cd-3.7%, U-3.5%, Cr3+-9%, Cr6+-2% and Ni-3% has been achieved.
2. Single step polishing of effluents containing toxic heavy metals to extremely low concentration (like Pb down to 5ppb, Cr, Cd and Ni down to 20ppb).
3. *Azolla* biofilters retain heavy metal binding capacity at pH between 3.0-11.0.
4. The binding capacity is retained upon acid wash.
5. *Azolla* biomass for preparing biofilters can be easily obtained and *Azolla* biomass is produced in outdoor farms and polyhouses. *Azolla* farming is cheap, reproductive and large scale biomass production is being developed further.
6. Also metal laden *Azolla* biomass is easily decomposable and combustible
7. *Azolla* processes have been proved to be superior to active charcoal, zeolite, active earth, etc., and they are comparable to cubolite.
8. *Azolla* forms proper matrix at has very high amount of pectin less of cellulose and thus allow the flow of solution.
9. These processes can also be used for detoxification of the radioactive wastes.

Effect of *Azolla* on physiochemical properties of the soil was studied by Awoden M.A.[34] Soil pH, organic matter, N, P, K, Ca, Mg and Na increased with reduction in soil bulk density but increased soil porosity. *Azolla* is able to grow in the saline conditions, if adapted to it in a stepwise manner. Growth behaviour of *Azolla pinnata* at various salinity levels

and induction of high salt tolerance studies showed adaptation involved the development of a capability in the plants to regulate ion concentration [35].

Azolla sp. can be exploited for treatment of tannery and other Cr contaminated wastewaters [36]. It was found that *A. pinnata* and *Lamna minor* removed the heavy metals iron and copper from polluted water [37]. The pollutants at low concentration could be treated by passing it through ponds and can be reused for agriculture purpose. Results found by Cohen-Shoel [38] shows biofiltration of toxic elements by *Azolla* biomass. *Azolla* exhibits a remarkable ability to concentrate metals Cu, Cd, Cr, Ni, Pb and nutrients directly from pollutants [39] or sewage water [40]. It was found [41] that intact and treated biomass can remove heavy metals from water and wastewater.

In a review on *Azolla* Wagner [32] calls *Azolla* ña green gold mine . The mankind is threatened by drastic global environmental changes triggered by his own activities, we need to investigate and develop alternative strategies for conducting our affairs. The application of *Azolla* as biofertilizer , as a green manure, as mosquito repellant, in weed control as feed for livestock , in production of biogas[42] and bioenergy, play a significant role in maintaining or improving the state of global environment. There is a definite need to exploit the potential of the aquatic pteridophyte in a more efficient manner in the future, through biotechnological interventions. Therefore a combination of approaches involving basic and applied research should be taken towards making *Azolla* more resistant to environmental fluctuation and also less labour-intensive, so that its actual utilization is diversified and enhanced in agriculture, industry and environmental management.

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Issues & challenges in effective design of search engines

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Abstract— *With vast expansion of Web as Information resource, extracting knowledge from the Web is becoming difficult. To find Web pages, one typically uses search engines that are based on the Web crawling framework. This paper describes the basic architecture, and components of search engine. Major issues and challenges in implementing effective Web crawlers are also identified. An insight into the next generation search engines is being provided.*

I. INTRODUCTION

WWW is a vast resource of hyperlinked and heterogeneous information including text, audio, video, image etc. that continues to grow rapidly at million pages per day. With rapid increase in information resources available via WWW and users of the Internet, it is becoming difficult to manage and access the desired information on the web. Therefore, majority of users use information retrieval tools like search engines to find the desired information from the WWW. A Search Engine is an information retrieval system which helps users find information on WWW by making the web pages related to their query available. With a search engine, users have to type in “keywords” relating to the information that they need. The search engine would then return a set of results that match best with the keywords entered.

Many people believe that by using these information retrieval tools they can easily find the information on the topic they are looking for on the Web. However, many Web information services deliver inconsistent, inaccurate, incomplete, and often irrelevant results. For many reasons, existing Web search techniques have significant deficiencies with respect to robustness, flexibility, and precision. Since the first Web information services were based on traditional information retrieval (IR) algorithms and techniques. However, most IR algorithms were developed for smaller, more coherent collections than what the Web has become: today’s Web searching requires new techniques.

This article offers an overview of search-engine

architectures, Crawler and its types and discusses problems search engines face in indexing the web in maintaining or enhancing search-engine performance quality.

II. SEARCH ENGINE ARCHITECTURE

A Search Engine is an information retrieval system which helps users find information on WWW by making the web pages related to their query available. With a search engine, users have to type in “keywords” relating to the information that they need. The search engine would then return a set of results that match best with the keywords entered. A Web Search Engine can therefore be defined as a software program that takes input from the user, searches its database and returns a set of results. It is important to note that the search engine does not search the internet; rather it searches its database, which is populated with data from the internet by its crawler(s). Web search engines work by storing information about many web pages, which they retrieve from the WWW itself. These pages are retrieved by a Web crawler which follows every link it sees. Exclusions can be made by the use of robots.txt. The contents of each page are then analyzed to determine how it should be indexed. Data about web pages are stored in an index database for use in later queries. The typical architecture of a search engine is [7]:

The major components of search engine are Crawler, Indexer and Query processor. A crawler traverses the web by following hyperlinks and storing downloaded pages in a large database. It starts with seed URL and collects documents by recursively fetching links and storing the extracted URL’s into a local repository. The Indexer processes and indexes the pages collected by the crawler. It extracts keywords from each page and records the URL where each word has occurred. The query processor is responsible for receiving and filling search requests from user. The query processor processes user queries and returns matching answers in an order determined by a ranking algorithm.

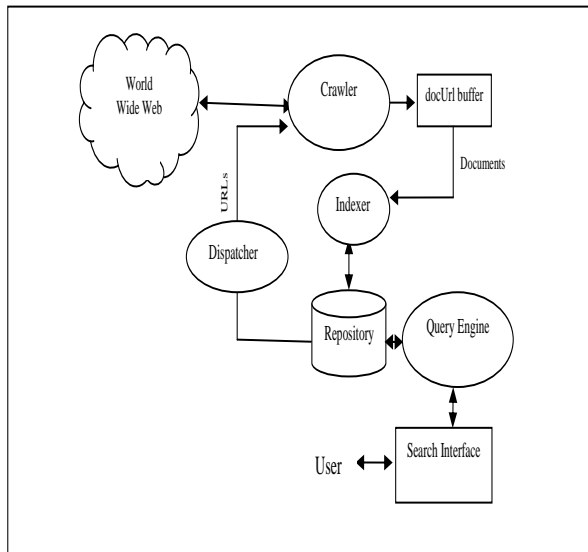


Figure 1 : Architecture of Search Engine

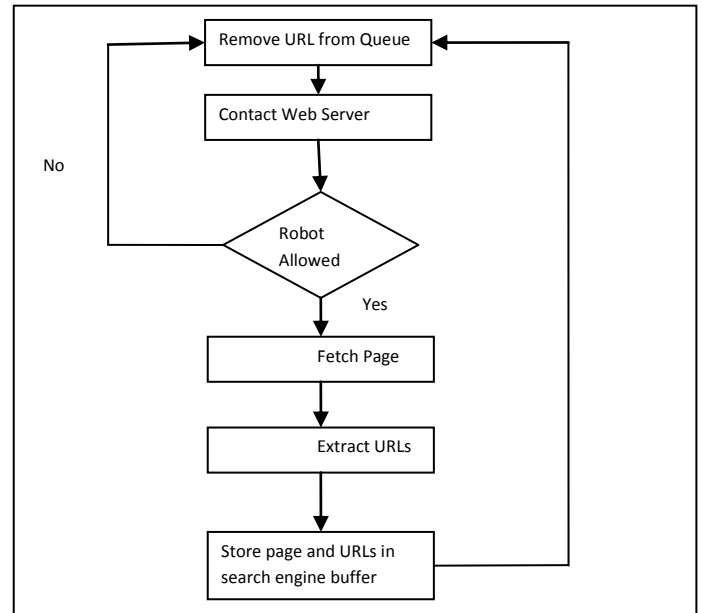


Figure 2 : Flowchart for working of a typical crawler

III. CRAWLER

A crawler is a program that downloads pages and stores them in repository maintained at search engine side. The objective of crawling is to quickly and efficiently gather as many useful web pages as possible, together with the link structure that interconnects them.

The basic operation of any hypertext crawler is as follows. The crawler begins with one or more URLs that institute a seed set. It picks a URL from this seed set, and then fetches the web page at that URL. The fetched page is then parsed, to extract both the text and the links from the page (each of which points to another URL). The extracted text is fed to a text indexer. The extracted links (URLs) are then added to a URL queue, which at all times consists of URLs whose corresponding pages have yet to be fetched by the crawler. The entire process may be viewed as traversing the web graph. Figure2 shows the flowchart for the working of a typical crawler.

As shown in Figure 2 Robot.txt files carries downloading permissions and also specifies the files to be excluded by the crawler.

Based on their page retrieval and documents refreshing techniques crawlers can be divided into several categories

- **Focused Crawler:** A focused crawler or topical crawler is a web crawler that attempts to download only web pages that are relevant to a pre-defined topic. The goal is to select links that lead to documents of interest, while avoiding links that crawler uses an additional classifier to select most promising links on a relevant page and the crawling cycle starts with a seed list which contains URLs that are relevant to the topic of interest. The main components of a focused crawler are Classifier, Distiller and download workers. Classifier makes relevance judgments on pages crawled and takes decision whether to expand links or not. Distiller determines a measure of centrality of crawled pages to determine visit priorities.
- **Parallel Crawlers:** In a parallel crawler multiple processes run in parallel to perform the downloading task, so that download rate is maximized. A parallel crawler consists of

multiple crawling processes referred as C-Proc. Each C-Proc performs the basic tasks that a single process crawler conducts. A parallel crawler may be categorized as Intra-site crawler, where all processes run on the same local network and communicate through high speed interconnect such as LAN and Distributed Crawler where processes run at geographically distant locations connected by the Internet. Coordination among processes may be achieved in three ways: Independent (no coordination), Dynamic assignment (central coordinator divide the Web into small partitions and dynamically assigns each partition to a C-Proc for download), Static assignment (Web is partitioned and assign each c-Proc before the start of a crawl).

- Migrating Crawlers: In migrating crawlers migrants move to the data sources i.e. servers before the actual crawling process is started. After performing all crawling tasks, migrant may move on the next server or may return to the originating node. The main advantage of this approach is that it allows us to distribute crawling functionality with in a distributed system and hence reduce the network load.

IV. ISSUES AND CHALLENGES IN WEB SEARCH ENGINES

In order to download the large number of web pages from the web, a highly efficient crawling system is needed. The enormous size of the web coupled with the dynamic nature of documents poses following issues towards design of an efficient crawling system.

1. How to crawl best pages: Since a crawler can download only some part of the web at any time, it must be biased towards downloading important pages first. search engines *should not* index the entire Web. An ideal search engine should know all the pages of the Web, but there are contents such as duplicates or spam pages that should not be indexed.

2. Overlapping of web documents: Overlap problem occurs when multiple crawlers running in parallel download the same web document multiple times due to the reason that one web crawler may not be aware of another having already downloaded the same page. Also many organizations mirror their documents on multiple servers to avoid arbitrary server corruption. In such a situation, crawlers may also unnecessarily download many copies of the same document. Moreover to improve the quality of downloaded web documents, multiple crawlers running in parallel must have global image of collectively downloaded web pages so that redundancy may be avoided

3. Network bandwidth/traffic problem: In order to maintain the quality, the crawling process is carried out using either of the following approaches: Crawlers can be generously allowed to communicate among themselves or they cannot be allowed to communicate among themselves at all.

In the first approach network traffic will increase because crawlers communicate among themselves more frequently to reduce the overlap problem whereas in second approach, if they are not allowed at all to communicate then as a result same web documents may be downloaded multiple times thereby consuming the network bandwidth. Thus both approaches put extra burden on network traffic.

4. Change of web documents: Changing of web documents is a continuous process. Of course, the frequency of change varies from document to document. Search engines should not only focus on the sizes of their indices, but also on their up-to-dateness. This change must be reflected at the search engine repository failing which a user may get an obsolete image of the web documents. Search engines face problems in keeping up to date with the entire Web, and because of its enormous size and the different update cycles of individual websites, adequate crawling strategies are needed.
5. Web Content: Web documents differ significantly from documents in traditional information systems. On the Web, documents are written in many different

languages, whilst other information systems usually cover only one or a few selected languages. Documents are indexed using a controlled vocabulary, which allows it to search for documents written in different languages with just one query.

Another difference is the use of many different file types on the Web. Search engines today not only index documents written in HTML, but also PDF, Word, or other Office files. Each file format provides certain difficulties for the search engines. In the overall ranking, all file formats have to be considered. There are some characteristics, which often coincide with certain file formats, such as the length of PDF files, which are often longer than documents written in HTML. The length of documents on the Web varies from just a few words to very long documents. This has to be considered in the rankings.

Another problem is the documents structure. HTML and other typical Web-documents are just vaguely structured. There is no field structure similar to traditional information systems, which makes it a lot more difficult to allow for exact search queries.

6. Spam: Everyone knows that spam is a problem from his or her own e-mail account. Like with e-mail accounts, spammers try to flood search engine indices with their contents. It is very important for search engines to filter these pages to keep their indices clean and keep a good quality of their results.
7. Temporal Quality of downloaded web documents: The quality of downloaded documents can be ensured only when web pages of high relevance are downloaded by the crawlers but the crawlers today are not capable of automatically tracking the user trends or the topics of current interest. Therefore, a crawler should be capable to automatically track the current trend topics and download web pages that meet user's current need.
8. Almost all available crawlers provide the parallelism through running the parallel crawling instances on the single machine. This imposes overload not only on the host machine but also leads to network congestion problem. Therefore there is a

need for a crawler to avoid network load and congestion by distributing the load among the servers.

V. NEXT GENERATION WEB

Due to the Web's continued growth, today's Web searches require new techniques- exploiting or extending linkages among web pages. A lot of research is going on in developing new web page retrieval, indexing and ranking techniques. Intelligent crawling is the need of the future which can be achieved using semantic search.

Semantic search aims to extend and improve traditional search processes based on IR technology. These intelligent search engines incorporate Web semantics and use more advanced search techniques based on concepts such as machine learning. These approaches enable intelligent Web information services, personalized Web sites, and semantically empowered search engines.

VI. CONCLUSION

This paper describes general architecture of a search engine along with its major components is given. A detailed discussion

of web crawlers and their types is also discussed. Although the web is a huge repository of information but it lacks quality control. Step toward a Semantic Web are steps toward intelligent searching and support the vision of the next generation search engines.

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Influence Of Various Parameters For Reliable Analysis Of Disc Brake Rotor

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Abstract— In the present work various parameters of rotor has been discussed for reliability of disc brake. Brake drum used in past design has been replaced by disc brakes which find application in motor bikes, racing bicycles, cars. It is having advantages of compactness, strength, water spillage out side the brake surface and heat dissipation by ventilation. The metallurgical properties of a rotor determine its strength, noise, wear and braking characteristics. Proper composition of the rotor is carefully selected and controlled during the casting. The rate of cooling also affects the hardness of a rotor. If a rotor is too hard, it will increase pad wear and noise. In this paper rotor metallurgy, cooling ribs, heat dam, surface finish have been explored for the reliability

Index terms—Brake; metallurgy; cooling ribs; heat dam; surface finish

I. INTRODUCTION

The disc brake is a device for slowing or stopping the rotation of a wheel while is in motion. A brake disc is usually made of cast iron, but may in some cases be made of composites such as reinforced carbon-carbon or ceramic-matrix composites. This is connected to the wheel and/or the axle. To stop the wheel, friction material in the form of brake pads (mounted on a device called a brake caliper) is forced mechanically, hydraulically, pneumatically or electromagnetically against both sides of the disc. Friction causes the disc and attached wheel to slow or stop. Joe Y.G. cha [1] explained Analysis of disc brake instability due to friction induced vibration. M.Bayat [2] explained the effect of ceramic in combination of functionally graded rotating disc and the friction-induced vibration with a constant friction coefficient. Utz von wagner [3] explained Influence of dynamic brake pad properties on automotive disc brake squeal. Brakes both disc and drum convert friction to heat, but if the brakes get too hot, they will become less effective because they cannot dissipate enough heat. This condition of failure is known as brake fade. The energy absorbed by brakes is dissipated in the form of heat. This heat is dissipated in the surrounding atmosphere to stop the vehicle.

II. DISC BRAKE ROTOR

The underlying scientific principle here is that friction converts motion into heat. The amount of heat that is generated depends on the speed and weight of the vehicle, and how hard the brakes are applied. The rotor's job is to provide a friction

surface, and to absorb and dissipate heat. Big rotors can obviously handle more heat than small rotors. But many cars today have downsized rotors to reduce weight. Consequently, the brakes run hotter and require better rotor cooling to keep brake temperatures within safe limit. Uneven rotor wear (which may be due to excessive rotor runout or rotor distortion) often produces variations in thickness that can be felt as pedal pulsations when the brakes are applied. The condition usually worsens as the rotors continue to wear, eventually requiring the rotors to be resurfaced or replaced. Rotors can also develop hard spots that contribute to pedal pulsations and variations in thickness. Hard spots may be the result of poor quality castings or from excessive heat that causes changes in the metallurgy of the rotors. A sticky caliper or dragging brake may make the rotor run hot and increase the risk of hard spots forming. Hard spots can often be seen as discolored patches on the face of the rotor. Resurfacing the rotor is only a temporary fix because the hard spot usually extends well below the surface and usually returns as a pedal pulsation within a few thousand miles. That is why most brake experts replace rotors that have developed hard spots.

Cracks are another concern with rotors. Cracks can form as a result of poor metallurgy in the rotor (too hard and too brittle because the rotor was allowed to cool too quickly during the casting process), and from excessive heat. Some minor surface cracking is tolerable and can often be removed by resurfacing, but large cracks or deep cracks weaken the rotor and increase the risk of catastrophic failure. So cracked rotors should always be replaced.

III. ROTOR METALLURGY

The metallurgical properties of a rotor determine its strength, noise, wear and braking characteristics. The casting process must be carefully controlled to produce a high quality rotor. You cannot just dump molten iron into a mold and hope for the best. The rate at which the iron cools in the mold must be closely monitored to achieve the correct tensile strength, hardness and microstructure. When iron cools, the carbon atoms that are mixed in with it form small flakes of graphite which help dampen and quiet noise. If the iron cools too quickly, the particles of graphite do not have as much time to form and are much smaller in size, which makes for a noisy rotor. The rate of cooling also affects the hardness of a rotor. If a rotor is too hard, it will increase pad wear and noise. Hard rotors are also more likely to crack from thermal stress. If a

rotor is too soft, it will wear too quickly and may wear unevenly increasing the risk of pedal pulsation and runout problems. The composition of the iron must also be closely controlled during the casting process to keep out impurities that may form "inclusions" and hard spots. One rotor manufacturer says they sample the molten iron every 15 seconds to make sure the composition is correct. The molten metal is also poured through ceramic filters that trap contaminants. Even the sand that is used to make the molds is specially treated to control moisture content. This helps keep the sand in place and prevents core shifts that can affect porosity, dimensional accuracy and balance. The grade of cast iron that is used in a rotor may even be changed to suit a particular application. One aftermarket rotor manufacturer uses a special grade of "dampened iron" to make replacement rotors for 1997-2002 Chevrolet Malibu and its sister vehicles (Olds Alero, Olds Cutlass and Pontiac Grand Am). In this case, the original OEM rotors turned out to be too noisy so General Motors switched to a dampened grade of iron to cure the problem.

IV. ROTOR COOLING RIBS

Vehicle manufacturers use a wide variety of different cooling rib configurations in their rotors. They do this to optimize cooling for different vehicle applications. So even though the brakes may appear to be identical on two different models, one may require increased cooling because the vehicle is heavier, has a more powerful engine, has less airflow around the brakes, etc.

Some aftermarket rotor manufacturers use the same rib design and configuration as the OEM rotors, while others do not. Some change the rib design to simplify the casting process or to reduce the number of different rotor SKUs in their product lines.

The OEMs currently use almost 70 different rib configurations in their rotors. Some ribs are straight, some are curved and some are even segmented. Some rotors are directional and some are not. Some rotors have evenly spaced ribs while others do not. Some ribs radiate outward from the center and others go every which way. One reason why they use so many different rib patterns is to maximize cooling and to reduce harmonics that contribute to brake squeal. Changing the rib design changes the airflow, cooling and noise characteristics of the rotor, which may make things better or worse depending on the application. That is why some aftermarket rotor manufacturers use the same basic design as the original, while others stick with more traditional venting. One brake manufacturer showed us a cutaway of an offshore "economy" rotor for a particular vehicle that had 32 ribs. The OEM rotor, by comparison, had 37 ribs and provided up to eight percent better cooling than the economy rotor when tested in the laboratory. And because the OEM rib design ran cooler, pad life was 28 percent longer than the economy rotor.

Another aftermarket brake manufacturer showed us test results that proved their rib design improves cooling and makes their rotor three times quieter than a competitive rotor. The recorded sound levels showed noise as high as 85 decibels screaming out of the Brand X economy rotor compared to only 40 to 50 decibels from their own "premium" quality rotor.

V. ROTOR HEAT DAM

A heat dam is often machined into the area between the friction surface and hat on most rotors. The dam is a thinner section of metal that reduces heat transfer from the rotor surface to the hat. This protects the wheel hub and bearings from the heat and also allows the rotor to flex when it gets hot to reduce the risk of warping and cracking. If a rotor manufacturer cuts corners and eliminates the heat dam, heat can travel more easily to the hub and wheel bearings and increase the risk of bearing failure. The rotor may also be more prone to cracking under high heat conditions.

VI. ROTOR SURFACE FINISH

Smoother is always better because it affects the coefficient of friction, noise, pad seating, pad break-in and wear. As a rule, most new OEM and quality aftermarket rotors have a finish somewhere between 30 and 60 inches RA (roughness average) with many falling in the 40 to 50 RA range. New rotors should always be installed "as is", and indexed on the vehicle with a dial indicator to minimize runout. As a general rule, there should be no more than .003 inches of rotor runout on most cars and trucks, but some cars cannot tolerate any more than .0015 inches of runout. Few technicians take the time to do this, but if they did they had probably see fewer comebacks because of pedal pulsation complaints.

VII. ADVANTAGES OF DISC BRAKE OVER DRUM BRAKE

Disc brakes are generally considered superior to drum brakes as they dissipate heat better due to brakes work by converting motion energy to heat energy.

VIII. CONCLUSIONS

These are the factors which influence the work of disc brake. Therefore the careful selection of the parameters is essential for improving the life and reliability of brake disc.

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Radon, thoron and their progeny measurements in the environment

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Abstract— Radon is an invisible, odourless, heaviest (9 times heavier than air) and radioactive gas. Radon, which is topic of public health concern, has been found to be a ubiquitous air pollutant in homes and in the environment of work stations. Risk projections imply that radon is the second leading cause of lung cancer after smoking. Measurement of radon, thoron and their progeny is important because the radiation dose to human population due to inhalation of radon and its progeny contribute more than 50% of the dose from all sources of the radiation. LR-115, type-II, plastic track detectors (SSNTDs) use to measure radon concentration.

Keywords—Radon, thoron, progeny, SSNTDs

I. INTRODUCTION

We live in a milieu of radiation and are continuously exposed to ionizing radiation from natural and artificial sources. Natural radioactivity is wide spread in the earth's environment and it exists in various geological formations in soils, rocks, plants, water and air (Ibrahiem et al., 1993; Malance et al., 1996; Aly Abdo et al., 1999). About 90% of radiation exposure to human arises from natural sources such as cosmic radiation, terrestrial radiation and exposure to radon, thoron and their progeny (BEIR VI, 1999). Radon, a topic of public health concern, has been found to be a ubiquitous radioactive air pollutant in homes and in the environment of certain workplaces (such as thermal power plants, gas turbine power plants, refineries and Liquid Petroleum Gas (LPG) bottling plants) to which all persons are exposed (Cole, 1993; Proctor, 1995; Kant and Chakarvarti, 2003; Kant et al., 2006; Marcia et al., 2006; Deka et al., 2006). Problem of radon is global and concerns the world population.

It is well known that exposure of population to high concentrations of radon and its daughters for a long period lead to pathological effects like the respiratory functional changes and the occurrence of lung cancer (BEIR VI, 1999). ^{222}Rn , a progeny of ^{238}U , formed from the radioactive decay of radium which occurs in trace amounts in rocks and soils all over the earth's crust, is an invisible, odourless, electrically uncharged noble but hazardous gas and emits alpha radiation. There are three isotopes of radon viz., actinon (^{219}Rn) with a half-life of 3.96 sec., thoron (^{220}Rn) with a half-life 55.6 sec., and radon (^{222}Rn) with a half-life 3.824 days, belonging to the decay chain of ^{235}U , ^{232}Th and ^{238}U , respectively.

Although, the concentration of thoron in the indoor air is expected to be less than that of radon, even then there is rising interest in the dosimetry of thoron for risk evaluation (Steinhausler, 1993& 1996; Shang et al., 1997, Tokonami et al., 2004). Radon is generated from radium present in soil, building material and even in water. It can be easily dispersed into the atmosphere and can easily enter into the homes via soil, cracks, water, windows etc. as shown in fig. 1.

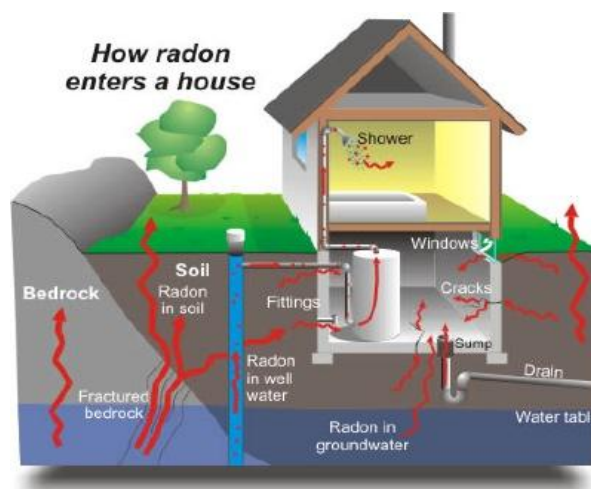


Fig. 1 Typical ways of entry of radon entry in dwellings

Radon can migrate and diffuse through different media. The migration of radon is dependent on its half-life and permeability of the medium. Radon is second most common cause of lung cancer after cigarette smoking. The environmental radioactivity build-up in the environment leads to the radiation exposure of both humans and biota (plants, animal etc.)

The exposure to alpha radiation emitted from radon-222 (^{222}Rn), immediate daughter of Radium-226, poses grave health hazards not only to uranium miners but also to people living in normal houses and buildings and workplace like thermal power plants, nuclear power plants, refineries and LPG bottling plants in which gas and oil processing operations are carried out, gas turbine power plants, fertilizer industry, granite industry, slate mines, cement manufacturing plants, industries using gypsum, asbestos, fly ash for making bricks,

partition boards and asbestos sheets, coal fields and other related industries (ATSDR, 1999, 5-11, 13-19). Radon now has been identified as occupational respiratory carcinogen by International Agency for Research and Classified Cancer (IARC, 1987). As per ICRP recommendations, it becomes necessary to take remedial steps for the reduction of radon and its progeny if the level is found to be more than 200 Bq-m⁶³ for dwellings and more than 500 Bq m⁶³ for the work place (ICRP, 1993).

Measurement of radon, thoron and their progeny in dwellings, workplaces and building materials is important because the radiation dose to human population due to inhalation of radon and their progeny contribute more than 50% of the dose from all sources of the radiation both naturally occurring and manmade (UNSCEAR, 2000).

Various researchers have reported that exposure to high levels of environmental smoke at the workplace and in other public sector indoor settings are important risk factors for lung cancer risk in workers (Grey, 1991; Kreuzer et al., 2000). Radon daughter exposure, however, has been associated with an increased risk of lung cancer. For this reason, all exposures should be kept below recognized exposure standards for the general public and unnecessary exposure to radiation should be minimized. The estimated level of health risk associated with average indoor radon levels is much higher than those due to other environmental carcinogens (Nazaroff and Nero, 1988). It is quite important to make a systematic study of radon exposure from health and hygiene point of view, because a radiation dose to human population due to inhalation of radon and its progeny contribute more than 50% of the total dose from the natural sources (UNSCEAR, 1999). It has a direct relevance to the public in general and the workers in Industries in particular. Modern Buildings are liable to allow build-up of radon, because the building envelope is almost airtight while the foundation is leaky to soil gas. Based on the study, the annual effective doses received by the persons and health risk assessment would be made as per ICRP (International Council for Radiation Protection) Recommendations.

II. MEASUREMENT TECHNIQUES

A. Twin Cup Dosimeter for Radon, Thoron and their progeny Measurements

In Twin Cup Dosimeter for Radon, Thoron and their progeny Measurements, solid state nuclear track detectors SSNTDs can be used for recording the alpha charged particle tracks. (Frank and Benton, 1978; Fleischer et al., 1975; Kant et al., 2006; Nain et al., 2010)

The LR-115 type II (Kodak- Pathe: Cellulose Nitrate type II, Vincennes, France) plastic track detector used for radon measurements. It consists of a 10-13 μm thick alpha-sensitive layer of red dyed cellulose nitrate plastic deposited on a 100 μm thick insensitive and non-detachable polyester base. The film is sensitive to alpha particles with energies in the range of

1.7- 4.8 MeV emitted by radon in the surrounding air. LR-115 films are not affected by electrons or by radiations in the electromagnetic spectrum (such as gamma rays, X-rays, ultraviolet or infra-red). These can, therefore, be handled without risk where such radiations are present.

The track etching mechanism of LR-115 detectors has been studied at different temperatures ranging from 300C to 600C for different etching times and the calculated value of activation energy is 0.1845 eV (Paul and Bose, 1980). Another suitable etch condition reported is 2.5 NaOH, 600C, 60 to 70 minutes with stirring (Costa-Riberio and Labao, 1975).

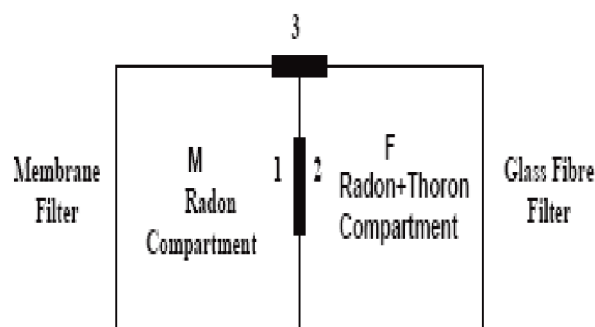


Fig-2 Twin Cup Chamber

The dosimeter which would be employed for the measurement consists of a twin chamber system with SSNTDs placed on the two sides of the central partition inside the cup and a bare film placed outside it, as shown in Fig. 2 (Eappen and Mayya, 2004). Each chamber has a length of 4.5 cm and a radius of 3.1 cm. The LR-115 films will be fixed in the dosimeter system and mounted at the same place.

The detectors will be exposed in the mixed field of radon-thoron in the environment of the dwellings and workplaces in three different modes:

- the bare mode, recording alpha tracks due to radon, thoron and their progeny
- the cup with filter paper mode, recording alpha tracks due to radon and thoron only
- the cup with filter paper and membrane mode, recording alpha tracks due to radon alone.

B. Can Technique for Radon Exhalation Rates Measurements from Various Samples

For the measurement of radon exhalation rates from material samples, the "Can technique" will be used (Kant et al., 2010; Rafique et al., 2011). The exhalation rate is the amount of radon emanated from a given sample per unit mass (for mass exhalation rate) or surface area (for surface exhalation rate) per unit time. A known amount of given sample is kept in plastic cans. The LR-115 plastic track detector is fixed on the bottom of the lid of each can with tape

such that sensitive side of the detector faces the specimen. The can is tightly closed from the top and sealed as shown in fig. 3.

At the end of the exposure time (~100 days), the detectors will be removed and subjected to a chemical etching process in 2.5 N NaOH solution at 60°C for 90 minutes. The etched detectors are thoroughly washed and dried and the alpha tracks are counted using an optical Olympus microscope with CCTV camera and a monitor at magnification 600 X. using some standard equations (Kant et al., 2010), radon exhalation rates are calculated.

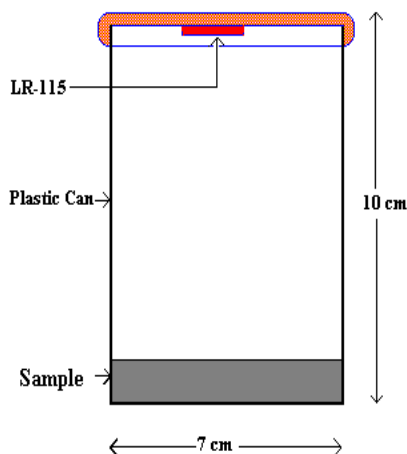


Fig.3 The can for the measurement of radon exhalation rates

III. CONCLUSION

The measurement techniques indicate moderate to high levels of radon/ thoron concentration at different locations in the environment. Measurement shows adverse effects on humans and Biotas. So, necessary steps should be taken to minimize the adverse effect on the environment from naturally occurring radioactive material exposure through monitoring, safe guidelines and handling of contaminated waters.

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Document structure similarity methods: a review

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Abstract—The primary goal of Search Engines is to provide user information relevant to its query. For this purpose a web crawler is used which is a part of search engine and responsible for fetching data. The crawler traverses the web and provides pages to the search engines. Generally crawling is based on content but it is observed that structure of a page plays an important role in getting more relevant data. This paper reviews some methods given by various researchers in which crawling is based on structure of a page rather than content.

Index Terms—C Search Engines, Web Crawler, Document Structure.

I. INTRODUCTION

In everyday life we take help of search engines (such as google, altavista, yahoo etc.) to search for information on the World Wide Web. Search engines try to maintain real-time information by running an algorithm on a web crawler.

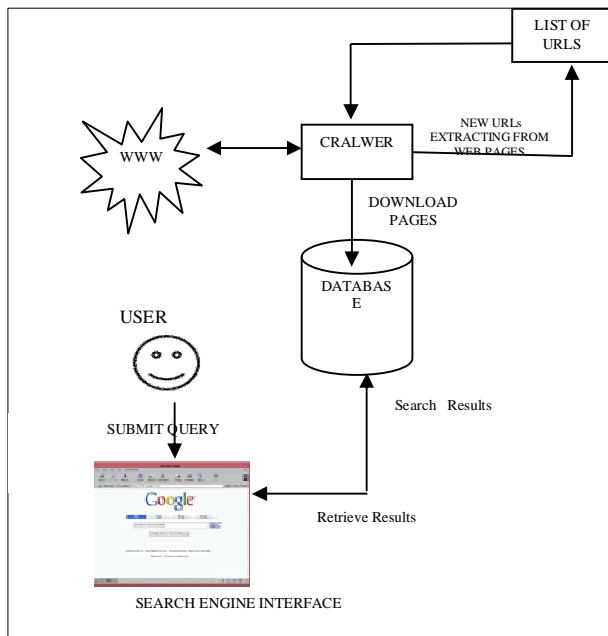


Fig. 1. Architecture of a Search Engine

A Web Crawler is a program that visits Web sites and reads their pages and other information in order to create entries for a search engine index. The architecture of a general search engine is shown above in figure 1.

On everyday basis large number of documents gets added on the Web. This has made document extraction process

cumbersome. Focus of most of the research work related to document extraction is on content of the document. But with the increase in number of documents on the web, identifying documents on the basis of their structure seems to be more meaningful. Structural information helps in grouping of large number of pages from various websites. Algorithms based on similarity of structure for searching information compute the minimum cost edit distance between any two document structures. However, as these algorithms are expensive, typically requiring $O(n^2)$ or more time to compute the distance, there are opportunities to create algorithms that are faster, but provide slightly less accuracy in computing the distance. In this paper we present an overview of the current approximation algorithms used to detect structural similarity between different web documents.

II. DOCUMENT SIMILARITY METHODS

Overview of the different types of algorithms that have been used to determine document similarity has given below. The different metrics described are tree edit distance similarity, tag similarity, Fourier transforms, and path similarity.

A. Navigation pattern

Vidal et al.[1] proposed that by knowing the structure of a page beforehand which is a sample page of users query, relevant page(s) can be searched more efficiently. So, like previous crawling methods in which all pages related to search topic has been fetched, now fetch only those pages which will have similar structure as that of sample page in terms of relevancy.

For the desired purpose a tool is developed by Vidal et al.[1] for generating structure-driven crawlers that requires only little efforts from users, since it relies on a sample page of the pages to be fetched. To accomplish this, given a sample page and an entry point to a Web site, the tool greedily traverses the Web site looking for target pages, i.e., pages that are structurally similar to the sample page. Next, it records all paths that lead to target pages and generates a navigation pattern which is composed by sequences of patterns of links a crawler has to follow to reach the target page. Finally, the tool generates a crawler based on these patterns. From this point on, the crawler can be used to fetch pages that are structurally similar to the sample page, even if new similar pages are added later.

B. X-PATH

It is considered that web pages are in the form of HTML pages. **Wang et al.[2]** represent web Documents as document Object Model (DOM). But before representing HTML pages into Dom tree, first convert them into XHTML pages. Let us assume an example, suppose A & B are two Dom trees corresponding to two web pages. A formula is derived that calculate similarity between documents. The formula follows as:

$$\text{Similarity}(A, B) = \frac{\text{SimpleTreeMatching}(A, B)}{(\text{sizes}(A) + \text{sizes}(B))/2}$$

Where,

$\text{SimpleTreeMatching}(A, B) \rightarrow$ the number of maximum matching nodes of tree A & tree B;
 $\text{sizes}(A) \& \text{sizes}(B) \rightarrow$ the number of nodes on tree A and tree B.

When $\text{Similarity}(A, B)$ is closer to 1, tree A and tree B are very similar to each other, and the HTML documents they represent are also very similar. For a given specific threshold $\theta(0 \leq \theta \leq 1)$, if the $\text{Similarity}(A, B) \times$, then the two trees are considered to be matched successfully, and the Web data will be extracted correspondingly; otherwise, the two trees does not match. In this paper, θ is set as 0.6.

C. DOM TREE

Chunying Kang [3] also decomposed these web pages in DOM tree. Then these DOM trees are then traversed in breadth first manner. On the basis of traversal, statistics of its changes, layer by layer DOM node tree comparison and then the sum of all floors of the changes are computed. Some threshold value is fixed on the basis of which it is decided that if their value is less than some threshold then pair of pages are structurally similar otherwise not.

D. BETWEEN XML DOCS

Nierman et al. [4] gives the idea to measure structural similarity between two XML documents. Tree edit distance based measures are used here. The algorithm developed by them is dynamically finds the distance between any pair of documents. A collection of documents are derived from multiple Document Type Descriptors (DTDs) are used here from which pair-wise distances between documents in the collection are computed and cluster the documents using these distances. It is observed that the resulting clusters match the original DTDs and has better results than previously used similarity methods.

E. FOCUSED CRAWLERS' APPROACH

Ling Yu et al. [5] represents web page in the form of tree. Tree has nodes that denoted as tags such as form, body, table, title etc. Now similarity between two trees is computed as:

$\text{Structure} \times \text{Structure} _ [0 \dots 1]$, which returns the degree of similarity of a structure of the page operating to the structure of the page given. It is considered that if the situation is ideal then this function should have the property that if its value for x_1 is greater than for x_2 then we can conclude that the similarity of x_1 to the page is higher than x_2 . The main idea behind this function is that usually similar structure in pages belonging to a specific domain.

III.CONCLUSION

With time various methods have been developed for searching relevant web pages. Broadly there are two kinds of methods used for searching pages-Content based and structure based. This paper highlights some of important methods based on similarity of structures. Various methods discussed in the paper shows that structure based methods give better results than content based methods.

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Popular Science

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Abstract— Portmanteau words like ‘infotainment’ and ‘edutainment’ well reveal how great can be the value of media in spreading information and education. Science will not inspire, if not for media; it will become a pastime for bookworms merely. So, to liberate us from a ‘frog-in-the-well’ existence, we must communicate and we must know. I can see media as digging tunnels through innumerable wells and creating a network through which information can be exchanged and scientific knowledge shared- globalization and global villages can be viewed that way. Science can be used to enlighten the masses, not as staple of pedantic lectures but liberated of jargon and intellectual elitism. Science is firmly grounded in laws but still amazes. It also intimidates. Text book science certainly does. Not so with popular science. It is contemporary realization that science has to deal with literature; it cannot afford to lord over an isolated realm. It will have to get folk appeal- be butt of jokes and at the heart of humour. To be ‘happening’ and form an interesting part of ‘noosphere’ it has to even get parodied. It may also venture into speculation and evoke wonder rather than harp on realism all the time. Information has to be blended with entertainment to become palatable as infotainment. Science has to enter speculation and learn its lessons from science fiction to keep up its popularity and even relevance. Putting its finger on the nerve of contemporary populace, science has to be egalitarian, not elitist. At the same time, popular science has to be guarded from overt theatricality and sensationalism. So, the line dividing science fiction from futuristic writing has to be carefully drawn.

I. INTRODUCTION

Portmanteau words like ‘infotainment’ and ‘edutainment’ well reveal how great can be the value of media in spreading information and education. Science will not inspire, if not for media; it will become a pastime for bookworms merely. So, to liberate us from a ‘frog-in-the-well’ existence, we must communicate and we must know. I can see media as digging tunnels through innumerable wells and creating a network through which information can be exchanged and scientific knowledge shared- globalization and global villages can be viewed that way. Science can be used to enlighten the masses, not as staple of pedantic lectures but liberated of jargon and intellectual elitism. Science is firmly grounded in laws but still amazes. It also intimidates. Text book science certainly does. Not so with popular science. It is contemporary realization that science has to deal with literature; it cannot afford to lord over an isolated realm. It will have to get folk appeal- be butt of jokes and at the heart of humour. To be

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II. LEARNING FROM LITERATURE

In his preface to *Hyperspace* Kaku recalls Nobel Prize winner Isidore I Rabi’s stance who castigated physicists saying that ‘science –fiction writers had done more to communicate the romance of science than all physicists combined’ (xii).

So, science is also learning from literature. In fact, science has picked up more from literature than just the use of literary devices. Scientists are working and writing on themes suggested by most imaginative of authors. It has been understood that though science may lose popularity if it does not become more appealing or more practicable/applicable as technology, literature will remain relevant whatever be the drift of times. Pure science, therefore, garners support from literature in gaining popularity. For example, sitcoms that parody science or use jokes tapping on stereotypes of scientists and mathematicians ultimately inspire the audience to check the fundamental theories.

Modern science writing aims to make science accessible to the informed laymen, for example Richard Dawkins has compiled an anthology of scientific papers in *The Oxford Book of Modern Science Writing* (2008) with a title allusive of this orientation. Similarly Roger Penrose has written a much acclaimed book *The Emperor’s New Mind: Concerning Computers, Minds and the Laws of Physics* (1989), another Oxford publication.

Many scientists give enigmatic titles to their essays, not only this they begin explicating on their theories through illustrations, evocative imagery, anecdotes and allegories and analogies. They may also allude to some mythological story rather than just citing terse precedents from the scientific world.

Media’s role in spread of scientific awareness and temper cannot be gainsaid. It goes beyond literature to visual and

performing arts. Where should one place MJ's moon-walk or music called metallica? One may also be reminded of cubist paintings and surrealistic art, and automatic writing. Does the allusion to science in these media make or mar its purpose? Media, for the purpose of the paper, is writing, performance or technological media-all.

III. METHODS

Science is adopting a multi-pronged strategy to gain media popularity.

First method involves demystification of traditional ideas and received wisdom or folklore or even nursery rhymes. Hoisting counterposts to check various statements by. For every answer that literature or scriptures offer from creation/genesis to rainbows and butterflies- science has an alternative answer emerging in rational and logical world. Parodies of nursery rhymes also highlight how our perspectives change with technological advancement. This one by Ian D Bush is shared by Kaku:

Twinkle, twinkle little star
I don't wonder what you are,
For by spectroscopic ken,
I know that you are hydrogen. (Hyperspace. 186)

Second strategy to make science appeal to the reader works by highlighting its own enigma, evoking mysteries and keeping questions open-ended as in discussions on nature of electrons, parallel universes, other dimensions and time travel. Offering itself as the window to the universe and laying out vistas to be explored. Even hypothesis have become as worthy of attention as thesis itself; sometimes demanding even more respect.

It was the poet who hitched his wagon to the moon first, scientists followed and then came the 'giant leap for the mankind'. Is it not true that Isaac Asimov envisaged the arrival of robots and laid down three laws of robotics fifty years before robots first appeared in reality in Japan? Robots were first talked about in a Czech play called RUR by Karel Capek (Rossum's Universal Robots) in 1920. Artificial Intelligence, Cybernetics and Genetic Engineering have also inspired sci-fi writing with human sojourns into Jurassic periods and conceptions of androids, humanoids, cyborgs, hybrids and clones. We have moved from textual robots to actual robots and from robot slaves of RUR to Asimov's intelligent robots materialized as Asimo, the real-world humanoid developed by Honda and displayed at Expo 2005. Sci-fi magazines have time-travel, space travel, wormholes, aliens and UFOs as patent objects but modern science writing too takes these as serious subjects. From Science Fiction, we move to the realm of Futuristic Writing. In his preface to Hyperspace, Michio Kaku informs: 'Physicists at the California Institute of Technology, for example, have seriously proposed the possibility of building a time machine,

consisting of a wormhole that connects the past with future. Time machines have now left the realm of speculation and fantasy and have become legitimate fields of scientific research"(x).

Science fiction and futuristic writing both emerge at the intersection of science and literature, but the first is fictional while futuristic writing based on sound theories and analyses is considered non-fiction. Sci-fi has inspired the scientists with possibilities of time-travel and space-travel to an extent where futurists like Stephen Hawking and Alvin Toffler have built sound reputations for themselves exploring these themes.

Apart from sci-fi and futuristic writing, there are biographies of scientists that may invoke debates and sustain interest being hinged on debates. For example, consider the play Copenhagen centered on a meeting of scientist doyens.

A third quite effective strategy adopted by scientists to popularize their endeavours is to joke about their work, appear as caricatures in cartoons and animated movies and parody their own seriousness. This is a winsome method indeed as the stereotype of the boring scientist is turned over its head. Poems that dramatize science wars and retell stories of scientists also evoke interest in the origin of science polemics as in "Said Ryle to Hoyle" that recounts how Hoyle's Steady State Hypothesis was battered by Ryle's Telescopic observations(See Dawkins MSW. PartII 172). Similarly, erudite treatises may be written couched in literary frames as The Emperor of All Maladies: A Biography of Cancer by Siddhartha Mukherjee. The text alludes to Leo Tolstoy's Anna Karenina. It describes a cancer cell as immortal. JBS Haldane's scatological poem "Cancer's a Funny Thing" also builds upon the theme (MSW. Part II. What Scientists Study. Dawkins 172). It is said that when in 1930, physicist Wolfgang Pauli hypothesized a new, unseen particle called the neutrino in order to account for the missing component of energy in certain experiments on radioactivity that seemed to violate the conservation of matter and energy, he stated his achievement almost as a censure: Pauli asserted that he had committed the 'ultimate sin' by predicting the existence of a particle that could never be observed. 'Cosmic Gall' about Neutrinos by John Updike may also be quoted to illustrate the Pauli's point:

Neutrinos, they are very small.
They have no charge and have no mass
And do not interact at all.
The earth is just a silly ball
To them, through which they simply pass,
Like dustmaids down a drafty hall
Or photons through a sheet of glass.
They snub the most exquisite gas,
Ignore the most substantial wall,
Cold-shoulder steel and sounding brass,
Insult the stallion in his stall,
And scoring barriers of class,
Infiltrate you and me! Like tall
And painless guillotines, they fall

Down through our heads into the grass..

IV. THE PITFALLS

Worship of science too can become irrational sometimes. We may speak of 'scienticism' here. One recalls the 'spherical cow' metaphor that emerges from a spoof on the reductive reasoning of scientists that imposes simplistic interpretations on complex phenomena. Everything may be reduced to facts. It may be emphasized and revealed that number crunching is another thing and science does not always work best through reductive thinking. In fact, the continual enigma presented by and the fascination with the 'schrodinger's cat' hypothesis only stresses the difficulty of considering contingencies as the hinge of any thesis. How to define and capture flux and how to comprehend complex phenomena will be the subject of science; it may be realized, however, that phenomena are not reducible to physical laws merely. They are too complex and virtually irreducible to equations though humans by nature would impose their own perceptions on these philosophical or physical.

Another strategy also exists, though its gains are dubious and may be it earns notoriety rather than fame for science and scientists. It is hoax. Starting with alchemy, the pursuit of gold in the history of science that bespeaks of human fascination with the glitter of gold. In fact, an eighteenth century play was called the alchemist. Soon it was realized that alchemy was a pseudo-science rather than science. Hoax is science that makes news but is found to be fraudulent, morphed or tempered on investigation. It is a bogey claim to some discovery or invention. Hoax feast on science and some of them are legendary enough. For instance, there was a hoax when media in 2002 raised furore over the possible disappearance of the 'blonde' gene disappearing imputed to WHO study ; in truth, however, no such claim was made by WHO. And what happened to the 2K virus the dread of all computer programmers?

V. THE COPENHAGEN DEBATE

Science is also considered the measure of human progress. It demonstrates our capability in our perceptions of the abstract as well as the minutae, but at the opposite end, also our insignificance in a universe of astronomical distances. It pampers the anthropocentrism that keeps the morale of humans up. Histories and Biographies emerge from this man-centric outlook. Sometimes the biographies of scientists become interesting case studies of a scientific venture, even a political or social commentary capturing the milieu of the times. Such a semi-biographical play is Copenhagen by Michael Frayn that has a particular meeting between two scientists in 1941 as its focus. One was Werner Heisenberg who gave his name to the "Uncertainty Principle" well-known amongst scholars of physics and chemistry and the other was Niels Bohr, an equally famous counterpart. In 1927 they did

some research together and it is supposed to be of significance to the nature of the second world war. According to Wikipedia, the play had its premiere in London in 1998 and it was successful: 'Copenhagen opened in the National Theatre in London and ran for more than 300 performances, starring David Burke as Niels Bohr, Sara Kestelman as Margrethe Bohr, and Matthew Marsh as Werner Heisenberg. It was directed by Michael Blakemore' (Wikipedia). The play had its Broadway opening in 2000 and was adapted into a TV movie in 2002 by Howard Davies produced by the BBC.

As an excerpt from Copenhagen, a play on science goes:
Act II

Bohr: It works, yes. But it's more important than that. Because you see what we did in those three years, Heisenberg? Not to exaggerate, but we turned the world inside out! Yes, listen, now it comes, now it comes.... We put man back at the centre of the universe. Throughout history we keep finding ourselves displaced. We keep exiling ourselves to the periphery of things. First we turn ourselves into a mere adjunct of God's unknowable purposes, tiny figures kneeling in the great cathedral of creation. And no sooner have we recovered ourselves in the Renaissance, no sooner has man become, as Protagoras proclaimed him, the measure of all things, than we're pushed aside again by the products of our own reasoning!- We're dwarfed again as physicists build the great new cathedrals for us to wonder at - the laws of classical mechanics that predate us from the beginning of eternity, that will survive us to eternity's end, that exist whether we exist or not. Until we come to the beginning of the twentieth century, and we're suddenly forced to rise from our knees again.

Heisenberg It starts with Einstein.

Bohr It starts with Einstein. He shows that measurement - measurement, on which the whole possibility of science depends - measurement is not an impersonal event that occurs with impartial universality. It's a human act, carried out from a specific point of view in time and space, from the one particular viewpoint of a possible observer. Then, here in Copenhagen in those three years in the mid twenties we discover that there is no precisely determinable objective universe. That the universe exists only-as a series of approximations. Only within the limits determined by our relationship with it. Only through the understanding lodged inside the human head.(ACT II)

The socio-cultural milieu and concerns of the age that spawned and saw the world wars comes through in this dialogue from the play in ACT I:

Heisenberg I've no idea what's a secret and what isn't.

Bohr No secret, either, about why there aren't any. You can't say it but I can. It's because the Nazis have systematically undermined theoretical physics. Why? Because so many people working in the field were Jews. And why were so many of them Jews? Because theoretical physics, the sort of physics done by Einstein, by Schrödinger and Pauli, by Born and Sommerfeld, by you and me, was always regarded in Germany as inferior to experimental physics, and the

theoretical chairs and lectureships were the only ones that Jews could get.

Margrethe: Physics, yes? Physics.

Bohr: This is physics.

Margrethe: It's also politics.

Heisenberg The two are sometimes painfully difficult to keep apart.

Bohr So, you saw those two papers. I haven't seen anything by you recently.

Heisenberg :No.

While physics is compared to politics much as technology can sometimes be equated with arm race, so is ski-ing compared with physics again in Act I:

Heisenberg: Your ski-ing was like your science. What were you waiting for? Me and Weizsäcker to come back and suggest some slight change of emphasis?

Bohr: Probably

Heisenberg: You were doing seventeen drafts of each slalom?

Margrethe: without me there to type them out.

Bohr: At least I knew where I was. At the speed you were going you were up against the uncertainty relationship. If you knew where you were when you were down you didn't know how fast you'd got there. If you knew how fast you'd been going you didn't know you were down.

Heisenberg: I certainly didn't stop to think about it.

Bohr: Not to criticise, but that's what might be criticised with some of your science.

Heisenberg: I usually got there, all the same.

Bohr: You never cared what got destroyed on the way, thought. As long as the mathematics worked out you were satisfied.

Heisenberg: If something works it works.

Bohr: But the question is always, What does the mathematics mean, in plain language? What are the philosophical implications?

Heisenberg: I always knew you'd be picking your way step by step down the slope behind me, digging all the capsized meanings and implications out of the snow.

Margrethe: The faster you ski the sooner you're across the cracks and crevasses.

Heisenberg: The faster you ski the better you think.

Bohr: Not to disagree, but that is most . . . most interesting.

Heisenberg: By which you mean it's nonsense. But it's not nonsense. Decisions make themselves when you're coming downhill at seventy kilometres an hour. Suddenly there's the edge of nothingness in front of you. Swerve left? Swerve right? Or think about it and die? In your head you swerve both ways. . .

Margrethe: Like that particle.

Heisenberg: What particle?

Margrethe: The one that you said goes through two different slits at the same time.

Heisenberg: Oh, in our old thought-experiment. Yes. Yes!

Margrethe: Or Schrödinger's wretched cat.

Heisenberg: That's alive and dead at the same time.

Margrethe: Poor beast

Bohr: My love, it was an imaginary cat

Margrethe I know.

Bohr: Locked away with an imaginary phial of cyanide.

Margrethe: I know, I know.

Heisenberg: So the particle's here, the particle's there.

Bohr: The cat's alive, the cat's dead

Margrethe: You've swerved left, you've swerved right.

Heisenberg Until the experiment is over, this is the point, until the sealed chamber is opened, the abyss detoured; and it turns out that the particle has met itself again, the cat's dead.

Margrethe: And you're alive.

Bohr: Not so fast, Heisenberg.

Heisenberg The swerve itself was the decision.

Bohr: Not so fast, not so fast!

Heisenberg: Isn't that how you shot Hendrik Casimir dead?

Bohr: Hendrik Casimir?

Heisenberg: When he was working here at the Institute.

Bohr: I never shot Hendrik Casimir.

Heisenberg: You told me you did.

Bohr: It was George Gamow. I shot George Gamow. You don't know - it was long after your time.

Heisenberg: Bohr, you shot Hendrik Casimir.

Bohr: Gamow, Gamow. Because he insisted that it was always quicker to act than to react. To make a decision to do something rather than respond to someone else's doing it.

Heisenberg: And for that you shot him?

Bohr: It was him! He went out and bought a pair of pistols! He puts one in his pocket, I put one in mine, and we get on with the day's work. Hours go by, and we're arguing ferociously about - I can't remember - our problems with the nitrogen nucleus, I expect - when suddenly Gamow reaches into his pocket...

Heisenberg: Cap-pistols.

Bohr: Cap-pistols, yes. Of course.

Heisenberg: Margrethe was looking a little worried.

Margrethe: No - a little surprised. At the turn of events.

Bohr: Now you remember how quick he was.

Heisenberg: Casimir?

Bohr: Gamow.

Heisenberg Not as quick as me.

Bohr: Of course not. But compared with me.

Heisenberg: A fast neutron. However, or so you're going to tell me...

Bohr: However, yes, before his gun is even out of his pocket . . .

Heisenberg: You've drafted your reply.

Margrethe: I've typed it out.

Heisenberg: You've checked it with Klein.'

The play blurs the line between philosophy and science. In fact, the play emphasizes that philosophy may guide or misguide a scientific endeavour and it may engender a scientific enigma but it may even resolve it.

In Act II there is a discussion on the open-ended nature of

science. Not science that works as, to put it in Isaac Asimov's words from *I, Robot* 'the slide-rule genius' may say, not science as an open-shut case rather science that puzzles and poses challenges to human observation, perception and claims to objectivity. Consider this statement from Act II:

'Bohr: And I'm met at the barrier by Einstein and Ehrenfest. And I change my mind because Einstein - Einstein, you see? - I'm the Pope - he's God - because Einstein has made a relativistic analysis, and it resolves all my doubts.'

The statement, however, is so ambiguous that it seems rather an affirmation of doubts than resolving of them. And this is emphasized in the dialogue that follows:

'Heisenberg: No, but I show him the strangest truth about the universe that any of us has stumbled on since relativity - that you can never know everything about the whereabouts of a particle, or anything else, even Bohr now, as he prowls up and down the room in that maddening way of his, because we can't observe it without introducing some new element into the situation, an atom of water vapour for it to hit, or a piece of light - things which have an energy of their own, and which therefore have an effect on what they hit. A small one, admittedly, in the case of Bohr . . .

Bohr: Yes, if you know where I am with the kind of accuracy we're talking about when we're dealing with particles, you can still measure my velocity to within - what . . . ?

Heisenberg: Something like a billionth of a billionth of a kilometre per second. The theoretical point remains, though, that you have no absolutely determinate situation in the world, which among other things lays waste to the idea of causality, the whole foundation of science - because if you don't know how things are today you certainly can't know how they're going to be tomorrow. I shatter the objective universe around you - and all you can say is that there's an error in the formulation!'

After a while Heisenberg tries to expound on his ideas by creating analogies wherein he is a photon and Bohr is an electron. Bohr, apparently, draws upon the same analogy to continue the scholarly debate.

It appears that the open-ended nature of the debate must be responsible for the play's popularity, though some intricate scientific questions were involved and demanded from the

audience sound scientific knowledge and even participation in the debate.

VI. CONCLUSION

Beyond this, science exudes influence on all fields and all fields give back to science. This symbiosis becomes obvious where science fiction and futuristic writing have guided prospective inventions. Sometimes there are resonances of fiction in science like the 'god particle' Higgs Boson, the 'robots' envisaged by Isaac Asimov, and fantastic hybrids like unicorns and sphinxes that inspire genetic engineering. Science in media helps. Science is released from the scientific clique. Media has made all watertight compartments impossible- all realms have bearings on others. They could have been instrumental in ushering the nuclear and atomic bombs.

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Gandhian Charkha and Appropriate Technology: A Challenge for the Technocrats

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Abstract— Six decades of post- independence policies have failed to eradicate poverty in India¹ In all these decades India have tried to blindly emulate the western industrial model and in the process has totally ignored the wisdom of the man who is known as Father of the Nation. Gandhi was not only a freedom fighter, but he was also a thinker in his own right. He developed the philosophy of Appropriate Technology and focused on Charkha as a tool for emancipation of Indian masses. The current paper argues that India can achieve its targets by developing an indigenous model based on appropriate technology which is labour intensive, instead of importing western technology which is capital intensive.

I. INTRODUCTION

India is rapidly marching towards industrialization, with liberalization of economy the march of industrialization has become even faster. But ironically the industrialization has not been able to fill the gap between the rich and the poor of the country. Moreover, the gulf between the rural and urban areas is still getting wider. The industrialization has created more problems than it has solved. The establishment of metropolitan cities and the continuous influx of people into them in the search of green pastures have put even more pressure on the limited sources and infrastructure. India in its search for industrialization has forgotten the age old wisdom, it has even ignored the philosophy of the man who is known as ‘the father of the nation.’

It is important to note that the government who always talks about emulating Gandhian philosophy, and in fact has left no stone unturned in developing Gandhism as a world famous brand, continues to ignore the wisdom of the great man. Gandhian concept of ‘ahimsa’ and ‘non-violence’ are known throughout the world. But these are not the only things that Gandhi had to offer to the world. In fact, Gandhian philosophy has assumed even greater importance in the current scenario where environmental degradation is dominating almost all the debates. The current paper is an attempt to build up a case for Gandhiji’s philosophy regarding development of India and Charkha as his chosen instrument for the aforesaid goal. In fact, Charkha is a model for the modern technocrats to emulate; it is what a machine should be like: easy to operate, labour intensive, easily available and easy to transport.

During the reign of Mo-Tse-Tung, China used Appropriate Technology for rural development. While concentration in the urban areas was on building large scale, capital intensive factories, the focus in the rural areas was on the development of small scale industries based on appropriate technology [1]. The rural industries, making use of Appropriate Technology, were expected to take advantage of the country’s abundant local resources including industrial waste or scrap from large scale city-based factories. However, long before China’s use of Appropriate Technology, it had long been an important part and parcel of India’s culture and village industries even before 1930s. One of India’s early pioneers of Appropriate Technology was the ‘father of nation’, Mahatma Gandhi. In fact, many people refer to Gandhi as a father of Appropriate Technology and the “first appropriate technologist” [2]. Rybczynski points out: “It was Gandhi, who, before China’s Mao Tse-tung, recognized that the peasants should be the basis for economic development in Asia” [1]. Gandhi spoke incessantly of the need for village industries in India, while maintaining that India’s survival and future were dependent on the state of village where most Indians reside. The Charkha (spinning wheel) was Gandhi’s ideal Appropriate Technology device, and he saw in it a “symbol of freedom, self-reliance and a technical means that was right for India” [1]. The idea of technology discriminately enriching a minority of people at the expense of the majority or putting masses of people out of work to increase profit was in Gandhi’s view counterproductive and unacceptable.

Gandhian Charkha can be savior for the world and can act as an inspiration for the technocrats and scientists who are devoting their lives to reverse the environmental damage.

Environmental degradation and global warming are probably the most discussed issues today. Almost all of the scientists agree that the problem is created by the human beings who have worked hard to gain leisure. E.F. Schumacher sums up the problem: Our scientists and technologists have learned to Compound substances unknown to nature against many of them nature is virtually defenceless. There are no natural agents to attack and break them down” [3]. Some of these Compounds which were hailed as wonder molecules at their inception were discovered to be the worst villains of environment. The example can be cited of chloro-fluoro Carbons which were hailed as wonder molecules were found to deplete

the ozone layer , a natural protective shield against the harmful radiation of the sun. Similar is the example of polythene.

Gandhi's Charkha is an important symbol in this case. In fact, Charkha symbolizes many things at the same time. Charkha symbolizes clean, inexpensive and decentralized technology. One of the hallmarks of modern industrial revolution has been the size, complexity and the cost. The modern machines are so expensive that these "reserve the privilege of production to fewer and fewer people". On the other hand, Charkha symbolizes the machine that everyone can buy and operate. The steps to progress associated with AT provide a reasonable basis for

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people and communities to understand the technological processes being employed therefore the local people are able to control it. This concept is also very different from high technology applications, where machines are complex and most of the users can't understand their working and have to call mechanics from far away places whenever the machines break down. Moreover, AT also stresses on sustainability. The components, equipment and materials used to create the AT devices are within the budget of end users. The infrastructure that is required in AT is available at local level. Again, this concept is philosophically different from modern high tech industries that rely upon strong external infrastructure which is available only at a few places. For Gandhi, Charkha is an important machine that can revive and revitalize Indian rural economy:

"I... Claim for the Charkha the honour of being able to solve the problem of economic distress in most natural simple, inexpensive and business-like manner. It is the symbol of the nation's prosperity and therefore, freedom. It is a symbol not of Commercial war but of commercial peace [4].

One of the most important problems with modern industrialization is that the industries can be set up at selected place only. The huge machines need broad metalled roads, trained work force, uninterrupted supply of energy. In other words, the modern machines are not the docile servants rather they are the masters. Their human slaves have to leave their families, dislocate from their places of birth and leave their traditional economic activities to become a part of moderns industrialized process and live a life of ennui as depicted by Dickens in his novels. Gandhi was also acutely aware of this conditions:

I want the dumb millions of our land to be healthy and happy... If we feel the need of machine, we certainly will have that helps every individual has a place, But there should be no place for Machines that concentrate Power in a few hands and turn the masses into

mere machine minders[3].

One of the Important product of this industrial revolution have been the rise of metropolitan cities. Huge human populations have established their bases around the industries that are run by these machines. These metropolitan Cities having a population more than a million generates about "5,00,00 tonnes of polluted water, 2,000 tonnes of solid wastes and 950 tonnes of air pollutants [5]. The human residents of these metropolitan cities live in inhuman conditions. Displacement has several severe impact on the psychological health of a person. Displacement leads to the breaking of joint family system which acted as a kind of "old age insurance to old age parents and other members of family [6]. According to the website www.indidivorce.com the divorce rates in India are shooting up because of the breaking up of joint families.

Moreover, the colossal machines have failed to solve the economic problems of India. These machines are capital intensive, but the need in India is to develop technology that is labour intensive. Gandhi's Charkha is the best example of technology that suits India. It not only allows the people to remain in the homes, but provides them with an extra of incomes

I claim for charkha the honour of being able to solve the problem of Economic distress a most natural Simple, inexpensive and business like manner It is the symbol of Nation's prosperity and therefore, freedom. It is a symbol not of commercial war but of commercial peace. [4]

Gandhi knew from the very beginning that the huge machines will create a problem of unemployment. For him the revival of cottage industries was the most important mission in his life, as the revival of Cottage industries means alleviation of poverty.

Revival of the Cottage industry and not cottage industries will remove the growing poverty. When once we have revived the one industry all other industries will followI would make the spinning wheel the

Foundation on which to build a sound village life.. I would make the wheel the Centre round which all other activities will revolve. [7]

In fact, Charkha implies what Schumacher calls "Appropriate Technology." [8]. The undisputed leader of the appropriate technology movement was E.F. Schumacher, a British economist who worked for sometime in India and Burma during 1950s and 60s. Schumacher propounded the philosophy in his book *Small is Beautiful*, where he described the central doctrine of Appropriate Technology as (a) simple, (b) small scale (c) low cost, and (d) non-violent. The U.S.

office of Technology Assessment has further refined these tenets by describing Appropriate Technology as (a) small scale (b) energy efficient (c) environmentally sound (d) labour intensive (e) controlled by local community, and (f) sustained at the local level.

Persistent socio-economic problems of the III World countries, despite the decades of the massive infusion of advanced technology from the industrial world have raised the question about the appropriateness of this technology. Actually the technology creates only a few jobs for a small number of people due to high capital/ labour ratio. Due to this the production improves in the urban centres where the infrastructure is present to support big factories and the other areas remain undeveloped. This also worsens the unemployment conditions and lead to the migration of poor people to the industrial centres which put an extra burden the cities. Schumacher blamed this technology, imported from rich countries, for creating what he called the “process of mutual poisoning.” This is a condition in which the industrial development adversely affects the economy of the traditional sector. He blames modern technology for high rates of employment, poverty, great income disparity and declining access to basic needs.

Appropriate technology as a development approach is intended to address such socio-economic problems especially in the rural and informal sectors. The argument for AT is that jobs should be put before the production, but the techniques can be developed which promote both. Stewart points out that Appropriate Technology does not mean compromising output: “The argument for appropriate technology is not that jobs should be put before output, but that techniques can be developed which promote both. Appropriate Technology is intended to raise productivity and incomes outside the advance technology sector and so extend the benefits of development throughout the population [1].

The Appropriate Technology movement is of greater importance to the developing countries’ where the resources are currently stretched to the breaking point and will surely be exceed in the future with further increase in population. So the only real chance for any type of quality of the most be found by people of the industrialized and developing words working together to utilize all their resources in the most effective and efficient ways. The Appropriate Technology movement has at its philosophical heart the desire to capacitate people of all walks of life to create. Meaningful Employment 2.Comprehension of Technology 3.Self Reliance and 4.Reduced Environment Impacts. A significant benefit of Appropriate Technology is the creation of employment and service options that would not exist without this form of development. Modern high technology industries seek to provide maximum output of product while limiting human involvement. The efforts to achieve uniformity of product quality using high tech systems often leads to creation of dull, boring and monotonous work. Appropriate technology concept

seek to accomplish the absolute opposite effect: maximum human involvement with reasonable product output.

Appropriate implies the technology that is localized, based on local geographical, social and economic conditions. In other words appropriate technology makes the use of the resources and labour that suits the local conditions . On the other hand, the industrial technology is universal, where human beings have to make change according to the suitability to the massive machines. According to Schumacher , the technology that is rampant in the world creates four important problems:

1. We can't close the gap between rich and poor,
2. We are faced with this polarization and the pattern of settlement .
3. We have these ecological problem.
4. We have the energy problems[8].

On the other hand “appropriate technology” is free from all these constraints. In fact, if the production is concentrated in many hands instead of one geographical Centre then the nature gets time to recover . In India, pollution has clearly become an intractable problem and the revered rivers of India, its lifelines: holy Ganges and Yamuna have been converted into drains by industrial pollution . After decades of mechanized industrialization enormous pollution has had a significant impact on the plane, some of which may not be repairable. With significant population increases anticipated, the chances are that the problem of pollution will increase further. A key concept of Appropriate Technology is the design and function of the devices that cause minimal negative impact on the environment. Success of Appropriate Technology is directly measured with regard to its ability to operate and meet human needs without causing undue pressure or stress on the local environment. The Chemicals used in the industry pollutes holy Ganges without giving her a chance of cleansing itself. On the other hand, if leather industry would have been established at small scale at several places, then pollution would have been places tractable problem. In *Small is Beautiful*, Schumacher quotes Leopold Kohron the problem of ‘scale’: “Small scale operations. No matter how numerous are always less likely to be harmful to the natural environment than large scale ones simply because their individual force is small in relation to the recuperative forces of nature. There is wisdom in smallness if only on account of the smallness and patchiness of human knowledge, which relies on experiment for more than on understanding.

Another important as fact of Gandhi's philosophy that has often been ignored is summed up in his oft quoted quotation-- The earth provides enough to “satisfy everyone's need, but not for every one's greed.” Today production is based not on the principal of utility, rather it is based on greed. The business houses do not satisfy our needs , rather they lure us to change our

gadgets without wearing them out. The best example can be given in the mobile phone industry. A Company changed a model within months with only slight change and lure the customers to buy it. Clearly motive is to learn more money with slight respect for environment. According to Wikipedia “The USA discards 30 millions Computers each years and 100 million phones are disposed of in Europe each year” [9]. Only 20% of this waste is recycled and rest of it is dumped in landfills and incinerators. This created a big environmental disaster as “an estimated 70% of heavy metal” in USA comes from discarded items. The picture is gloomy in India also. Lewis Mumford also criticized modern technology on the same basis. He criticizes the modern trend of technology which emphasizes Constant unrestricted expansion, production and replacement. He contends that these goals work against technical perfection, durability, social efficiency and over all human satisfaction [10].

Gandhi’s work exerted a great influence on Schumacher, who envisioned a technology for the III world that was midway between, for example, a hand hoe and a tractor. According to him the concept of AT to be considered useful, it must be conducive to meeting the challenges following propositions:

- Workplaces have to be created in the areas where the people are living now, and not primarily in metropolitan areas into which they tend to migrate.
- This work places must be cheap enough so that they can be created in large numbers.
- The production methods employed must be relatively simple, so that the demands for high skills are minimized not only in the production process itself but also in matters of organization, raw material supply, financing, marketing and so forth.
- Production should be primarily from local materials and mainly for local use[120-121].

It is clear that India’s model, a time lies in adapting an indigenous model. a time tested one as advocated by Mahatma Gandhi. Decades of emulation Western models of industrialization and working on imported machinery has only Complicated the problems. The population below poverty line is increasing, quality of life is decreasing pollution and environmental degradation is taking place at a rapid scale, but Indian government is still not ready to admit its mistake. The example can be cited of nuclear power generation. Though Gandhi and Schumacher would have advocated more use of solar power, an endless source of energy in the sub-continent.

Instead of investing huge capital in nuclear power plants, government can utilize it to erect an infrastructure that will utilize Indian climatic and geographical advantage. Nuclear power plants will be dependent of imported fuel but sunshine is abundant.

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Modelling and performance improvement of inverted pendulum using pid controller

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Abstract— Inverted pendulum is a standard problem in control system. This is a single input multiple output system having pendulum's angle and cart position as control parameters. In this user is able to dictate the position and velocity of the cart through the motor. It is a non-linear system, which can be treated as linear system, without much error and provides a good practice for prospective control engineers. This project presents the modeling of an inverted pendulum using differential equations for one degree of freedom. Its open loop performance on the basis of time response is observed which depicts that inverted pendulum is unstable as pendulum's angle diverges very rapidly. For stabilizing it, closed loop system is used. The purpose for this experiment was to test different algorithms used to control mechanical systems. By combining computer and electrical system with mechanical ones, mechanical systems can be controlled and provide responses that improve their ability to perform certain functions. The objective of the control system is to balance the inverted pendulum by applying force to the cart that the pendulum is attached to. This project proposes a procedure to control one of the parameter underneath the other. Using PID controller, the transient response and stability of the inverted pendulum is improved. The whole work presented in this report is simulated by using equations of motion using SIMULINK in MATLAB.

Keywords— Inverted pendulum, dynamic modelling, pid controller, state space model, MATLAB/SIMULINK.

I. INTRODUCTION

The inverted pendulum system is a standard problem in the area of control systems. They are often useful to demonstrate concepts in linear control such as the stabilization of unstable systems. Since the system is inherently nonlinear, it has also been useful in illustrating some of the ideas in nonlinear control. In this system, an inverted pendulum is attached to a cart equipped with a motor that drives it along a horizontal track. The user is able to dictate the position and velocity of the cart through the motor and the track restricts the cart to movement in the horizontal direction. Sensors are attached to the cart and the pivot in order to measure the cart position and pendulum joint angle, respectively.

II. MODELING AND SYSTEM ANALYSIS

The cart with an inverted pendulum, shown below, is "bumped" with an impulse force, F . Determine the dynamic equations of motion for the system, and linearize about the pendulum's angle, $\theta = \pi$ (in other words, assume that pendulum does not move more than a few degrees away from the vertical, chosen to be at an angle of π).

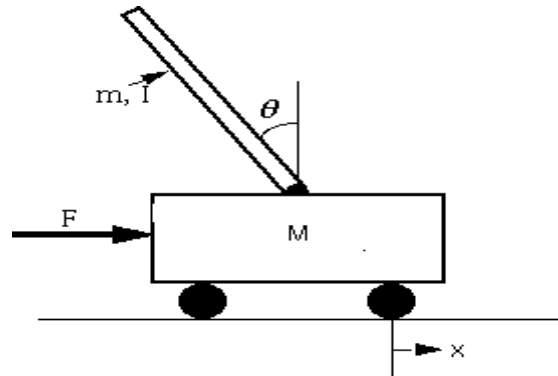


Fig 1 Cart with Inverted Pendulum

For this example, let's assume that

M	mass of the cart	0.5 kg
m	mass of the pendulum	0.2 kg
b	friction of the cart	0.1 N/m/sec
l	length to pendulum center of mass	0.3 m
I	inertia of the pendulum	0.006 kg*m ²
F	force applied to the cart	
x	cart position coordinate	
theta	pendulum angle from vertical	

III. OPEN LOOP RESPONSE

In this system output does not depend upon input or we can say that output is not compared with the reference signal.

An open-loop controller, also called a non-feedback controller, is a type of controller that

computes its input into a system using only the current state and its model of the system.

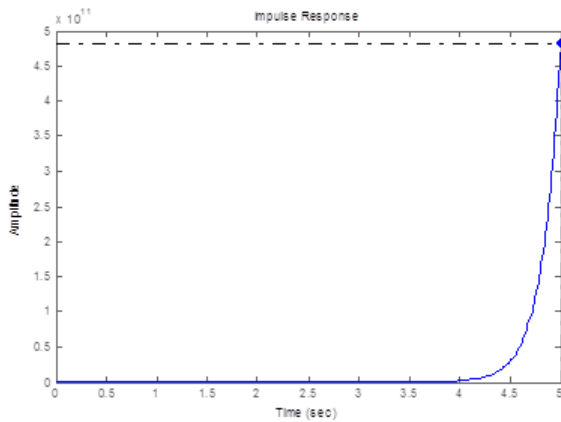


Fig 2 Open Loop response of pendulum's angle.

Analysis of time response give peak amplitude- 4.82×10^{11} in 5 sec as our requirement is not fulfilled so we have to control it by closed loop system.

The response is entirely unsatisfactory. It is not stable in open loop.

IV. CLOSED LOOP RESPONSE

A proportional–integral–derivative controller (PID controller) is a generic control loop feedback mechanism (controller) widely used in industrial control systems – a PID is the most commonly used feedback controller. A PID controller calculates an "error" value as the difference between a measured process variable and a desired setpoint. The controller attempts to minimize the error by adjusting the process control inputs.

The PID controller calculation (algorithm) involves three separate constant parameters, and is accordingly sometimes called three-term control: the proportional, the integral and derivative values, denoted P, I, and D. Heuristically, these values can be interpreted in terms of time: P depends on the present error, I on the accumulation of past errors, and D is a prediction of future errors, based on current rate of change. The weighted sum of these

three actions is used to adjust the process via a control element such as the position of a control valve, or the power supplied to a heating element.

By tuning the three parameters in the PID controller algorithm, the controller can provide control action designed for specific process requirements. The response of the controller can be described in terms of the responsiveness of the controller to an error, the degree to which the controller overshoots the setpoint and the degree of system oscillation. Note that the use of the PID algorithm for control does not guarantee optimal control of the system or system stability.

Some applications may require using only one or two actions to provide the appropriate system control. This is achieved by setting the other parameters to zero. A PID controller will be called a PI, PD, P or I controller in the absence of the respective control actions. PI controllers are fairly common, since derivative action is sensitive to measurement noise, whereas the absence of an integral term may prevent the system from reaching its target value due to the control action.

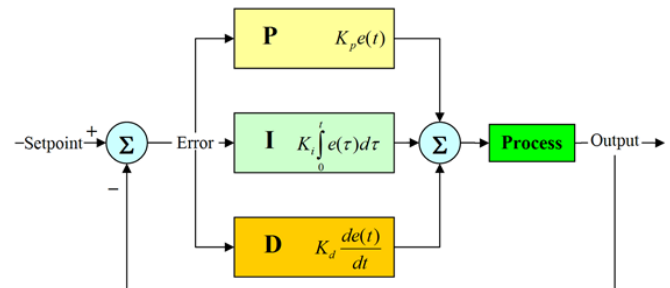


Fig 3 Closed Loop PID Controller

V. CLOSED – LOOP WITH DISTURBANCE

The control of this problem is a little different than the standard control problems, since we are trying to control the pendulum's position, which should return to the vertical after the initial disturbance, the reference signal we are tracking should be zero. The force applied to the cart can be added as

an impulse disturbance. The schematic for this problem should look like the following.

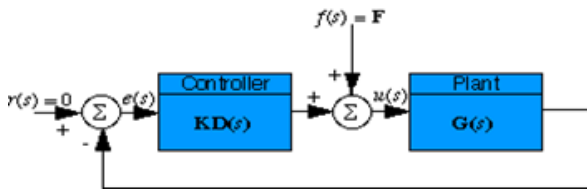


Fig 4 Closed Loop controller for Pendulum's position.

VI. TUNING

There are several methods for tuning a PID loop. The most effective methods generally involve the development of some form of process model, then choosing P, I, and D based on the dynamic model parameters. Manual tuning methods can be relatively inefficient, particularly if the loops have response times on the order of minutes or longer.

The choice of method will depend largely on whether or not the loop can be taken "offline" for tuning, and the response time of the system. If the system can be taken offline, the best tuning method often involves subjecting the system to a step change in input, measuring the output as a function of time, and using this response to determine the control parameters.

Manual Tuning

If the system must remain online, one tuning method is to first set K_i and K_d values to zero. Increase the K_p until the output of the loop oscillates, then the K_p should be set to approximately half of that value for a "quarter amplitude decay" type response. Then increase K_i until any offset is corrected in sufficient time for the process. However, too much K_i will cause instability. Finally, increase K_d , if required, until the loop is acceptably quick to reach its reference after a load disturbance. However, too much K_d

will cause excessive response and overshoot. A fast PID loop tuning usually overshoots slightly to reach the setpoint more quickly; however, some systems cannot accept overshoot, in which case an over-damped closed-loop system is required, which will require a K_p setting significantly less than half that of the K_p setting causing oscillation.

Ziegler-Nichols Method

Another heuristic tuning method is formally known as the Ziegler–Nichols method, introduced by John G. Ziegler and Nathaniel B. Nichols in the 1940s. As in the method above, the K_i and K_d gains are first set to zero. The P gain is increased until it reaches the ultimate gain, K_u , at which the output of the loop starts to oscillate. K_u and the oscillation period P_u are used to set the gains as shown:

Ziegler–Nichols method

Control Type	K_p	K_i	K_d
P	$0.50K_u$	-	-
PI	$0.45K_u$	$1.2K_p/P_u$	-
PID	$0.60K_u$	$2K_p/P_u$	$K_pP_u/8$

We should get the following velocity response plot from the impulse disturbance:

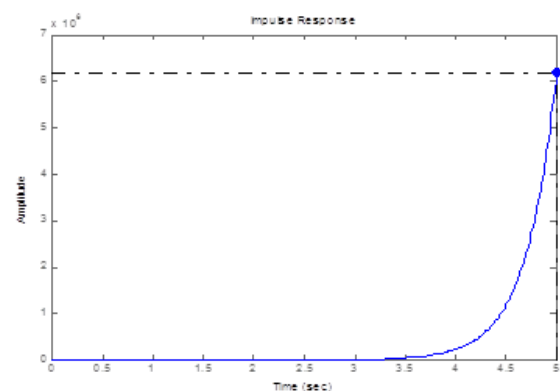


Fig 5 Closed Loop Response with $k_p=1, k_d=1, k_i=1$.

Analysis of time response give settling time within 2% and peak amplitude 6.19×10^6 which is not desired. This response is still not stable. Let's start by increasing the proportional control to the system. Increase the K_p variable to see what effect it has on the response. If you set $K_p=100$, and set the axis to axis $([0, 2.5, -0.2, 0.2])$, we should get the following velocity response plot:

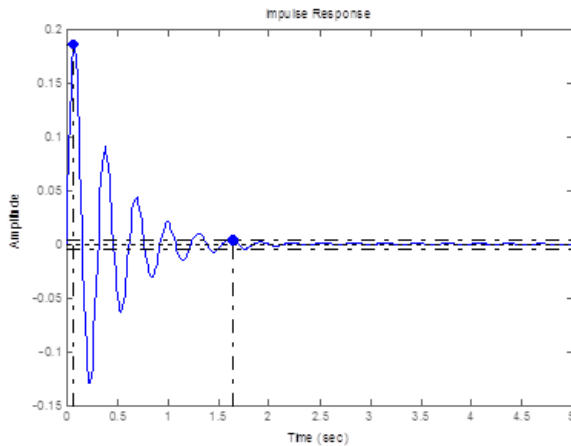


Fig 6 Closed Loop Response With $k_p=100$, $k_d=1$, $k_i=1$.

Analysis of time response give settling time of the response is determined to be 1.64 sec, which is less than the requirement of 5sec. Peak response, however is larger than the requirement of 0.05 radians. The settling time is acceptable at about 2 seconds. Since the steady-state error has already been reduced to zero, no more integral control is needed. We can remove the integral gain constant to see for ourself that the small integral control is needed. The overshoot is too high, so that must be fixed. To alleviate this problem, increase the K_d variable. With $K_d=20$. We should now see the following velocity response plot:

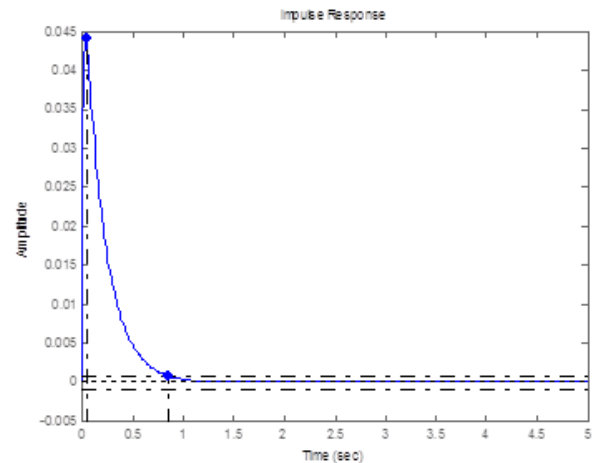


Fig 7 Closed Loop Response with $k_p=100$, $k_d=20$, $k_i=1$.

Analysis of time response give peak amplitude 0.0442 and settling time 0.844. As we can see, the overshoot has been reduced so that the pendulum does not move more than 0.05 radians away from the vertical. All of the design criteria have been met, so no further iteration is needed.

VII. CART POSITION

The block representing the position was left out because that variable was not being controlled. It is interesting though, to see what happening to the cart's position when the controller for the pendulum's angle is in place. To see this we need to consider the actual system block diagram:

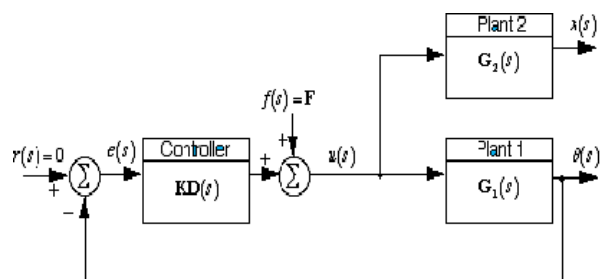


Fig 8 Closed loop For Cart Position

VIII. CONCLUSIONS

The in this study, a PID controller is designed and employed for controlling pendulum's angle and cart's position . The model here is to developed a balance between pendulum's angle and cart position so that the pendulum exactly fall over it.

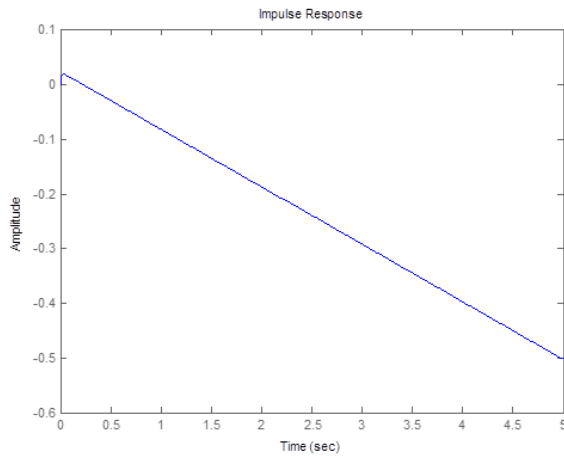


Fig 9 Closed loop Response of Cart Position

As we can see, the cart moves in the negative direction with a constant velocity. So although the PID controller stabilizes the angle of the pendulum, this design would not be feasible to implement on an actual physical system.

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Green building in India

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Abstract—Energy demand of India is rising day by day. The increase in energy demand is due to the economic growth, rising income levels and availability of better goods and products. There is equal pressure on the natural and environmental resources due to the economic growth. Human activities are causing irreversible damage to the global environment. Definitely it will have adverse impact on the life of future generation. The increasing concern for the environment, in response to the global warming, is driving thinkers to seek sustainable energy solutions. Green building uses less water, optimizes energy efficiency, conserves natural resources, generates less waste and provides healthier space for occupants, as compared to a conventional building. Green Building is 'high-performance building,' 'sustainable design' and 'preserving precious resources.' This paper will try to emphasize on the green building benefits and also will try to show the decision maker that even though there are risks factors involved of going green, these can be managed. The main purpose of this paper is to develop a framework for benefits and risks of retrofitting existing buildings to green standards. The Indian companies should think on the idea of the green building projects in India.

I. INTRODUCTION

In recent days, the concept of the “green” buildings is getting popularity day-by-day. It is best way to reduce the resource footprint of traditional buildings. Green building is one which uses less water, optimizes energy efficiency, conserves natural resources, generates less waste and provides healthier space for occupants, as compared to a conventional building. The conventional buildings construction and operation consumes large amount of water and electricity. And also, they produces large amount of waste and have adverse impact on the life of many people. Green building design is preserving the interrelationship between nature and buildings.

KEY ATTRIBUTES OF GREEN BUILDING

It is expected that green buildings will be efficient in their use of energy, water and other resources. It also has lower energy, operating, and life cycle costs and can, thus, yield higher building values.

INDIAN GREEN BUILDING COUNCIL (IGBC)

The Indian Green Building Council (IGBC), was formed in

the year 2001 by Confederation of Indian Industry. Indian Green Building Council (IGBC) Green Homes is the first rating programme developed in India. It is based on accepted energy and environmental principles. It strikes a balance between known established practices and emerging concepts.

BENEFITS OF GREEN BUILDING

The benefits of the green building can be categorized along three fronts- environmental, social and economic.

1. ENVIRONMENTAL BENEFITS

The environmental benefits of having green buildings are:

- Reduces waste generation (any type either liquid or solid)
- Efficient water management
- Uses minimum energy
- Minimizes pollution (air, water, soil etc.)
- Maximizes the use of renewable energy sources
- Depletion of the natural resources will be minimizing
- Emissions like carbon-dioxide/GHG will be reduced.

2. SOCIAL BENEFITS

The social benefits of having green buildings are:

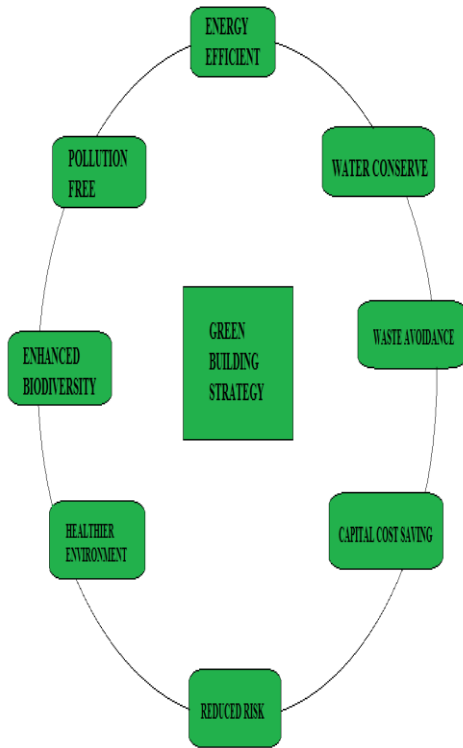
- Habitable working and living environment for the workers and minimal negative impact on the surroundings
- Improved health of the occupants.

3. ECONOMIC BENEFITS

The economic benefits of having green buildings sre:

- Overall operating cost is less
- Capital cost saving
- Higher future value of property
- Reduce life cycle energy cost
- Improvement of employee productivity and satisfaction
- Increased productivity
- Lower health related costs
- Lower litigation risks because of improved indoor

air quality.



GREEN BUILDING RATING SYSTEM:

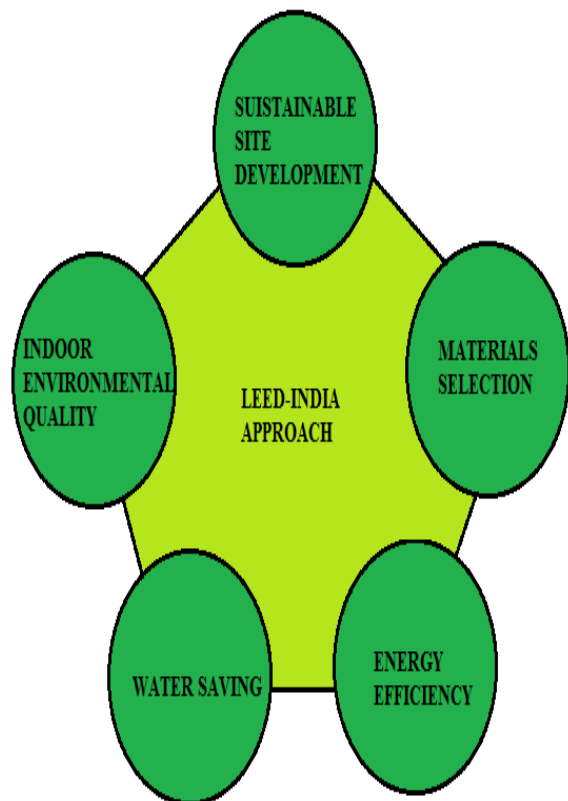
It is basically a tool in measuring and evaluating the environmental performance of a building. These rating systems cover a broad range of environmental considerations. From the building site selection, design, and construction, to building operations and workspace quality are considered in it.

The most widely recognized certification system around the world today is the LEED (Leadership in Energy and Environmental Design) and GRIHA (Green Rating for Integrated Habitat Assessment).

1. LEED-INDIA

It is developed by the United States Green Building Council (USGBC) in 1998. It is internationally and nationally accepted benchmark for the design, construction and operation of high performance green buildings.

According to the Indian Green Building Council, the market for LEED-rated green buildings in India is projected to increase to a \$5 billion by 2012. And the total market for green building materials and equipment is estimated to be more than 10 times the size of the LEED-rated green building market in India. The new version of LEED (LEED v3), launched in April 2009, emphasized more on carbon-dioxide emissions and energy performance. LEED has application categories of new construction (LEED-NC), existing buildings operation and maintenance (LEED-EB), core and shell (LEED-CS) commercial interiors (LEED-CI) homes, schools and healthcare. LEED-NC is a green building rating system that helps to guide and design high-performance commercial buildings. LEED-CS is a set of performance standards for certifying the design and construction of Core and Shell buildings.



2. GRIHA

It is basically a tool to evaluate the 'greenness' of a

building in India. The Energy and Resources Institute (TERI) developed GRIHA in 2007.

It is accepted as the national rating system for green buildings by the Ministry of New and Renewable Energy (MNRE), Government of India. It is suitable for all kinds of buildings in different climatic zones of the country.

The main purpose of GRIHA is to provide a series of guidelines and benchmarks to those interested in construction of a sustainable and green building. All new buildings of the central government/public sector undertakings would at least meet the requirements of GRIHA-3 Star. This star base rating system consists of 34 criteria (which are categorized under various sections) and 100 point system with differential weightage and applicability of various criteria. The minimum points required for certification is 50.

MYTH ABOUT GREEN BUILDINGS

Many people think that green building is expensive. They think that green building means insulation, highperformance glass, energy-efficient lighting and HVAC equipment, control systems, all of which are expensive, and renewable systems, such as solar PV, windmill, which are also expensive.

FACT ABOUT GREEN BUILDINGS

A research study done by TERI on seven green-rated buildings shows that green buildings are cheap than conventional buildings. Even though the capital investment for these green buildings are higher than conventional buildings. Cash savings that take place through these green buildings not only compensate for the initial cost increment, but provide benefits to the occupants throughout the lifetime of the building.

OBSTACLES IN THE PATH OF GREEN BUILDINGS

There are many obstacles that are often come path in the success of the green buildings. Some of these obstacles are:

- Absence of the integrated design approach
- Lack of awareness of low-cost solar passive principles
- Extensive cost of the certification process, including consultancy for green building
- Higher construction cost due to the lack of knowledge.

OVERCOMING THESE OBSTACLES

The real challenges for green buildings in India lie in creating market mechanism using some methods. These methods are:

- Improving certified training, quality education:
People in India should adopt integrating approaches. They should be aware about the greenness in the building. Our country should have credible institutions to provide training and education the area of green buildings.
- Implementing proven financial mechanism:
India should work on their financial mechanism, such as loans with lower interest rates, reduced taxes, and tariff on carbon-dioxide emissions of green building rating system.

GREEN BUILDING PROJECTS IN INDIA

1. Biodiversity Conservation India Ltd (BCIL)
2. Suzlon Energy Limited– Pune
3. Olympia Technology Park-Chennai
4. ITC Green Centre – Gurgaon
5. The Druk White Lotus School-Ladakh
6. Doon School- Dehradun
7. Nokia- Gurgaon

CONCLUSION

The market growth and demand for green building will continue to grow in time with more experienced professionals, higher performance & quality and reduced cost.

Green building is the solution to many problems from environmental to financial, from community to industrial. The future of green building will be carbon neutral and zero emission buildings. In the future, green building will be the common practice for the construction industry and common necessity for owners, facility managers and tenants in if not now.

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Fault Identification of BLDC Motor Using Signal Processing Techniques—A Review

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Abstract: Now a days the Motor Current Signature Analysis (MCSA) is considered as the most popular fault detection method because it can easily detect the common machine fault such as Rotor faults, Stator faults, Inverter faults, Dynamic eccentricity, Short winding, Bearing & gearbox failure. The present paper discusses the fundamentals of Motor Current Signature Analysis (MCSA) and condition monitoring of the brushless DC motor using MCSA with different signal processing techniques such as FFT, STFT, wavelet transform (WT). Motor current signature analysis (MCSA) can effectively detect abnormal operating conditions in BLDC motor.

Index Terms: BLDC Motor, MCSA, FFT and WT

I. INTRODUCTION

Brush Less DC motors or electronically commutated motors are electric motors powered by direct current electricity and having electronically commutation systems, rather than mechanical commutators and brushes. A BLDC motor has rotating permanent magnets and a fixed armature. An electronic controller replaces the brush/ commutator assembly of brushed DC motor which continually switches the phase to windings to keep the motor turning. A BLDC motor has trapezoidal waveform back-EMF with 120 electrical- degree wide conducting period. The current is rectangular in shape. At any instant of time during operation, or during one conducting period which is 60 electrical degrees, two of the stator phases are excited as positive and negative terminal while the third phase floats. One of the main features of BLDC motor is that the Back-EMF signals provide information about the rotor position in order to generate commutations patterns and sequence. BLDC machines are being used, often in critical high performance applications. Fault diagnosis and condition monitoring of BLDC machines are assuming a new importance. Early detection of faults and asymmetries could allow preventive maintenance to be performed and provide sufficient time for controlled shutdown of the affected process, thereby reducing the costs of outage time and repairs.

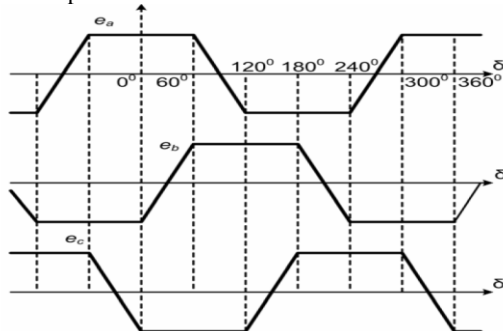


Figure 1: Induced EMF in Three Phases [5]

II. MAJOR FAULTS IN BLDC MOTORS

Major Faults Of BLDC Motors are Broken rotor bar, Static & dynamic air gap irregularities, Dynamic eccentricity, Winding short, Bearing & gearbox failure.

a. Inverter faults: BLDC motors are inverter fed. Many faults can occur in the inverter, such as the loss of one or more of the switches of a phase, the short circuit of a switch, and the opening of one of the lines to the machine.

b. Rotor faults in BLDC machines are eccentricities, damaged rotor magnets, & damaged Hall sensors. All of these rotor faults cause problems such as vibration & noise.

c. Stator Fault is breakdown of the winding insulation. This usually occurs in the region where the end windings enter the stator slots. It is caused by large electrical voltage stresses, electrodynamic forces produced by winding currents, thermal aging from multiple heating & cooling cycles, and mechanical vibrations from internal & external sources.

III. DIAGNOSTIC METHODS TO DETECT FAULTS

Diagnostic Methods to detect faults are Electromagnetic field monitoring, Temperature measurements, RF emission monitoring, Noise & vibration monitoring, Motor Current Signature Analysis (MCSA), AI & NN based techniques. The signal processing tools include DFT, FFT, STFT and Wavelet transform. Artificial intelligence is also used for fault diagnosis. These techniques include the applications of expert systems, genetic algorithm, neural networks and fuzzy logic. Modern techniques are based on application of advanced DSP tools on stator currents for fault diagnosis i.e. MCSA. Faults can be diagnosed using any one of signal processing techniques. These signal processing techniques cannot be used for diagnosing every type of faults. There is need to compare and analyze various signal processing techniques for diagnosing a particular fault to identify most congruous technique for particular fault.

a. Fault Diagnosis In BLDC Motors

- When the fault happens, the motor can be operated without breakdown, but it is necessary to maintain the motor for continuous working. Several methods have been applied to detect faults. It is important to be able to detect faults while they are still developing. This is called incipient failure detection. Timely warning that can be followed by maintenance can avoid catastrophic failures & costly long down times. The incipient detection of failures

also results in a safer operating environment. Faults can occur either in stator, rotor, inverter or in the external systems connected to the motor.

- Vibration monitoring is the most popular choice for condition monitoring but it is preferred for use only in large machines where expensive accelerometers can be afforded.
- Electrical monitoring, which includes current based monitoring, is the most recent of all condition monitoring techniques and is inexpensive as electrical sensors are lower in cost compared to mechanical transducers.
- Condition monitoring is defined as the continuous evaluation of the health of the plant and equipment throughout its service life. It is used to detect various types of faults such as rotor fault, short winding fault, air gap eccentricity fault, bearing fault, load fault etc.
- Current monitoring does not require additional sensors because basic electrical quantities associated with electromechanical plants such as current & voltage are readily measured by tapping into existing voltage & current transformers that are always installed as part of protection system. It is non intrusive & implemented in motor control centre remotely from the motors being monitored.

b. Methods For Current Monitoring

- Methods for current monitoring are MCSA (Motor Current Signature Analysis) & Park Vector approach. MCSA uses the current spectrum of machine for locating characteristic fault frequencies. When a fault is present, the frequency spectrum of the line current becomes different from healthy motor. Such fault modulates air gap & produces rotating frequency harmonics in the self & mutual inductances of machine.

IV. SIGNAL PROCESSING TECHNIQUES

Different algorithms are proposed to track & detect the faults operating under different load conditions: Fast Fourier Transform, Short time Fourier Transform, Wavelet Transform, Gabor Transform, Park's Vector approach, Wigner Ville distribution, Short time Fourier Transform and MCSA. The condition monitoring techniques utilised the spectral analysis of motor current or voltage.

A. Fast Fourier Transform (FFT). FFT is employed for the extraction of frequency contents in signal, in order to detect stator and rotor faults in BLDC motor. A fault in motor by FFT can be detected easily in comparison to time domain analysis. FFT is simply a computationally efficient way to calculate the Discrete Fourier Transform (DFT) which is calculated as

$$X(k) = \frac{1}{N} \sum_{n=0}^{N-1} x(n) e^{-j \frac{2\pi kn}{N}} \quad K=0,1,2..N-1 \quad (1)$$

Where $X(k)$ – Fourier transform of the signal

k – frequency index

n – time index

N – total length of the signal

The specific characteristic fault frequency can be easily & accurately diagnosed using FFT with the loss of time information.

B. Short Time Fourier Transform (STFT)

STFT is used to analyse signal in both time and frequency domain. In this, original signal is divided into small segments and each segment is multiplied with shifted window function of a chosen width in order to produce short stationary signals. This process is defined by :

$$X(\tau, w) = \int_{-\infty}^{+\infty} i(t) W(t - \tau) e^{-jw\tau} dt \quad (2)$$

$X(\tau, w)$ – short time Fourier transform of the current signal $i(t)$

$w = 2\pi f$, where f is the frequency of the signal

$W(t-\tau)$ – window function

t – time

τ – delay parameter

The drawback of this technique is that particular size for time window, is same for all frequencies. But many signals require variable window size.

c. Wavelet analysis

The wavelet analysis confines signals information in the time frequency plane and makes it suitable for the analysis of non- stationary signals. It is a substitute to the STFT analysis. The general Wavelet transform of a signal is defined by:

$$WT(a, \tau) = \frac{1}{\sqrt{a}} \int_{-\infty}^{+\infty} i(t) \phi_{a,\tau} \left(\frac{t-\tau}{a} \right) dt \quad (3)$$

Where WT – wavelet transform of the current signal, $i(t)$

$\phi_{a,\tau}$ – wavelet function

a and τ – scaling and translation respectively

$*$ denotes the complex conjugate of the function

Wavelet analysis allows use of both long time intervals requiring more precise low frequency information and short time intervals requiring high frequency information. But this analysis has disadvantage of using large no of scales for calculations.

c. Park's Vector Approach

The best representation of Park's vector is circular locus centered at the origin of the I_d and I_q coordinate:

$$I_d = \sqrt{\frac{2}{3}} i_a - \frac{1}{\sqrt{6}} i_b - \frac{1}{\sqrt{6}} i_c \quad (4)$$

$$I_q = \frac{1}{\sqrt{2}} i_b - \frac{1}{\sqrt{2}} i_c \quad (5)$$

In the case of healthy motor, three phase current leads to the Park's vector with the following components:

$$I_d = \frac{\sqrt{6}}{2} i_m \sin(wt) \quad (6)$$

$$I_q = \frac{\sqrt{6}}{2} i_m \sin(\omega t - \pi/2) \quad (7)$$

Under faulty conditions, I_d and I_q change and shape of pattern of faulty motor is different from healthy motor. In condition monitoring, the Park's vector approach can be used for detection of various faults.

V. DISCUSSIONS

MCSA is condition monitoring technique which uses the current spectrum of a machine for locating characteristic frequencies indifferent from characteristic frequencies of healthy machine. The signal processing can be carried out in either time domain or frequency domain or time – frequency domain. When a signal is analysed in frequency domain, it often provides valuable information of the process operation. The faults can be diagnosed by comparing spectrum of healthy motor with spectrum of faulty motor.

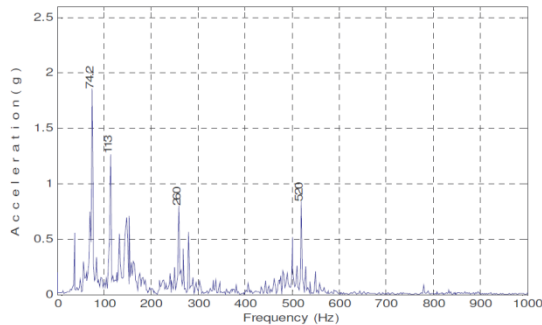


Figure 2: Motor Current Spectrum of a Healthy [6]
Motor

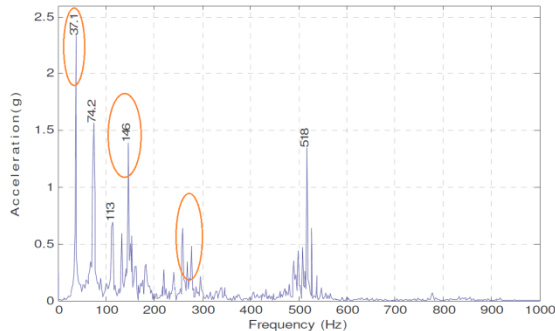


Figure 3: Motor current Spectrum with two broken rotor bars [6]

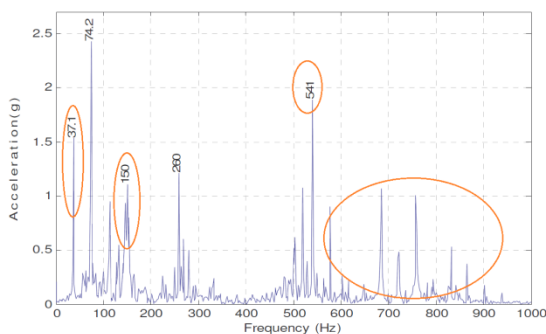


Figure 4: Motor current Spectrum with faulty bearing [6]

VI. MCSA DIAGNOSIS APPROACH

MCSA is an online condition monitoring technique for diagnosis of the faults in motor and thus avoids complete failure of the motor. In MCSA method, the basic procedure involves phase current measurement with the help of Current Transformer after then, signal is fed into signal conditioning unit which converts the measured current into voltage and also provides proper filtering. Finally, output from the signal conditioning unit is connected to the data collector/analyser for detection of fault and resulting output signal is sent to computer for analysis.

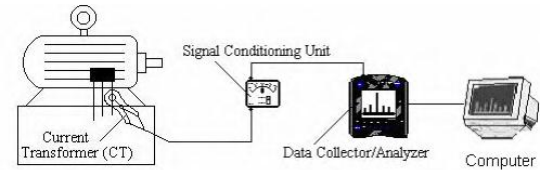


Figure 5: Basic On Line Current Monitoring System

VII. LITERATURE REVIEW

Numerous applications of using MCSA in equipment health monitoring have been published among the nuclear-generation, industrial and defence industries. Stator current is monitored for diagnosis of different faults of induction motors and BLDC motors.

A. Induction Motors

1. Neelam Mehala [1], has worked on condition monitoring and fault diagnosis of induction motor using MCSA. This study presented comparative analysis of techniques applied for detection of motor faults.
2. Randy R. Schoen [2] et. al. has addressed the application of motor current signature analysis for the detection of rolling-element bearing damage in induction machines. This study had investigated the efficacy of current monitoring for bearing fault detection by correlating the relationship between vibration and current frequencies caused by incipient bearing failures. Randy R. Schoen presented a method for on-line detection of incipient induction motor failures which requires no user interpretation of the motor current signature, even in the presence of unknown load and line conditions.
3. Hamid A. Toliyat et. al. [3] developed a new induction machine model for studying static rotor eccentricity.
4. M.E.H. Benbouzid and H. Nejari et. al.[4] stated that preventive maintenance of electric drive systems with induction motors involves monitoring of their operation for detection of abnormal electrical and mechanical conditions indicating failure of the system.

B. BLDC Motors

1. Time frequency representations has been presented as a solution for the diagnosis of rotor faults in BLDC motors operating under constantly changing load &

speed conditions. Four Time-Frequency Representations (TFR) are considered: STFT, WVD, CWD and ZAM. TFR are implemented in real time & their load computations are compared in order to study their suitability for implementation in commercial system.

2. Wigner Ville family of time frequency distributions has been presented as an alternative to STFT & Wavelets for diagnostics of rotor faults in a BLDC motor. Wigner Ville distributions possess better frequency resolution than STFT & Wavelets.

3. Wavelet transform of stator current signal has been proposed for detecting dynamic eccentricity in BLDC motors operating under rapidly varying speed & load conditions by S.Rajagopalan [5].

4. Faults in aerospace & transportation industries (non-stationary conditions) has been analyzed. Windowed Fourier Ridges is proposed for detection of rotor faults.

5. Hyung-Woo Lee [6] presented a winding function based method to analyze the inter turn fault in stator windings of a BLDC motor. The winding functions & inductance of stator windings are explained in detail & information simulation results based on winding function theory is provided to analyze current abnormalities & torque pulsation under turn to turn short.

6. Awadallah, M.A. [7] studied faulty performance of PM BLDC motor drives under open switch conditions. Wavelet transform was used to extract diagnostic indices from the current waveform of motor dc link. An intelligent agent based on adaptive neuro-fuzzy interference systems (ANFIS) was developed to automate the fault identification & location process. ANFIS was trained offline using simulation results under various healthy & faulty conditions obtained from a lumped parameter and network model. ANFIS testing shows that system could not only detect the open switch fault but also identify faulty switch.

7. Awadallah, M.A. [7] designed a model based diagnostic system for stator winding inter turn faults of PM BLDC motor drives. A transient model of drive system is set up & run under different healthy & faulty conditions. The steady supply current was selected as diagnostic signal to compare the healthy operation to faulty operation under different loads. The supply current signal was transformed to frequency domain using DFT. Appropriate diagnostic indices are extracted from supply current spectrum to differentiate between healthy & different faulty conditions.

VIII. CONCLUSION

BLDC motors are used in industries and home appliances. It is necessary to develop new conditioning methods for BLDC motor so that breakdown time can be reduced to its minimum level. During research, new method(s) will be developed to monitor & diagnose the faults of BLDC motor which will diagnose the faults in more reliable and timely manner resulting into significant reduction in cost of preventive maintenance.

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Room temperature ferromagnetism in dilute magnetic semiconductors

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Abstract—Dilute magnetic semiconductors (DMS) has been attracting researchers due to their potential application in future spintronics applications. But most of practical applications require Curie temperature for DMS to be around room temperature or more. Hence significant research work has been carried out on finding suitable DMS which has high Curie temperature. In this article primarily we have tried to derive the expression for curie temperature by applying Coherent Potential Approximation to Mean Field theory for magnetism in DMS. Then based on the expression for curie temperature it's dependence on various parameters like carrier density, magnetic impurity density, carrier mean free path, type of impurity, defects etc has been found.

Index Terms— DMS, Ferromagnetism

I. INTRODUCTION

Recently Dilute Magnetic Semiconductors have become focal point of researchers due to their promising applications in the field of spintronics. Although Magnetic semiconductors has been studied since early 1980's but still they have not been adopted for practical applications and are limited to laboratory experiments. One of the main reason which has hampered their usage in practical applications may be low curie temperature. Dilute magnetic semiconductors are broadly divided in two categories i.e II-VI DMS and III-V DMS. The II-VI semiconductor based DMS like $\text{Zn}_{1-x}\text{Mn}_x\text{Te}$ and $\text{Cd}_{1-x}\text{Mn}_x\text{Te}$ has not become so popular because most of these DMS are paramagnetic in nature. Still they have been used in some small applications like optical isolators. But unlike these III-V semiconductor based DMS like $\text{In}_{1-x}\text{Mn}_x\text{As}$ and $\text{Ga}_{1-x}\text{Mn}_x\text{As}$ are very popular because they show strong ferromagnetism and have higher curie temperature. Also their Curie temperature depends on carrier concentration which can be controlled by doping. Sometimes ternary semiconductors are also preferred due to ease in p-type doping and higher carrier mobility which results in strong double exchange interactions between transition metal ions (dopant). Dietl proposed several suitable candidates as hosts for DMS based on the mean field theory. All these materials were assumed to be exhibit p-type conductivity, and the carrier-mediated magnetism was expected to come about due to sp-d

hybridization. However, most of the work published on high temperature magnetic order DMS materials has involved n-type materials such as Co-doped ZnO or Mn-doped GaN. Some of these materials have been shown in table 1. [5][9][11]

Recently Cu doped $\text{Zn}_{1-x}\text{Fe}_x\text{O}$ based ferromagnetic semiconductors has been successfully synthesized with curie temperature of 550 K and saturation magnetization of $0.75\mu\text{B}$ per Fe at room temperature.[1] Recently spin-coated nickel-doped zinc oxide nano-crystalline thin films using high-quality colloidal diluted magnetic semiconductor (DMS) quantum dots as solution precursors has been successfully prepared. These films show robust ferromagnetism with Curie temperatures above 350 K and 300 K saturation moments up to 0.1 Bohr magnetrons per nickel.[2] Above room temperature ferromagnetic behavior has been achieved in Si through Mn ion implantation with saturation magnetization of 0.3 emu/g at 300 K. The saturation magnetization increased twice after annealing at 800 °C for 5 min. The Curie temperature for all samples was found to be greater than 400 K. A significant difference in the temperature-dependent remnant magnetization between the implanted p-type and n-type Si is observed, giving strong evidence that a Si-based diluted magnetic semiconductor can be achieved.[3]

Recently efforts has been carried out to control Ferromagnetic behavior of GaMnN-DMS using electric field. The exchange interaction between Mn ions and holes in GaMnN DMS results in FM ordering, which can be altered by controlling the number of interacting holes. However, Mn forms deep acceptor bands in GaMnN films resulting in an insulating film and even the doping with the Mg acceptor does not improve the film conductivity. Consequently, the electric field controlled FM has been difficult to realize. But it has been observed that p-type AlGaIn/GaN strained-layer superlattices (SLSs) forming p-SLS/GaMnN/p-SLS heterostructure overcome the problem of the highly resistive GaMnN films. A correlation between the FM of the film and the availability of holes in the p-type SLSs has been observed. The idea is to separate the DMS mediating hole carriers from the GaMnN films by growing GaMnN on a p-GaN layer. The source of mediating carriers is the p-GaN and the hole concentration can be controlled by applying an electric field.[12]

where u_i is either u_i^A or u_i^M depending on the ion species occupying the i site

Table 1

Material	E _g (eV)	Doping	μ_B	T _c (K)
GaN	3.5	0.9% Mn Cr	0.9 0.9	940 > 400
AlN	4.3	7% Cr 5% V	1.2 4.2	> 600 > 400
TiO ₂	3.2	1-2% Co 7% Co 2% Fe	0.3 1.4 2.4	> 300 650- 700 > 300
SnO ₂	3.5	5% Fe 5% Co	1.8 7.5	610 650
ZnO	3.3	15% V 5% Fe 1% Cu 10% Co 0.9% Ni	0.5 0.75 2.0 0.06	> 350 550 280- 330 > 300
Cu ₂ O	2.0	5% Co 0.5% Al	0.2	> 300
In _{1.8} Sn _{0.2} O ₃	3.8	5% Mn	0.8	> 300

Room temperature ferromagnetism has also been observed in Nb-doped SrTiO₃ (NSTO) single crystals . The ferromagnetism can be eliminated by air annealing and can be again recovered by subsequent vacuum annealing. The temperature dependence of magnetic moment intimately resembles the temperature dependence of carrier density suggesting an intrinsic origin of the ferromagnetism - carrier-mediated Ruderman-Kittel-Kasuya-Yosida interaction.^[4] Consider DMS of the type A_{1-x}Mn_xB, where the parent material AB is assumed to be a nonmagnetic III-V compound and both of the exchange interaction between carrier and impurity spins, and the direct exchange interaction between magnetic impurities are taken into account

$$H = \sum_{ij\sigma} t_{ij} a_{i\sigma}^{\dagger} a_{j\sigma} + \sum_i u_i - J \sum_{\langle ij \rangle} \vec{S}_i \vec{S}_j$$

$$u_i = \begin{cases} E_A \sum_{\sigma} a_{i\sigma}^{\dagger} a_{i\sigma} & i \in A \\ E_M \sum_{\sigma} a_{i\sigma}^{\dagger} a_{i\sigma} - \Delta \sum_{\sigma} a_{i\sigma}^{\dagger} a_{i\sigma} (\sigma S_i) & i \in Mn \end{cases}$$

Here $a_{i\sigma}^{\dagger} (a_{i\sigma})$ is the creation (annihilation) operator for a carrier with spin σ at i site; S_i denotes the spin of localized impurity at i site ; Δ is the effective coupling constant between the localized spin and itinerant spin; J is the coupling constant between the neighboring localized impurity spins, which depends on their distance and for the anti-ferromagnetic exchange interaction case $J < 0$. To consider the effect of the direct exchange interaction between magnetic impurities on T_c, dividing equation (1) into the impurity term and the itinerant carrier term

$$H_{imp} = - \sum_i h S_i^z - J \sum_{\langle ij \rangle} S_i^z S_j^z$$

$$H_{carr} = \sum_{ij\sigma} t_{ij} a_{i\sigma}^{\dagger} a_{j\sigma} + \sum_i u_i$$

where h is the field induced by the polarization of the carrier spins. Where $S_i^z = \pm S$ is the localized spin also known as Ising spin and H_{imp} is the molecular field approximation as $S_i^z S_j^z = \langle S_i^z \rangle \langle S_j^z \rangle + \langle S_i^z \rangle S_j^z - \langle S_i^z \rangle \langle S_j^z \rangle$ Within this mean approximation, the Hamiltonian (3) become

$$H_{imp}^{MF} = NxJym^2 - \sum_i S_i^z (h + 2Jym)$$

where N is the number of lattice sites, x is Mn density, $m = \langle S_i^z \rangle$ refers to the average magnetization per lattice site, γ is the effective number of surrounding impurities a given impurity interacts with.

We apply CPA to the Hamiltonian (4). In CPA the carriers are described as independent particles moving in an effective medium of spin-dependent coherent potentials. The coherent potential $\sum_{\sigma} (\sigma = \uparrow, \downarrow)$ is determined by demanding the scattering matrix for a carrier at an arbitrarily chosen site embedded in the effective medium vanished on average. By using a bare semicircular non-interacting density of states (DOS) with half bandwidth W :

$$\rho_0(z) = \frac{2}{\pi W^2} \sqrt{W^2 - z^2}$$

we obtain a quadratic equation for $G_{\sigma}(\omega)$ and it is solved analytically by using Ferrari method^{[7][11]}. Throughout this work, we assume that the carriers are degenerate. Then the carrier energy can be expressed as

$$E_{carr}(m) = \int_{-\infty}^{\mu} \omega (\rho_{\uparrow}(\omega) + \rho_{\downarrow}(\omega)) d\omega \quad (1)$$

where μ is the chemical potential and $\rho_{\sigma}(\omega) = -\frac{1}{\pi}\tilde{S}G_{\sigma}(\omega)$ is the DOS with spin σ . The free energy per site of the system (1) at temperature T is given as

$$F(m) = E_{carr}(m) + hmx + xJ\gamma m^2 - xk_B T \ln \left(\sum_{S^z=\pm S} e^{\beta(h+2J\gamma m)S^z} \right) \quad (3)$$

By minimizing F with respect to m we obtain the following equation for h

$$h = -\frac{1}{x} \frac{dE_{carr}(m)}{dm}$$

By using the Weiss molecular field theory, each impurity spin feels an effective field

$\bar{h} = h + 2J\gamma m$ and the local magnetization is then calculated by

$$m = SB_S \left(\frac{\bar{h}S}{k_B T} \right)$$

where

$$B_S(x) = \frac{2S+1}{2S} \coth \left(\frac{2S+1}{2S} x \right) - \frac{1}{2S} \coth \left(\frac{1}{2S} x \right)$$

is the conventional Brillouin function and

for Ising spin $S = \frac{1}{2}$

The Curie temperature is determined by differentiating both sides of Eq. (9) with

respect to m at $m = 0$. This leads to the formula

$$k_B T_C = \frac{S(S+1)}{3} \left(-\frac{1}{x} \frac{d^2 E_{carr}(m)}{dm^2} \Big|_{m=0} + 2J\gamma \right)$$

So, we have

$$T_c = T_{c0} - T_{AF}$$

Where

$$T_{c0} = -\frac{S(S+1)}{3xk_B} \frac{d^2 E_{carr}(m)}{dm^2} \Big|_{m=0}$$

is the Curie temperature of the system in the absence of antiferromagnetic interaction between magnetic impurities; and $T_{AF} = \frac{2S(S+1)}{3k_B} J\gamma$ describes the contribution of the antiferromagnetic interaction to the Curie temperature. Above equation has been derived in some early studies within the Weiss mean field theory, implies that the Curie temperature is determined by competition between the ferromagnetic and antiferromagnetic interactions.^[6]

Curie temperature is complicated function of carrier density, magnetic impurity density, carrier mean free path etc.

Curie temperature has been plotted against different carrier concentrations for different values of magnetic dopant (Mn) concentration and mean free path using equation (10) and compared against predictions from standard Virtual Crystal Approximation (VCA) method .

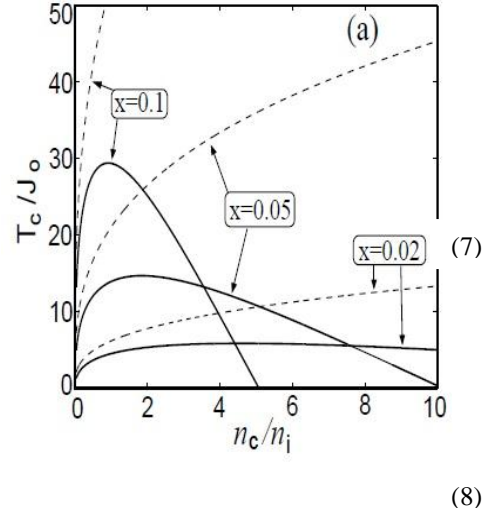


Figure 1 : Calculated Curie temperature as function of normalized carrier density (n_c/n_i) for different values of x & fix MFP. VCA computations has been shown in dashed line.

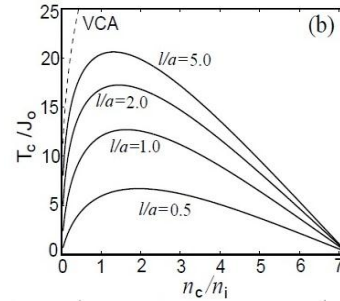


Figure 2 : Calculated Curie temperature as a function of normalized carrier density (n_c/n_i) for different values of MFP & fix x. VCA computations has been shown in dashed line.

Upon analyzing the above results from theoretical calculations it is apparent that maximum Curie temperature is obtained for optimum carrier density $n_c/n_i \sim 0.5 - 2$ and also T_c first increases with concentrations for very low values of x after attaining it's maximum values it starts decreasing. T_c cannot be increased by just increasing magnetic impurity concentration for optimum carrier density (n_c/n_i) actually we have to maximize mean free path for obtaining maximum curie temperature. Also curie temperature depends upon type of magnetic impurity being doped however it affects amount of magnetization below curie temperature also. The elements with large number of unpaired valence electrons shows larger magnetization as well as curie temperature as compared to those which have less unpaired valence electrons as shown in the figure below

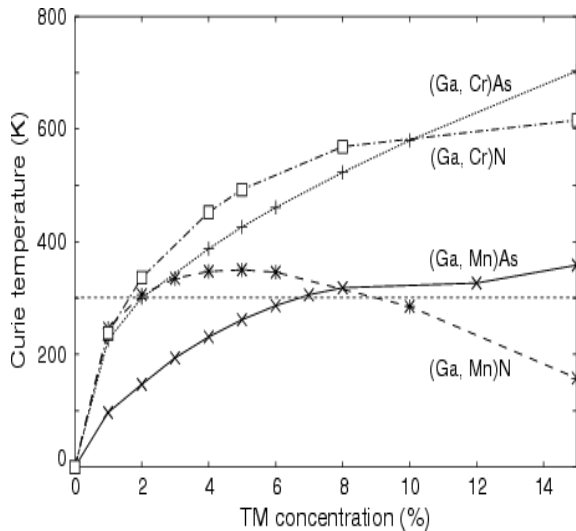


Figure 3 : Curie temperature as function of Magnetic impurity doping concentrations for Mn & Cr doped in GaAs & GaN

From figure 3 it is apparent that Curie temperature of Cr doped GaAs/GaN is more as compared to Mn doped GaAs/GaN because Cr has one more unpaired valence electron as compared to Mn which contribute to higher net spin of Cr ions in the lattice which give rise to large amount of magnetization and also contribute to higher ferromagnetic interactions as compared to Mn in the host semiconductor lattice.

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A Review of Various Techniques for Protection of IC Circuit from Electro Static Discharge

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Abstract-- This paper review various techniques used these days to remove errors which arise because of Electro-static Discharge (ESD) in proper working of IC circuit. According to an estimate, ESD accounts for more than 40% of total failure of integrated circuits. The sources of ESD, causes and types of failure are briefly discussed in this paper. The three mostly used devices and their use in protecting internal circuit from ESD with some of the possible circuit design has been explained. Starting from diode based protection circuit design to more complex MOSFET based two stages ESD protection design and substrate triggered Field Oxide Device (FOD) design, are reviewed and compared. The possible protection circuit design for output circuit is also discussed.

Key word-- ESD, FOD, ggNMOS, MOSFET.

I. INTRODUCTION

The electro static charge (ESD) is sudden transfer of charge between two objects at different potentials, so it is the charge balancing process between two objects. ESD is a transient discharge of static charge that arises from either human handling, during manufacturing, testing, handling and assembly of integrated circuits (ICs). This unintentional charge transfer may generate large voltages (100V to 10 kV)[2] due to the small size and capacitance of the integrated devices. These large voltages can result in high currents through the devices that may cause malfunctioning or even permanent damage to the circuit. The energy dissipated and damage made is mainly due to current in ICs during discharge.

Most ESD damage is thermally initiated process in the form of device / interconnect burn-out or oxide break-down. The basic phenomenon is that sufficient heat is generated in a small volume significantly faster than it can be removed, leading to a temperature rise beyond the limit of the IC circuit.

Other than these effects ESD can cause errors in safe operating limits as:

PN-junction may melt.

- Void formation in gate oxide.
- Metal interconnects / vias may melt or vaporization, leading to shorts/open circuit.

II. PRINCIPLE SOURCES OF ESD IN IC'S

A. Human Factors [1]

A person working on a synthetic floor can accumulate up to 20 kV. This voltage is discharged when the person touches an object that is sufficiently at ground as the circuit completed. Charge exchange occurs between the person and the object in very short time duration (10 ns - 100 ns). The discharging current is approximately 1A - 10A, depending upon the time constant. This is the main factor in ESD to cause IC circuit damage.

B. Application of Test and Handling Systems

Equipment can accumulate static charge due to improper grounding. The charge is transmitted through ICs when it is picked up for placement in test sockets during the testing of the circuit.

C. Self charged IC

Sometimes IC becomes charged during transport or by the contact with charged object. ICs remain charged until they come into contact with a grounded surface (large metal plates /test sockets). Charge is discharged through the pins of ICs. Large currents in the internal circuit can result in high voltage inside the devices, which can cause damage to thin dielectrics and insulators as large current would flow through them.

III. FAILURE

A. Types of failure

Hard failure: Physical destruction of device so that it is no longer works properly.

Soft failure: Temporary change in logic functions for short span of time.

Latent failure: Development of stresses in device and leading to its failure after some period of its use.

B. Causes of failure

- Interconnect lines are finer thus more susceptible to fusing.
- Junction depths are shallower thus more prone to degradation.
- Low oxide thickness breaks at lower breakdown voltages.

IV. ESD PROTECTION DEVICES

A. Resistor [1]

N-well resistors exhibit a large resistance in the saturation region. N-well resistors in the saturation region can be used as current-limiting devices for ESD protection by limiting the amount of ESD discharging current.

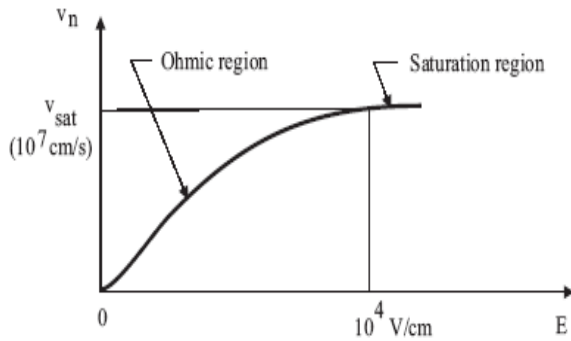


Figure 1: Saturation Velocity.

At high voltages, the velocity of free electrons saturates due to the increasing collision with silicon lattices. As a result, the current through n-well resistors remains nearly constant regardless of voltage increase

B. Diodes [1]

When forward-biased, diodes can sustain a large current with a small device dimension. The ON resistance of PN diode at

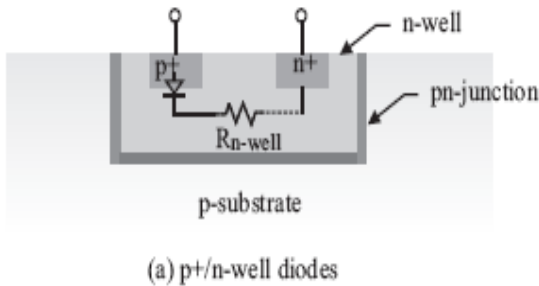


Figure 2: Diode cross-section.

high current levels is much lower. Reverse biased diodes have high resistance so they are not suitable ESD current shunt. Heating in reverse biased diode is high than forward biased diode due to presence of high electric field.

C. MOSFET [1]

MOSFET can also be used as the protection device of the circuit from ESD. The main design parameters of NMOS are (i) channel length, (ii) drain contact-to-gate spacing, and (iii) device width. The source contact-to-gate spacing is not critical and is kept at its minimum design value.

- The minimum channel length is good for efficient turn-on but the punch-through limit will be reduced.
- Drain contact-to-gate spacing affects the resistance of ballast resistors. For silicide processes, the minimum drain contact-to-gate spacing is used.
- Device width determines the maximum current that the device can conduct.

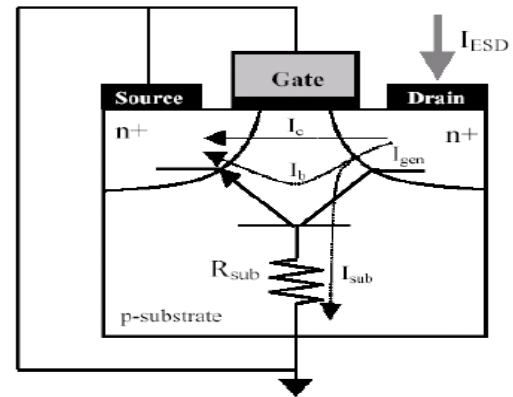


Figure 3: Typical operation of NMOS.

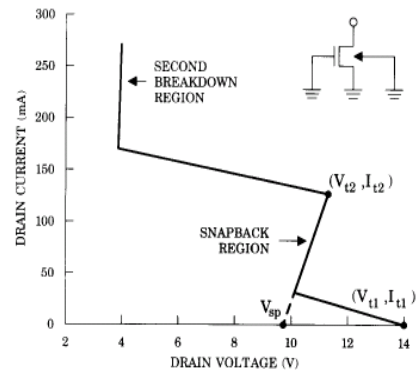


Figure 4: V-I characteristics of MOSFET under ESD.

During a ESD strike (shown in Figure 3) the PN-junction at the drain is reverse biased and as the ESD pulse increases it

undergoes an avalanche breakdown which results in very small conduction in the device as shown by V_{t1} , I_{t1} in Figure 4. Holes flow to the substrate thus substrate potential increases, and this potential increases till source and substrate junction is forward biased at V_{sp} then NMOS moves in snapback region as shown in Figure 4. This snapback mode results in turning ON of parasitic BJT, thus ESD current flows from the collector the (drain of NMOS) to the emitter (the source of NMOS that is connected to the ground) as shown in figure 3. In snapback region there is small variation of voltage but very sharp increase of current this rise is upto holding voltage V_{t2} , I_{t2} as shown in Figure 4. Upto, which ESD stress at the drain of the NMOS transistor (PAD), is released.

The ESD stress should be released upto V_{t2} , I_{t2} as shown in Figure 4, because after this second breakdown of device takes place, the device fails at that point and would not be workable after this point.

The dimensions of ESD NMOS should be large enough to handle large ESD currents, also multiple fingers structure is used to implement ESD NMOS because for them ESD pulse flows through many devices thus averting damage of any device due to ESD stress. In order to achieve this gate-coupled NMOS is used because V_{t1} is lower than V_{t2} , hence there is uniform triggering of all NMOS fingers.

D. Features of ESD Protection Circuits

- An ESD protection circuit should provide a low-impedance path from input pads to the ground during an ESD strike to release the static charge accumulated on the pads.
- Clamp the voltage of the pads at a level that is below the dielectric breakdown voltage of thin transistors during an ESD strike.
- Provide very high impedance and a low capacitance during normal operation such that it has a little effect on the operation of the protected circuits.

IV. SIMPLIFIED ESD PROTECTION CIRCUITS [1]

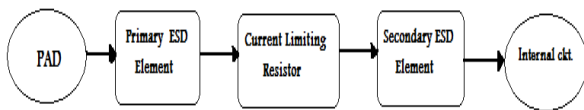


Figure 5: Block diagram of ESD Protection circuit.

- Primary ESD Element: It conducts more in bulk thus results in higher power dissipation capability. Primary ESD protection elements have large width and need more time to turn on.
- Current limiting resistor: It provides voltage drop required to activate primary, limit the current flowing into the internal circuits and withstand some ESD voltage so that the secondary protection circuit will not be damaged in an ESD strike.
- Secondary device: It is triggered at voltage below the breakdown voltage of input transistor. Since, it is not required to carry large currents they serve to limit the voltage at the circuit being protected until the primary ESD protection devices are fully operational. These devices have smaller width.
- The effectiveness of the primary ESD protection devices is determined by the secondary protection stage. Due to the small dimensions, the secondary protection devices start operating before the primary protection devices are activated. It is critical to ensure that the operation of the primary protection devices is activated before the secondary protection devices enter their thermal breakdown so that the secondary ESD protection devices will not be destroyed by ESD stress.

V. INPUT CIRCUIT PROTECTION

A. Using diode [1]

Large area diodes D1 and D2 are used to dissipate large current as shown in Figure 6, the ESD protection circuitry need to be triggered before gate oxide is damaged, in order to overcome this issue two small area diodes D3 and D4 are used. Now if the positive ESD pulse is applied. When time equivalent to product of junction capacitance of diode D3 and current limiting resistor has lapsed then D3 starts conducting in forward mode, in the meantime current flow through resistor is increasing and this result, in the increase of potential drop at node of D1, D2 and resistor.

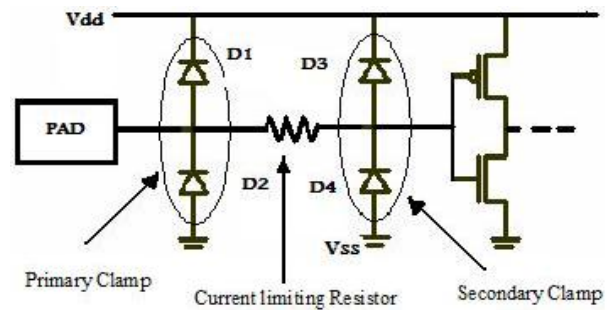


Figure 6: ESD Protection circuit using diodes.

Thus, rise of potential at this node leads to turning ON of diode D1. Since, D1 is very large area diode so it releases whole ESD stress. Hence, both objectives are achieved.

B. Using MOSFET

1) Two-stage ESD protection circuit [4]:

To protect the thinner gate oxide of the input stage in CMOS ICs under all ESD stress conditions, a traditional two-stage ESD protection circuit for the digital input pin is shown in Figure 7. A gate-grounded short-channel NMOS is used as the secondary protection device to clamp the overstress voltage across the gate oxide of the input circuits. To provide a high ESD protection level, a field-oxide device (FOD) is often used as the main discharge element in the primary protection stage to discharge ESD current. Between the primary and secondary stages, a resistor R is added to limit ESD current flowing through the short-channel NMOS in the secondary stage. The primary ESD clamp device must be triggered on to discharge ESD current before the gate-grounded NMOS (ggNMOS) [4] in the secondary stage is damaged by the overstress ESD current. If the primary ESD clamp device has a high turn-on voltage, the resistance of R should be large enough, even on the order of kilohms. Under the positive-to- and negative-to- ESD conditions, the ESD current can be discharged through the FOD and ggNMOS devices.

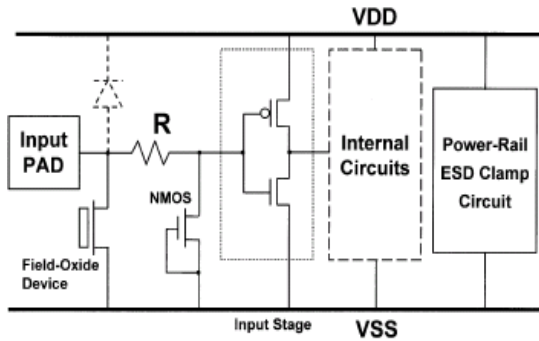


Figure 7: Traditional input ESD protection circuit for digital input pin in CMOS IC's.

However, in the mixed-voltage situation, the diode or PMOS connected from the pad to V_{DD} power line is forbidden by the normal circuit operation with a high-voltage input signal. Without the diode or PMOS connected from the pad to V_{DD} , the positive ESD stresses are still discharged from the pad to power line and then conducted through the power-rail ESD clamp circuit to the grounded pin. The efficient power-rail ESD clamp circuit is important under such ESD stress conditions to bypass ESD current away from the internal circuits.

The ESD protection device must be drawn with larger device dimensions, which has often been realized in layout with multiple fingers to reduce the total silicon area. But, during ESD

stress, the multiple fingers of the ESD protection MOSFET cannot be uniformly turned on. Only several fingers of the MOSFET are turned on and, therefore, damaged by ESD. This often causes a low ESD level in the ESD protection circuit, even if the MOSFET has been drawn with a large device dimension. To efficiently improve the turn-on uniformity among those multiple fingers, the gate-driven design increase ESD robustness of the large-device-dimension NMOS. The gate-driven design causes ESD current to discharge mainly through the surface channel of the NMOS therefore the NMOS is easily burned out by ESD energy. To avoid the sudden degradation on ESD level of the gate-driven devices, the substrate triggered design can be used to improve ESD robustness of the ESD protection devices.

2) Substrate triggered design [3]:

The input ESD protection circuit with the substrate-triggered design is shown in Figure 8. This input ESD protection circuit is combined with a short-channel gate-grounded NMOS (Mn1), a resistor (R), and a FOD.

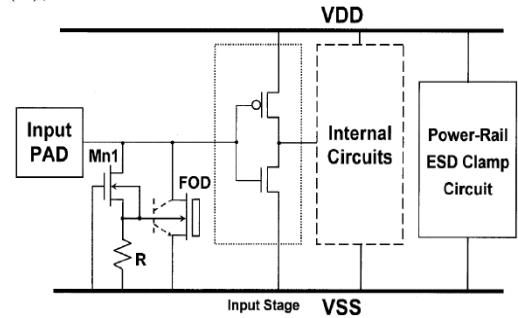


Figure 8: ESD protection circuit with substrate-triggered FOD to protect the input stage.

During ESD stress, the short-channel gate-grounded NMOS with a lower snapback breakdown voltage can be more quickly triggered on than the FOD with a higher breakdown voltage. Both the source and the substrate of the gate-grounded NMOS is connected to the substrate of the FOD to form a trigger path to the base of the parasitic lateral bipolar junction transistor (LBJT), which is shown by the dashed line beside the FOD in Figure 8. The collector/emitter of the parasitic LBJT is formed with the drain/source of the FOD and the base formed from the substrate of the FOD. To effectively trigger on this parasitic LBJT, a suitable voltage is applied on the resistance R to turn on the base-emitter junction of parasitic LBJT during ESD stress. This method works for both positive and negative ESD stresses.

During positive or negative ESD stress conditions, the ESD current is still discharged from the pad. A turn-on efficient power-rail ESD clamp circuit should be included in the chip to provide overall ESD protection for the input pin. Some of the

research paper discuss more efficient use of this techniques for RF based circuits [5]. So in the circuits which are ultra sensitive part of the IC or in advance technologies these circuits techniques are used and preferred.

3) Substrate-triggered design Vs Two stage protection Design”

By using the substrate-triggered design, the FOD in Figure 8 can be uniformly turned on to sustain higher ESD levels than the traditional two stage protection design in Figure 7, under the positive ESD stress conditions. The two-stage ESD protection design may provide high ESD protection levels for the digital input pins, but because the large series resistance and the junction capacitance of the ESD clamp devices cause a long RC delay to the input signal, such a traditional design is not suitable for analog pins[4]. For current-mode input signals or high-frequency applications, the series resistance between the input pad and input stage is neglected. The traditional two-stage ESD protection design in Figure 7 is not suitable for analog applications. On the other hand, the substrate-triggered ESD protection circuit without series resistance, as that shown in Figure 8, can provide lower triggered voltage to effectively protect the thin gate oxide of the input stage. It is, therefore, more suitable for analog circuit applications.

C. Output Protection [3]

For the protection of output circuit, additional protection circuitry is not required. It simply can be done by using CMOS as shown in Figure 9. The CMOS used in output stage itself acts as ESD protection circuit. When positive ESD occurs then PMOS (M1) drain substrate junction is forward biased and ESD pulse gets path to flow through V_{DD} .

Similarly when negative ESD occurs then in NMOS (M2) drain substrate junction is forward biased and ESD pulse gets path to flow through V_{SS} , but for M2 we also use diode as additional protection device connected between V_{SS} and pad. We use diode for M2 because width of M1 is 2 to 3 times more than M2 so it can effectively pass ESD pulse without any damage to it whereas there are chances of M2 to get damaged.

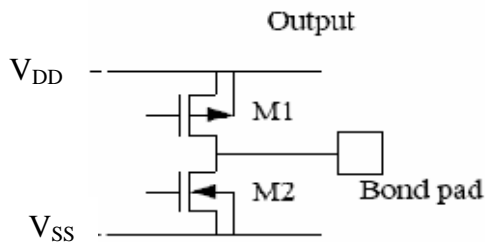


Figure 9: Output Protection using CMOS.

V. CONCLUSION

In this paper we have discussed various methods to protect the circuit from ESD. Traditional two stage design and substrate triggered FOD are also compared. The best method can be applied by taking the actual circuit into consideration i.e. we can not apply two stage design in analog circuit as it would causes input signal to delay in normal operation whereas substrate triggered FOD would protect the circuit effectively. So it important to protect the IC circuit form ESD with right design techniques, otherwise the normal operation of the circuit would be affected.

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Scientific temper: crucial for media

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Abstract—Scientific knowledge is needed for enlightened life and good enjoyment. In this context media holds a position of great responsibility. At every stage, the aim and objective of media should be to create scientific outlook amongst the people so that all superstitions, blind faith and conviction could disappear in society. In this paper, my area of discourse is ‘daily soap being telecast on television’. Many people, especially women have become so addicted to these soaps that they seem to have become an integral part of their routines. Now as these serials exercise a strong impact on the minds of the viewers directly or indirectly, the persons concerned or producers of the channels should deem it their duty to see to it that the programmes should be shown in a true scientific spirit. They should lay greater emphasis on the development of scientific temper which all members of society should acquire. Moreover, it should not be forgotten that mind only interprets whatever is fed by the senses and owing to inherent limitation of knowledge gives a distorted picture of the categories of the subject, time and space. Media especially television that holds a huge potential of influencing a large number of people should carefully sieve the programmes and not allow superstition and blind faith to flow through them.

Keywords- Media, television, scientific knowledge.

1. INTRODUCTION

As the population of modern human increased on our planet they formed larger groups and communities. To prevent dispute and aggressive behaviour among members of the group or tribe, certain rules and regulations became necessary so that the members of the group could lead a relatively peaceful life. As human beings civilized, more acceptable rules and regulations became necessary as a corollary. As the human species civilizes into a more advanced and noble society, these rules and regulations or laws, which have regulated life of human societies, are modified whenever necessary from time to time. This evolution is still on. These rules are formulated to guard the people not only against disputes and aggression but also from immoral and unscrupulous members of society, which use misinformation and misguidance to cheat and harm them. To be more precise, at this moment of time in this part of the world, superstitions exist in a very large extent in the majority of uneducated and educated strata of society. It is also a fact that there exist large number of people whose main means of livelihood is to misuse these superstitious beliefs and fill their own coffers. If societies have to be more civilized a deliberate attempt has to be made to change the scenario. This could be changed on the one hand by educating the people and on the other by preventing unscrupulous elements in society from taking advantage of

the ignorance of people. Hence it is very necessary to enact a law to protect the people from such unscrupulous members of society.

Questions are always posed as to whether society changes simply by enactment of rules and laws? There is ample historical evidence to prove that enactment of laws has always helped society to give up such evil, uncivilized practices. Moreover, if there is an active social agitation going on in the society, against some undesirable belief systems and if a large section of society is actively participating in eradicating harmful superstitious beliefs, and then the enactment of such a law will certainly accelerate this process. Moreover, people, social reformers and well-wishers desire that in the interest of the community, their representatives should ratify such an act as early as possible.

The scientific age is riddled with intriguing contradictions and human-made follies. The technology-driven consumer culture and entertainment industry has fueled the growth of primitive superstitions, myths and new age beliefs. The need to promote a rational discussion on science, technology and equitable social development has never been so pressing. The first thing to guard against such trends is to be aware of the subtle persuasive techniques, marketing strategies and advertisement gimmicks that make us increasingly helpless consumers in the scientific age.

The information age is not free from its perils. This may sound like an oxymoron. But there is a growing body of evidence that clearly raises serious concerns of increasing influence of technology in our daily lives. We are constantly bombarded by an enormous amount of information flowing from the Internet, television and other forms of mass media. The menace is still prevalent even in this Internet era as is evident from the growing crimes being perpetrated under the garb of superstitious beliefs at the behest of vested elements.

Sometimes it is hard to discern relevant from frivolous, good from bad and desirable from deceitful. *While the capacity to find patterns and infer meanings had obvious advantages for survival, the brain is not always successful in distinguishing meaningful and meaningless patterns. In fact, “pattern finding” and “order seeking” mechanisms form the basis for nearly all existing myths, superstitions, cultural taboos and ritual practices all over the world. The same mechanism also makes us extremely vulnerable to all kinds of deceptions and manipulative techniques that impair our critical faculties. We may imagine things that don’t exist, make false judgments, accept uncritical claims, misinterpret facts and arrive at conclusions that are completely at odds*

with reality. Conveying the excitement of science and scientific discovery is no doubt an essential part of science education and public outreach activities. But equally important is to learn to draw the distinction between unsubstantiated claims and factual findings based on sound reasoning and evidence. Discerning magical thinking and vague ideas from the realm of possibilities that lie within limits of physical laws is therefore important to inculcate scientific temper.

Stevie Wonder once sang that superstition is "when you believe in things that you don't understand." Superstitions rise to our minds when we want more control or certainty about something. We want an explanation for why things go wrong -- or right -- and, for whatever reason, we're quick to attribute success or failure to something seemingly innocuous.

But how many of us really know what they mean, or, more importantly, where they came from?

Here I would like to make distinction between faith and superstition. Following and practicing your religious beliefs, traditions and customs does not amount to superstition. Superstition is blindly following, believing or practicing something which has no religious basis.

Unfortunately in India, the pure religious practices have, with the passage of time, turned into superstition thanks to unscrupulous pandits, poojaris, babas, sadhus and the like. Today, very few people know about the genuine customs even as most people follow superstition disguised as religion.

Television is a powerful audio-visual medium having a strong impact. In the last decade, television has reached the remotest corners catering to not only the educated masses but illiterate people living in distinct villages,"TV serials and programmes concerning ghosts, horror and supernatural powers reinforce blind faith in society.

The Maharashtra Andhashraddha Nirmoolan Samiti (MANS) (Maharashtra Blind faith Eradication Committee), a voluntary organisation, has questioned if such telecast of ghost and horror episodes or advertising so-called supernatural powers is permissible under the law. It is on a mission to revive the memories and work of great social reformers and promote scientific spirit among people.

Ever since the times of cable TV have arrived, roots of superstitions have gone deeper further down. The trend of leaving the domestic chores in the hands of servants and spending the times leisurely in front of T.V. sets has fast

caught up. Whereas the daughters-in-law handed over the kitchen works over to the servants, mothers-in-law too have washed hands in the flowing Ganges. Taking leave from the daily domestic chores, they have taken shelter to the idiot box to while away their times which alongside providing entertainments for all age groups is presenting superstitions too.

Media has been dedicating more time to programmes that promote blind faith just to sustain television rating points (TRPs).

There are channels devoted to news, religious preaching, and entertainment but other types of serials, ghost and horror serials are becoming more and more popular among the spectators and more so among children.

Television is also used for advertising hundreds of products brought in market like golden rings, pearls, stones, yantras, kavach which the advertisers claim to be endowed with supernatural powers.

After being bombarded by such advertisements, the common man tends to go for such things and later realises that he has been cheated. In this way, millions of people are victimised.

Whether the Constitution of India, under the right of freedom of expression, allow such things which cause injury to the mind and good sense of the masses and affect development of scientific temperament of the society.

Should public exhibition of ghost and horror episodes or serials and false advertisements about so called articles endowed with supernatural power, such as Kavach, Yantras or ring by the TV channels should be allowed.

The Cinematograph Act 1952, provides for examination and certification of a film or cinema by the Board of Film Certification. There are also guidelines which stipulate that anti-scientific visuals or words should not be exhibited.

The Board of Film certification should ensure that any episode, serial, film or advertisement to be presented by TV channels concerning ghosts, horror and supernatural power should not be allowed for exhibition.

"Such exhibitions reinforce the blind faith in society and strengthens it. It is unconstitutional and injures the social health.

I. CONSUMER MARKET AND ENTERTAINMENT INDUSTRY

The consumer market and entertainment industry too have forged an unholy alliance with technology to exploit the gullible public. The mass media and digital technology has emerged as a most powerful instrument of propaganda and persuasion.

The younger generation loves horror show, women like Ekta Kapoor's Saas- Bahu never ending serials are spoiling the family's traditions and customs. The conspiracies shown in them mar the peace of the family.

Spreading superstitions effectively by saints and pandits become the star attraction through numerous TV shows.

Take for instance the popular show "Balika Vadhu" which deals with important social issues of child marriage and widow remarriage. Even this serial has not escaped from the strokes of superstition. Gauri, the other woman in the serial spoils her marriage with Jagat as it does not take place on a "Subh Mahurat". Stories of ghosts-jinh read during childhoods, the roaming spirits torturing innocent humans out to take revenges after their deaths, magicians, tantriks come alive into the mind through TV serials. The audiences are once again pushed deep down into the old world of superstitions. Many other instances of superstitious beliefs such as breaking of glass, putting off of lamp, or some other ominous portents, stress the importance of believing in such irrational things and then subsequent consequences have to be borne.

The "Fear Files" show being broadcasted on Zee TV (every Saturday and Sunday) is just a source of creating more misunderstandings about nature and gives new dimensions to dangerous imaginations to paranormal activities that do not actually exist. Toddlers and young children and any normal person who watch such television shows are more likely to develop anxiety, sleep disorders, and aggressive and self-endangering behaviors. It is reasonable to recommend that we pay closer attention to the potential media stimuli that create long-lasting fears of the surrounding world, fears that can interfere with normal functioning. Hence, I would like that a much awaited necessary action should be taken against the TV show.

Even to this day in Bollywood, there are films being produced relating to revenges to be taken of the past birth's atrocity, emerging as an ichchadhari Nagin.

The books of 'Harry Potter' and films based on them are breaking all records of popularity to smithereens.

In the crowd of increasing the TRPs of such superstitious serials, not only the older people are contributing to this mite but well educated intellectuals working in the MNCs are playing their role to the fullest.

III.EFFECTS

After watching some horror serials people are haunted by these scenes in their dreams. The blame falls on the daughter in law as if she is using some black magic. As a result the peaceful atmosphere of the family gets polluted.

The peace of the house is totally tattered by a magical doom and gloom in the family. Books elaborating the meanings of dreams are being sold like hot cakes.

The menace is still prevalent even in this Internet era as is evident from the growing crimes being perpetrated.

There are many other examples of how technology is used to (mis)educate and enslave people. These techno-hyper challenges pose a greater threat to the advancement of scientific temper and critical thinking among people.

We cannot stop propaganda, but we can certainly take some discrete steps to stay immune to it.

Subtle ideas and values are ingrained through clever visual imagery, tantalizing graphics and sound effects.

Children are highly susceptible to propaganda and become soft targets for mind control.

Where will this mental atrophy lead to? These people later on come into the grips of depression, tension and worries ending into the psycho clinics. At the beginning of the 21st century and the new millennium, everyone is aware of the need to be able to think with an open mind and to lead a rational life. The Constitution of India has stipulated adoption of scientific outlook as one of the responsibilities of every Indian and has included it as a value to be inculcated through education.

Where lies the remedies to superstitions?

Intellectuals should condemn the telecast of these programmes, and try to instill scientific temper among the public

Rationalists should raise their voice whenever the media projects blind beliefs as the truth

Youngsters especially college students should form groups

and visit different areas periodically to work against superstition. Various programmes should be organised to this effect.

The programmes should include quiz, road shows, poster exhibitions and sale of literature on inculcating scientific temper. Eye opening programmes should be frequently staged to stress on the following:

- To cultivate scientific attitude, scepticism, humanism and critical thinking among the people
- To oppose harmful superstitions, which exploit people.
- To cultivate rationalistic moral values, humanism and create a just society.
- To encourage constructive analysis of religious traditions and customs.
- To agitate against harmful superstitions and rituals and suggest useful alternatives to some.
- To help and work with other social reform organizations.

It is most deplorable to telecast serials glorifying the supernatural powers," says a student, highlighting a joint campaign to check the evil of superstitious beliefs.

Regular protests made against programmes on the electronic media encouraging superstitions should be presented to the government.

Social activists like Dr Narendra Dabholkar and prominent activist Avinash Patil have asked the state government to take a lead in ensuring such content is banned from TV. Thought provoking cultural programmes against superstitious beliefs should be staged. Exciting feats based on scientific concepts to expose the deceptive tactics employed by the self proclaimed god men and tantriks should be performed for general masses. Media should take up the responsibility of addressing the problem of uneducated and backward areas such as the problem of witch hunting under which women are branded as witches and killed.

Remember, though you don't have control over the outside forces throwing surprises of life at you but you certainly have control over your mind the owner of which is none else but you yourself.

IV.CONCLUSION

As media holds a very responsible position in the Indian

scenario, it cannot afford to allow telecast of such serials that spread superstition and blind faith among people as 99% of Indian population watches television and the thongs shown in the serials and other programmes leaves an indelibly deep impact on the impressionistic minds of the gullible people. Because of which one of the greatest invention called "Television" has become an idiotic box.

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Frankenstein: Adventures of Gothicism with the Wings of Science

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Abstract—*Mary Shelley's Frankenstein offers an exceptionally fascinating insight into scientific issues of the day. Though intended as a ghost story where Mary was commenting on her own experiences rather than designing a manifesto for the future, it became the cornerstone of a new genre called "Science Fiction". In the novel she employs the concept of science gone mad as well as a crossover theme of science versus nature. To say, it is the story of a scientist named Victor Frankenstein who is one of the representative figures of modern scientists who created monster due to his excess focus in the quest of scientific knowledge but at last he lost the control over his own creation. He was over curious to learn the hidden law of nature due to his fervent love for science. In the novel he seeks to create something that will address the flaws of the world, and in doing so makes those flaws even more difficult to overcome. It can be said that through him Mary presented a critique of the world so much influenced with science, a world which do not even bother about the consequences of their aimless desires. It can clearly be stated that Frankenstein is in a way Mary's question to the thoughtless development of modern science. Through my paper I will be discussing that though the result of Victor's quest symbolized everything that seems bad or frightening about science but a closer look at the story shows that it was the not mad technological monster that was responsible for the upheaval but it was Victor. In other words, it is not the lifeless technology that is responsible for its adverse side but it is its very own creator who is responsible for it.*

Keywords- Science Fiction, Gothic, Frankenstein, Alchemy.

I. INTRODUCTION

Frankenstein written by Mary Shelley tells the tale of a man obsessed with creating life, but then abandoning that life once it breathes. During the times when the novel was written even the thought of raising the dead would have made the average reader wince in disbelief and terror. So, one could very well visualize the horror that Shelley created on the faces of her readers. It can be said that scenes like Victor wandering the streets of Ingolstadt or the Orkney Islands after dark on a search for body parts were purposefully designed to evoke from the reader a feeling of dread for the characters involved in the story. And this purpose was fully achieved by Shelley as her very friend Lord Byron ran screaming from the room when he heard Frankenstein's story for the first time.

It can be said that Frankenstein is Mary's question to the thoughtless development of modern science. The whole novel is about scientific ambition of the protagonist. It is said that one of the most important quest of scientific aspect is the quest of new

kind of creation. But it is seen that most of the scientists are unknown about how their invention will be resulted at last. They are thoughtless about the further coming danger and destructions of science. Victor Frankenstein the main protagonist of Shelley's Frankenstein is one of the representative figure of modern scientists who created monster due to his excess focus in the quest of scientific knowledge but at last he lost the control over his own creation. Rather the text shows Victor Frankenstein is compelled to lose his own family members and his own creation became the very cause of his own destruction. In other words, in the novel his quest for absolute knowledge and power has ended in his own destruction. Text shows that he was over curious to learn the hidden law of nature due to his fervent love for science, and this very curiosity shapes his course of action in the novel.

II. ORIGIN of SCIENCE FICTION

Brian Aldiss, himself a writer of science fiction, amongst others identified Frankenstein as 'the Origin of the Species' of science fiction. Victor's education as a man of science, and his subsequent experiment with the creature, demonstrates how the novel establishes distinct kinds of experimental investigation into the meaning of life. In its representation of the creature's creation through the reanimation of disparate dead body parts, the novel is clearly about science.

Moreover, in the first chapter of his own narration, Victor Frankenstein regards his engagement with science as the 'genius that has regulated his fate'. (the term used in the eighteenth century to describe both the physical sciences such as chemistry and physics and also the life sciences, biology and zoology)

III. INFLUENCE of ALCHEMY in VICTOR'S LIFE

From his very childhood Victor was enamored by alchemy. But as time passes he leaves alchemy to take up enlightenment science- chemistry and anatomy especially. As one traces this move, one can clearly see the history of the scientific revolution, and the Enlightenment, being played out in miniature.

It can be seen with her powerful pen Shelley captures the whole story of how Victor moved forward towards his own doom. On a rainy day setting on the shores of Lake Geneva, in France, he idly picks up a book- a 'volume of the works of

Cornelius Agrippa', a German alchemist of the sixteenth century. Agrippa's books were out of print during those times because of the nothingness that they contained. But Victor found the book interesting. He himself said that his engagement with Agrippa brought a new light upon his mind. Many a times he was told by his instructor as well as his father that Agrippa's work nothing but sad trash but according to Victor Agrippa's views had been 'exploded' as chimerical, which is to say, fanciful and inaccurate. Instead he feels that they had been replaced by the 'real and practical' knowledge of 'a modern system of science'. Nonetheless, Victor remarks that Agrippa warmed his imagination and perhaps says, the train of my ideas...received the fatal impulse that led to his ruin (Shelley, 24). Disobeying his father, Victor continued to read avidly in the works of alchemists when he returned home to Geneva, adding the works of Paracelsus and Albertus Magnus to those of Agrippa.

Later in the novel Victor declares that he has become a 'disciple' of Albertus Magnus, a Dominican friar and master of alchemy. Like Albertus, Victor soon entered with the greatest diligence into the search of philosopher's stone and the elixir of life. Afterwards his focus shifted to finding a cure for all diseases, to say banishing diseases from the human frame and to render man invulnerable to any but a violent death.

His ambitions become inflated when he leaves home for university, where he becomes enamored of the grandiose dreams of Renaissance magicians like Paracelsus and Cornelius Agrippa. One of his teachers dismisses this fascination with frank contempt, but another points out that modern scientists are beginning to achieve results even more marvelous than those which the optimists and charlatans of earlier eras had claimed. Victor then makes his crucial intellectual move, turning his attention to science -- specifically to the science of electricity the 'vital fluid' whose implications in the mechanics of muscular movement had recently been demonstrated -- as a possible means to achieving an unprecedented victory over the greatest of all tyrants: death.

IV. VICTOR'S TURN to MODERN SCIENCE

Further, the text shows that in spite of innumerable attempts Victor was neither able to raise ghosts and devils nor was he able to find the philosopher's stone and it was then that he became disillusioned with alchemy. And now it was the new science- or the 'science of natural philosophy' that caught his attention. Firstly, he was fascinated by the demonstration of the vacuum by use of an air pump (an experiment which proved that air was matter) and secondly the vivid lesson accorded by the

effects of lightening on a tree outside the family house in Belrive. Further his discovery of electricity was the last stroke which completed the overthrow of Cornelius Agrippa, Albertus Magnus, and Paracelsus.

Waldman, Victor's teacher, was an important figure in Victor's science. He is an unusual 'man of science', a generalist in a period of increasing specialization, an historian of science in a period consumed by a desire for the new and the innovative.

Under Waldman's influence, Victor becomes a model student, applying himself with avidity to his studies, improving rapidly. He realized his caliber as he says,

my ardour was indeed the astonishment of the students; and my proficiency, that of the masters (Shelley, 33) .

Though Victor shifted his focus towards science but a close reading shows that Victor has not abandoned alchemy or magic, but has supplemented it. In other words, the 'elixir of life' is not forgotten, but is now pursued by another route, that of modern scientific chemistry and physiology. His studies, he comments, take him beyond the limits of agreed knowledge, and this thirst for discovery lures him on. Indeed, it is at this stage, 'animated by an almost supernatural enthusiasm', that Victor's enquiry takes on a new dimension. His enquiry now expands to tackle the 'bold' question: 'Whence...did the principle of life proceed?' (Shelley, 33), which he begins to approach through the 'science of anatomy'. He was told that to examine the causes of life, one must first have recourse to death.

Further, the text shows that in pursuing the origins of life amongst the manifestations of death, Victor has recourse to graveyards and charnel houses (repositories of bones). We may picture him as the grave-robbing anatomist, fearlessly fossicking amongst recently putrefying corpses of the recently buried (Ellis, 150). In this way, Victor seems to be turning away from enlightenment science, which valued the kinds of open and public knowledge. His experiment was undertaken at night, out of sight and in secret. But although Victor walks on the dark side of science, he himself continues to experience enlightenment.

Armed with the 'astonishing...power' of 'bestowing animation' or life, Victor sets about 'the creation of a human being', the accomplishment of which would be the sublime expression of his sublime mastery. 'my imagination was too much exalted by my first success to permit me to doubt of my ability to give life to an animal as complex and wonderful as man (Shelley, 35).

These words of Victor clearly show the curiosity and the

sense of enlightenment that Victor was experiencing.

Undoubtedly, in his urge for searching the impossible, he neglects the passing of time and seasons, and even forgets his precious family. Moreover, while completing his experiments in resurrection he becomes withdrawn as well as intellectually isolated. And ultimately this process reaches a frightful climax when the work is finally complete. An eight foot tall patchwork man which he has made has only to open a cold eye for Victor to be suddenly overcome by repulsion at what he has done. He says:

How can I describe my emotions at this catastrophe, or how delineate the wretch whom with such infinite pains and care I had endeavored to form? His limbs were in proportion, and I had selected his features as beautiful. Beautiful! Great God! His yellow skin scarcely covered the work of muscles and arteries beneath; his hair was of a lustrous black, and flowing; his teeth of a pearly whiteness; but these luxuriances only formed a more horrid contrast with his watery eyes, that seemed almost of the same colour as the dun-white sockets in which they were set, his shrivelled complexion and straight black lips (Shelley, 38).

And so, repelled by the mere appearance, the inevitable imperfection, of his work, Frankenstein rejects the creature utterly. On the other hand, the creature was completely unaware about his creator as well as about the world in which he was born. Unable to understand the catastrophe he goes away. Further, the text shows that when the monster departs in confusion, Victor gladly reverts to type, renewing his relationships with his friend and his family whom he had earlier rejected. Where he deserted his very own creation, the one whom he had given life, the one who is wandering all alone in confusion his own family support and helps him to recover. But no one thinks about the helpless creature.

V. THE STRUGGLE of the REJECTED ONE

We see that *the creature is bitter and dejected after being turned away from human civilization, much the same way that Adam in Paradise Lost was turned out of the Garden of Eden. One difference, though, makes the monster a sympathetic character, especially to contemporary readers is that in the biblical story, Adam causes his own fate by sinning. But here his creator, Victor, however, causes the creature's hideous existence, and it is this grotesqueness that leads to the creature's being spurned. Only after he is repeatedly rejected does the creature becomes violent and decides to seek revenge* (Mellor,106).

The novel shows that in the creature's earliest days of life, he struggles with the concept of humanity and what it is to be

human. His new and unexplained existence places him in an introspective and indefinite state of inquisitiveness. As he explains to Frankenstein in their first meeting,

I admired virtue and good feelings and loved the gentle manners and amiable qualities of my cottagers, but I was shut out from intercourse with them, except through means which I obtained by stealth, when I was unseen and unknown, and which rather increased than satisfied the desire I had of becoming one among my fellows (Shelley,93).

It can be said that he is imbued with conflicting desires. He idealizes the emotions and interactions of the cottagers, yet is unsure of his place among them. He very cleverly utilizes his observations of the cottagers to create his own ideals of humanity. The readers can clearly notice that at this point in the novel, the creature still reflects a kind of kinship with those he is observing. It would seem that the creature views other people as closer to God, not simply because of his own isolation, but because he witnesses their apparent ability to function in a world of God. His desire to be accepted and assimilated is apparent when he speaks further of his feelings towards the cottagers. He says,

The more I saw of them, the greater became my desire to claim their protection and kindness; my heart yearned to be known and loved by these amiable creatures; to see their sweet looks directed towards me with affection was the utmost limit of my ambition (Shelley,102).

The creature reflects in these words a sense of simplistic desire, uncorrupted as yet by the malevolent and reactionary forces that will later come to shape his existence. His desire to be a part of the cottagers' lives, to have them accept him and even love him, illustrates a tangible connection felt between the creature and the rest of humanity. The creature goes on to say *I required kindness and sympathy; but I did not believe myself utterly unworthy of it* (Shelley,102). It can be said that throughout *Frankenstein*, knowledge of the existence of a creator has a crippling effect on the creature as he struggles to reconcile his own perception of himself with his maddening desire for divine approval and acceptance. The creature believes himself capable and even worthy of both emotional and psychological reciprocation and, by extension, capable of existing in harmony with the rest of humankind.

Besides his hideous appearance the creature was completely humble and he tried his best to be polite and kind with others. In

an attempt to further his capacity for human interaction and thereby define his place in society, the creature educates himself on morals and vices. He says,

I read of men concerned in public affairs, governing or massacring their species. I felt the greatest ardor for virtue rise within me, and abhorrence for vice, as far as I understood the signification of those terms, relative as they were, as I applied them, to pleasure and pain alone (Shelley, 100).

The creature develops his own sense of morality without the influence of religion or the creator mythology. His standards are human and reactionary, based solely on the senses of "pleasure and pain", yet they are crucial and significant to his development. As he wrestles with ideas of right and wrong, good and evil, he comes closer to sating his desire for acceptance and integration into society. Of the cottagers, the creature goes on to say,

Such was the history of my beloved cottagers. It impressed me deeply. I learned, from the views of social life which it developed, to admire their virtues and to deprecate the vices of mankind (Shelley,98).

This passage signifies one of the few positive influences of humankind on the creature. Through their unknowing example, the cottagers serve the creature as teachers, imparting a sense of morality and virtuous behavior through simple human interaction.

It is evident from these examples from *Frankenstein* that the creature is capable of learning moral and virtuous behavior without the influence of spiritual or divine proclamation. The presence of a bible or other religious scripture is conspicuously absent from his education, yet he is capable of developing a thoroughly structured sense of morality and ethics. His "*ardor for virtue*" and "*abhorrence for vice*" is a basis for strong intellectual development, as well as being instrumental in positive human relations, the end goal of the creature's self-education.

The sudden and drastic change in the creature arises with the discovery of Frankenstein's journal. Upon learning of his "creator" and the foul circumstances surrounding his creation, the creature proclaims,

Everything is related in them which bears reference to my accursed origin; the whole detail of that series of

disgusting circumstances which produced it is set in view; the minutest description of my odious and loathsome person is given, in language which painted your own horrors and rendered mine indelible. I sickened as I read. 'Hateful day when I received life (Shelley,101)!

This is a strong departure from the hopeful and optimistic creature that arose earlier in the text. When confronted with the sordid details of his own creation, as well as the flatly horrific comments of Frankenstein, the creature regresses quickly into a negative and self-deprecating appraisal of himself.

From this moment forth, the creature abandons his sense of morality that was so carefully developed over time and becomes fixated instead upon the beliefs of his creator. In other words, when the "Frankenstein monster" realizes how he came to be and is rejected by mankind, he seeks revenge on his creator's family to avenge his own sorrow.

To summarize, he was rejected by his creator at the moment of his first awakening, and was subsequently reviled by everyone who caught sight of him; even his desperate attempt to make a home with a blind man had inevitably come to nothing. It was, he claims, the madness born of this rejection which led him to kidnap a child, and the revelation that the child was the brother of his creator that drove him to murderous frenzy. In consequence of all this the monster demands that a companion be made for him, given that he is too repulsive to be accepted into the community of men.

VI. CREATURE'S DEMAND FOR A COMPANION AND ITS CONSEQUENCES

Victor initially agrees to this request, and sets out to accomplish it on a remote islet in the Orkneys, but he is no longer insulated by obsession, and becomes terrified of the thought that he is giving birth to an entire race of monsters whose co-existence with mankind will be -- to say the least -- problematic. This prospect causes him to abandon the work, and no immediate repercussions ensue. In time, though, the monster sets out to exact his revenge, not upon Victor himself, but upon his friends and loved ones. He does not even spare Elizabeth whom Victor married. Instead, he kills her on her wedding night. And once again we see Victor isolated from the rest of humankind.

Undoubtedly we can say that Victor is responsible for his own behavior, and ultimately for the deaths of those he loves. His struggle is not with his Creator, but with his own ego. Out of

this first assumption comes the primary theme of the novel that is *with knowledge comes personal responsibility; the denial of responsibility leads to tragic outcomes* (Nocks,138). If Victor would have taken care of his responsibility and would not have judged the creature by his hideous appearance than the circumstances would have been different. He should have accepted his creation and should have abandoned it. This shows it was not our mad technological monsters that made the world the way it is and murdered so many of the things which we ought to hold dear; it was us.

The creature's obsession is fully realized in the last chapter of Frankenstein. Upon the death of Frankenstein, the creature exclaims, *That is also my victim! In his murder my crimes are consummated; the miserable series of my being is wound to its close* (Shelley,176)! In this statement, the creature expresses his final release from the cycle of death and revenge that had dominated his pursuit of Frankenstein. In the eyes of the creature, the creator is truly dead and only with the death of the creator is the creature free to once again determine his own fate. Even in choosing death for himself, an end left open to the reader's own discretion, the creature has finally realized a freedom from uncontrollable forces and his ability to decide his own destiny without the limitations of unattainable spiritual dogma.

VII. CONCLUSION

Victor's story is essentially that of a man who once had 'everything' but lost what he had through desiring even more. The 'everything' which he had includes material goods, but its most precious aspects are friendships and love, embodied in his relationships with Henry Clerval and his cousin Elizabeth. But unsatisfied with this 'everything' he had he goes on to take on the role of God. He decides to give life to a creature. And thus he was rightly punished for daring to usurp the divine prerogative of creation. A closely-related interpretation regards Victor Frankenstein as an archetypal example of a man destroyed by his own creation.

In a way it can be said that it is the story of a scientist who seeks to create something that will address the flaws of the world, and in doing so makes those flaws even more difficult to overcome. Such acts of creation are most obviously pursued by scientists but this desire to remake the world over in our own image exists in each one of us. This is the fundamental appeal of science fiction: As a genre it argues that we are each capable of creating the world anew. We are each capable of planting a new Eden and rewriting the history of humanity. And the fundamental moral of science fiction is that if we were actually to do so, that

brave new world would be as frightening and as hostile to any truly humanistic impulse as was Huxley's world or the world depicted in Brazil. We have not in fact progressed very far if at all, and if we attempt to create a new world it will simply replicate and possibly exaggerate the flaws of past worlds rather than ameliorate them. Which is not to say that within specific works of science fiction characters do not come to a realization of the limits of human endeavor. And similar was the case of Victor Frankenstein. In his childhood aspirations he unconsciously made the mistake of going beyond the scope of human endeavors and thus gave a call to his own doom.

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Effect of tooth deformation on contact ratio and tooth stresses in plastic spur gears

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Abstract—This paper deals with the effect of deformation on contact ratio and stress behaviour of plastic spur gear. It is shown that when one tooth of gear comes into contact with pinion tooth it gets some amount of deformation and due to this deformation, the behavior of second tooth coming in contact changes affecting the contact ratio. The contact ratio in actual practice differs from the theoretical results. For getting deformation and stresses on gear tooth, FEA is done. Results obtained indicate that in actual practice contact ratio is higher as compared to the theoretical results in case of plastic gears.

I. INTRODUCTION

Plastic gears are widely used now in many applications like electronic power steering, robots. It needs to understand the behavior of plastic gears as it is significantly different than metal gears. As modulus of elasticity of plastic gears are much less compared to metal gears, their behavior is different. Because of the low elasticity the amount of deformation in plastic gears are much higher than metal gears. In metal gears, the deformation is very less. We can say it is negligible in metal gears, while in case of plastic gears the deformations are high. As the gear tooth in contact deforms, it will affect the behavior of the next tooth coming into contact.

In the proposed work, one initial position of gear is taken as the case 1, and then rotation of some degree is given in each case and the deformation on first tooth which is in contact and stresses on second tooth is obtained. Contact ratio is calculated for the cases which is theoretical contact ratio. After finishing, new cases are taken in which deformation on first tooth is taken into consideration for finding contact points on second tooth and then again the stresses are obtained. The stresses obtained by both method, one without taking into consideration the effect of deformation and second by taking into consideration the effect of deformation, were compared.

1.1. Theoretical and actual contact ratio

The figure given below shows the path of contact while gear rotation. The line passing through A and A' is line of action which is cutting the addendum of gear and addendum of pinion at A' and A respectively. This distance AA' is the distance through which the tooth remains in contact. In other words when the contact between the tooth of pinion and gear starts at the point when the addendum of gear crosses the line of action which is point A' and the contact ends at the point when the addendum of pinion crosses the line of action which is point A. So we can say that AA' is length of contact.

1.2. Deformation in gear tooth

When the gears are rotating they are transmitting power and forces like tangential, normal, radial, acts upon its tooth. Due to these forces gears deform at the point of contact. However in most of the cases this deformation is very minor and within elastic limit, but it affects the behavior of the gear tooth. In the figure both, the original and deformed profile of a tooth is shown. The circle indicates the deformation in tooth 1 due to loading. This deformation causes the next tooth, tooth 2 to come into contact earlier. That means if the deformation is not considered the length of action would be AA but if we consider the deformation, the length of action is changed compared to AA because the tooth 2 comes in contact with corresponding pinion tooth before the point A.

In this way the length of action is affected by the deformation in tooth. The deformation in tooth depends on the load acting on it, but the main criterion effecting the deformation is material properties. The material with lower modulus of elasticity will naturally deform more compared to material having higher modulus of elasticity.

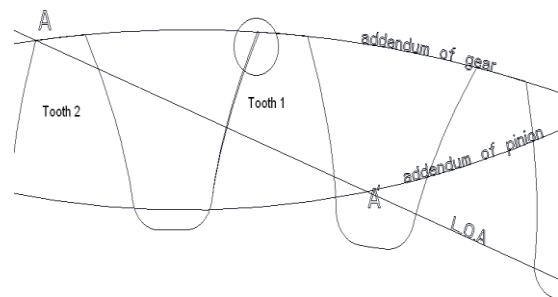


Fig.1.: Tooth deformation

2. FEA OF PLASTIC SPUR GEAR WITH AND WITHOUT EFFECT OF DEFORMATION

2.1 Material properties and dimensions of the gear

Material considered is Sustamid 66 which has following properties,

E (Modulus of Elasticity) : 3200 Mpa
V (poisson's ratio) :0.35

Dimensions of gear

pressure angle	20°
Module m	6 mm
Addendum a	5 mm
Dedendum d	6.5 mm
Zg	44
N	500 rpm

2.2 Contact points

As per the dimensions of gear a 2d sketch is prepared according the geometry of gear. The involute was sketched by the usual method. The gear profile was put in position where the first tooth contact begins. It is as given in figure.

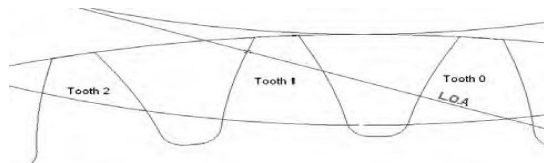


Fig.2.:Contact points

The line of action crossing the tooth profile gives contact point at the particular position. In figure that is shown by a marked point on tooth 1. Here two teeth are in contact tooth 0 and tooth 1, it was assumed that gear starts rotating from this position. After getting the point the co ordinates of the point were found, this point was taken as first point of contact. For all 2d sketching, sketcher module of Pro - E was used.

2.3 Calculation of transmitted load

While gear when a single pair of teeth is engaged, this pair transmits the full load or the full load is then applied on the one meshing tooth only. When double pair of teeth are engaged, the transmitted load will be divided between two meshing teeth:

Torque transmited $T = P / \omega$

.....(1)

The normal load applied on meshing teeth can be found as following:

$$F = T / r_b, \text{ Where } r_b = r \cdot \cos \phi$$

.....(2)

The stress analysis problem in this study is assumed as a plane elastic problem, since the applied transmitted load is assumed to be distributed uniformly across the width of the meshing tooth.

Therefore the load had been depended per unit width of tooth as following:

$$F_n = F / b \quad \text{.....(3)}$$

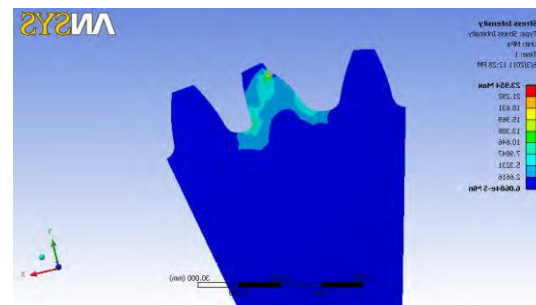
The component (F_x) and (F_y) will be

$$F_x = F_n \cdot \cos \phi$$

$$F_y = F_n \cdot \sin \phi$$

2.4 Finite Element Analysis

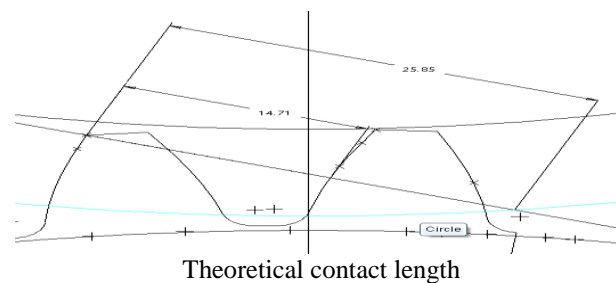
Analysis of each case was carried out in ANSYS by applying appropriate boundary conditions, loads and then solving it. The model was eliminated from whole gear to the three tooth gear to reduce calculation time. Mesh Refinement was given at the needed areas . The calculated load was applied on the contact line and results were obtained.



Results in ANSYS

In the same manner the contact points and stresses on tooth 2, taking into account the deformation on tooth 1 are obtained.

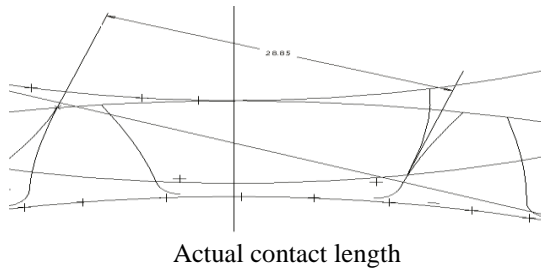
3. CONTACT RATIO CALCULATIONS



Theoretical contact length

The Figure above shows the length of path of contact when deformation is not considered. And the

Figure below shows the length of path of contact in actual action.



From both the cases contact ratios are calculated which are 1.7508 and 1.9532 respectively

4. RESULTS AND DISCUSSION

The stresses are obtained for both cases, one without the effect of deformation and second with the effect of deformation. For both the cases stresses induced in the tooth 2 were different. This difference was because of different contact points and different loading. The contact ratio with effect of deformation is .9532 which is higher than the theoretical one which is 1.7508. This difference in contact ratio is because of the increased time of contact resulting from the deformation. These results show the actual contact ratio and tresses are different than the theoretical ones.

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The role of technology in transforming the communication- a study of mobile banking technology

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Abstract— In this competent business world today the massive presence of mobile devices and the wireless technology have given room to tremendous business opportunities that are based on wireless infrastructure. Such opportunities are available in the form of timeless communications, business transactions, trading and more. The Mobile banking is a medium through which the customer communicates with a bank using a mobile device like mobile phone. Since there is no restriction of time, space hence the convenience of banking anytime anywhere is providing the concept of mobile banking a huge potential. The flexibility and ease of use, decreasing costs and ever increasing computational power is proving to be a highly fertile soil for the mobile devices to prosper, flourish, capture and sustain in the market. The adoption of such new technologies is based on many factors that influence ways of communication, trust and satisfaction of customers. This paper identifies the various factors influencing intention of customer to adopt mobile banking. The way communication has been transformed by this technology is evident however factors concerning cyber presence and security are big issues that need to be identified and tackled with care. The paper identifies security concerns and their impact on adoption of mobile banking.

Index Terms—Mobile banking, Customer adoption, Financial institutions

I. INTRODUCTION

Mobile and other communication devices are fast becoming enablers for organizations to perform business more effectively and efficiently. One of the most efficient applications is mobile banking (m-banking). The impact of technology has affected all aspects of individual and business life. There is increasing use of technology in businesses to achieve more efficiency, accuracy, collaboration and communication. Banking facility is not limited to physical premises these days. Mobile banking Technology has given wings to the banking services where a customer is free to access his account and related services anywhere using mobile and Internet services. The service industry is benefitted the most by this innovative technology. But is it really a boon to our society or are there any hidden issues that have not been visible and addressed yet. The issues concerning security and privacy, resistance by customers, extent of comfort,

confidence and convenience etc.

OBJECTIVE

- To study the factors influencing intention of customer to adopt mobile banking
- To identify the security concerns and their impact on adoption of mobile banking.

METHODOLOGY

The research for the above mentioned objectives is facilitated by undergoing literature review and identifying the major factors that have large impact on individual intention of adoption of mobile computing.

The mobile banking has become an affordable and very user friendly technology. It enhances communication amongst the users along with giving an extra edge to the mobile providers and the credit companies to be in direct touch with the customer. The SMS services keep the customers updated about the status of their transactions and account balances. Along with that there are applications provided by many credit companies to help the customer evaluate loan facility they can avail from respective banks or credit companies. These applications enable customer to keep track of their required need and estimate of what they need and their current earnings and balance in their accounts. Hence they are in a better position to assess whether or not they are eligible for a particular loan or not.

Similarly there are massive number of applications offered by several banks and financial institutions easing out the lives of the people by providing convenient, fast and accurate services.

Hence when a user had to decide on adopting a mobile banking perceived as a new technology, an advanced way of doing business the perceptions that affect in adoption pattern are as discussed.

1. Perception on type of user

Suoranta, M. and Mattila, M. (2004) gave out the communication source, user's age and user's household income as an indicators of the typical characteristics of potential adopters of mobile banking. The most user's of mobile phone and smartphones are between the age of 16-28. As per the level of income and social status of person grows the use of mobile devices increases with growing inclination

towards phones latest technologies these days smartphones .

2. Perception on type of media

The social media has been a booster for this upcoming and promising technology by opening several avenues to be able to connect with the current and prospective customers and share with them their offerings. It also provides the platform to address the concerns and challenges faced by today's customers. The mobile computing has given opportunity to the companies today to project their new image in the eyes of the customer. It is an instant two way communication between the customer and the financial service company. The regular communication with the customer through SMS based services help them promote their new offerings, informing the customer about latest updations and also having the opportunity to make new customers.

3. Perception on Cost and benefits

The mobile banking provides cost advantage to user in transaction costs, processing charges and transfer fees as compared to traditional banking. Furthermore there is time saving on call centers as well. Large number of providers of mobile banking provide the facility to reset the password through their mobile phone by answering the pre formatted questions (like debit card number and PIN) hence eliminating the need to be on call with call center executives for long time and wastage of time waiting to get the line free or getting exact service a person is looking for.

The mobile banking provides easy and convenient form of banking. Banks get big benefits by mobile banking in terms of efficiency of the business, integration of processes and attaining competitive edge. So if they tap this new technology to retain customers by creating , maintaining good relations and providing better services it will benefit them significantly. Yu T.K. et al (2009)

Customers enjoy the convenience of paying for the goods and services, utility bills, mobile bills other then managing their bank accounts using mobile banking.

The communication has been transformed by this technology in a way where the benefiter is both the provider as well as the receiver. The customer now is not restricted to the limits of banks opening and

closing hours to access and use their money. After the ATM (Automated Teller Machines) which gave the advantage to bank ANYWHERE, mobile banking came up with the booster of banking ANYTIME. For regions having low proximity to traditional banks particularly the rural areas this technology has delivered significant savings. It is cheaper than money transfers done traditionally, convenience for those who are unable to go to the banks in open hours and relatively safe option for transferring the money. The market is flooded with the inexpensive mobile devices these days that provide the applications to use feature of mobile banking.

Mobile banking enables the financial institutions and banks to understand the needs of their customers accurately and build mutually beneficial relationships. They can market their offerings direct to the customer's needs. In other words mobile banking is alternative to putting companies brand into customer's pockets.

4. Perception on ease of use and satisfaction

Saleem, Z. et al (2011) found in their study that mobile banking is profitable option for the banks technologically to increase the customer satisfaction.

The success of mobile banking depends on ease of use of its features and legal framework for mobile banking. Carrying out transactions through mobile phones attracts customers due to its convenience. But concerning the security and privacy issues, the providers must foresee the threats arising out of mobile banking and ensure the providers are in the regulated area and not allowing the unregulated bodies. This will build customer confidence in the online payment system who can use this promising tool without any fear or hesitation. Weber R. H. (2010).

Brett King, the, consultant and the author of book "Bank 2.0" identified 7 trends that according to him will change retail forever. The 7 trends included the arrival of iPhone, applications and the "screen", the phone serving as a wallet, knowing the customer and building services framework as per customer's needs, the data present in more collaborative and integrated manner, banks giving more emphasis on brand, products, and customer advocacy rather than the social media platforms, more real time flexible

systems and peer-to-peer payments as strong need for consumers in 2012.

The study carried out by Yong-Ki Lee suggested the factors that influence a person to use mobile banking from the unified perspectives include view of general technology, technology-specific view, user own characteristics, and task-user characteristics of mobile banking.

5. Perception on technology and risk

In the study to identify factors influencing the intent to use mobile banking services in SMS banking, the highest deciding factor was the perceived risk rate. Taleghani, M et al (2011).

To minimize the lack of customer adoption risk, Kaduściwas et al(2011) proposed a collaboration model permitting the set up of a single technology standard for mobile payments based on integration of various types of providers like telecom, retailers, mobile device manufactures.

Sjursen, H.(2008) emphasizes on need of collaboration between the banks and the mobile providers that leads to increased functionality. The degree of repeat use of the mobile banking services can be increased or decreased by the aid of technological infrastructure and services setting. Hence the usefulness perceived by customer and their intention to use it varies depending upon technology levels that drive mobile banking. Chung, N. et al (2009)

6. Perception on system quality and information quality

System quality and information quality considerably affect customer's trust. The trust of the consumer plays a vital role in determining consumer satisfaction with mobile banking. So in order to satisfy the mobile banking customers, the mobile banking system quality and information quality must be provided. Sanayei, A. et al (2011)

With the advent of mobile banking the banks are under pressure to provide administrative efficiency besides quality efficiency. The technological aspect plays crucial role in adoption of mobile banking however there are other factors as well that need to be identified.

7. Perception on Customer service

Yu, T.K. and Fang, K. (2009) emphasized on good customer relations. Properly established Sound managed and maintained customer relations plays

important role in increasing benefits to the bank by offering organizational efficiency, good integration, and providing competitive advantage. In the study by G., R. and Ravindran, D. S. (2012) strong relationship was observed between perceived service quality, the satisfaction and the intentions to continue with mobile banking. The customer satisfaction was found to be realized through service quality. However the risks factor negatively affects the service quality and satisfaction.

The key drivers identified by Singh, S., et al (2010) that influence the user's intention of adopting mobile banking are

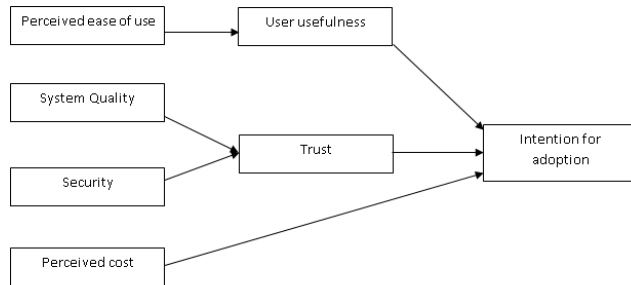
1. **Perceived usefulness**
2. **Perceived ease of use influencing intention, adoption and enhancing perceived usefulness**
3. **Subjective norms** - Perception of opinion of others (family, friends, authority figures)
4. **The higher self-efficacy** - People with self confidence
5. **The financial cost** - Lesser the cost higher is the intention of adoption
6. **Customers trust**
7. **Secured transactions** - Security includes many factors like confidentiality, authentication, and integrity.

8. CONCEPTUAL MODEL

The users of mobile commerce besides being the technology users also belong to the group of the social network. This social network consists of family, friends, reference groups and mentors. These groups have strong influence and recommend the services that are good thereby discouraging those that are not. When they decide to adopt any new technology the major factors under consideration are the perceptions, opinions and actions of an individual with respect to various dimensions of the product such as kind of service offered.

Hence adoption of mobile technology has factors that emanate from individual needs, criteria of usefulness, cost and benefits and perception about the associated risk and factors of security leading to building customer trust and satisfaction. Hence a conceptual model is proposed that can be further developed in light

more in depth research and impact of these factors on each other and cumulatively that result in shaping the intention of user for adoption of mobile computing.



CONCLUSION

Mobile banking is more than doing transactions. It is a tool of communication that has given a platform for the financial service providers to get connected to their customers, identify their needs and deliver accordingly. The communication is not limited to the companies only. The transformation of communication between the social groups has been also realized. The mobile banking offers customers an innovative technology providing services from entrainment, bill payments, planning holidays, calculating loans ranging from individual use to business use. However to develop future for this promising technology it is important to make an environment that builds and sustains customer trust in the banking services. It is important to understand major factors that affect the intention of adoption mobile banking. The satisfaction, service quality and technology play key role in building the trust in customers. Technology indicates the security issues including data security and consumer protection Weber and Darbellay (2010). Hence the mobile banking has a big potential in market and organizations can tap it by focusing on the key factors. The conceptual model proposed opens more scope for research in identifying the relationship among these factors and their

cumulative effect on the intention of adoption of mobile banking.

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Mushrooms as nutritive, biotransformer, ultimate biodegraders of agro-industrial wastes and a profitable industry

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Abstract— Mushroom are eukaryotic , spore bearing ,macrofungi, saprophytic with umbrella like fruiting body ,Both edible as well as poisonous species are well known. Edible fungi like Agaricus campestris, Agaricus bisporus and Pleurotus ostreatus are commercially cultivated all over the world .In India the main centres are at H.P(Solan),Punjab, Haryana and U.P.For mushroom cultivation technical training is a must ,which is freely given at research centres now-a-days. Cultivation requires spawns or seeds which are taken from commercial centres or from labs. in pure culture forms . These are then added to the pre- prepared compost mixture. Temperature as well as moisture plays a very important role as high temperature favors mycelial growth whereas the low temperature favors fruiting bodies (basidiocarp) formation. Mushrooms mainly consist of vitamin C,D, B6, B12 apart from minerals like calcium, iron, potassium, selenium. It is low in carbohydrates and fats with lots of medicinal properties. The bio-active constituents of mushroom show many pharmacological effects. It has antitumours, ,antiviral ,antifungal, antibacterial properties and also show hypocholesterolic and hypoglycemic effects. Mushrooms are good agents of biotransformers and biodegraders since it is seen that they can degrade wastes like straws of crops, stalks , leaves , jute, cotton and sugarcane trash due to their lignin as well as cellulose degrading activity. These are sustainable , technically feasible, environment friendly as well as commercially viable also compared to bacterial and others biodegraders. Protein rich straw left after the mushroom production is fed to cattle and the dung is used for biogas production and vermicomposting. So such integrated system is needed for profitable , sustainable and environment recycling of agro-industrial waste. Cultivation of mushroom is boon for farmers and can be a profitable industry as it provides maximum gains with minimum efforts..

Index Terms—Enter key words or phrases in alphabetical order, separated by commas. For a list of suggested keywords, send a blank e-mail to keywords@ieee.org or visit http://www.ieee.org/organizations/pubs/ani_prod/keywrd98.txt

I. INTRODUCTION

Mushrooms are macrofungi, with fleshy, subfleshy, leathery or soft, umbrella like fruiting body or sporocarp which bear the fertile spores. There are many types of mushrooms, it could be edible (wild as well as cultivated ones) like those of field mushroom (Agaricus campestris), horse mushroom

(Agaricus arvense), parasol mushroom (Lepiota procea), shaggy parasol (Lepiota rhacodes) , sticky bun (Boletus badius) ,shaggy mushroom (Agaricus augustus), oyster mushroom(Pleurotus ostreatus), Boletus, Morchella esculenta, etc whereas many of them are poisonous also eg. Fly agaric (Amanita muscaria), Amanita rubescens and Amanita excels, death cap (Amanita phalloides). Apart from these there are many mushrooms. toadstools, bracket fungi belonging to subdivision basidiomycotina and ascomycotina.

Agaricus (Psalliota) is the most common type of saprophytic mushroom and most of the other mushrooms also grow on dead decaying leaves, wood logs and similar surroundings, mainly in rainy season some are reported growing wildy from snowy mountains to sandy desserts on all types of soils, pastures ,forest land or litters, cropped or fellow land . Of these A.campestris , A.bisporus (European mushroom) , A.brunnescens (cultivated mushroom) and P.ostreatus (oyster mushroom) are common edible mushrooms which are commercially , as they are in demand for their nutritional value.

Cultivation

Although mushroom cultivation started as early as 17 th century by French horticulturists , but actual thriving industry came up in Paris in 1850. Till mid of 20th century it was gamble growing mushroom as most of time it failed to produce the sporocarps. This was mainly due lack of sterile conditions to produce the spawns (seeds) or requirement for growth, nutrition and reproduction.

In India, initially it was cultivated on large scale in Solan (HP) agricultural university. But now main mushroom cultivation and research centers are at Punjab university, Ludhiana, CS Azad University, Kanpur and National university, Lucknow. In Haryana, Ch. Charan singh university, Hissar, Mushroom cultivation and research center at Murthal and Sonipat are the main centers. Haryana is second in mushroom cultivation.

For cultivation following steps should be carefully followed with slight variation depending upon the type of mushroom:-

- Production of spawn (starter culture): seeds or spawn should be obtained free from any contamination from commercial centers or laboratories.

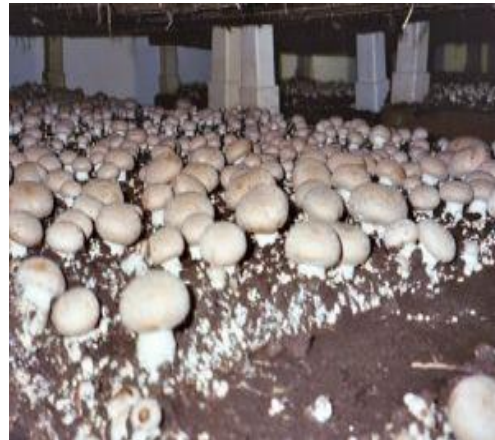
- Composting: horse dung, cow dung or manure are mixed with straws of wheat/rice/oat or sugarcane thrash and bagasse, jute and cotton stalk/leaves. Manure to wheat straw are mixed in a ratio 3/1 in case of *A. bisporus*. Heap of mixture is soaked in water and given



Starter culture



Composite mixture in beds



Young as well as fully mature basidiocarps (fruiting bodies) of *Agaricus campestris*.

3 to 4 turns at weekly intervals. To this, small amount of gypsum is added in 2 or 3 turnings. Time of composting may vary as per the cereal/straw used .

- Growing of fruiting bodies (sporocarps): for the fruiting bodies to come up, controlled temperature, aeration and humidity is required.

- The composite mixtures filled in beds or wooden trees. These are then left for pasteurization by slowly increasing the temperature upto 54 to 60o C and maintained for 24 to 48 hours or higher temperature for less time. This mixture is then ready for introduction to spawn (which is obtained from pure culture). After this the trays are kept at temperature of 23o C at 80 to 90% humidity for about 3 weeks. Cottony mycelial growth will start. Then the surface of the mixture is covered by thin layer of casing soil or vermiculite mixture at 13 to 14o C and 80 to 90% humidity. Since high temperature favors mycelia growth whereas low temperature favors fruiting body formation.

- Therefore , because of low temperature, fruiting bodies or basidiocarps begin to appear in 3 weeks time. This will continue then for 5 to 6 weeks. Although in case of *A. bisporus*, it can be grown at any time under the above mentioned conditions, but it best grown from October to February.

Nutritive value

Mushrooms show surprisingly high nutritive value. It consists of Ascorbic acid (vit C), Vit. D, Pyridoxin (B₆), Cobalamins(B₁₂), Riboflavin(B₂), Niacin(B₃), Pantothenic acid(B₅)(Manjunathan and Kaviyarasan, 2011) and minerals like calcium, iron, potassium, selenium and small amount of sodium, manganese and copper. These are also important source of biologically active compounds with potential additional medicinal value (Cheung 2010). Though, traditionally mushroom was used in China and Japan for medicinal purposes, but now it is common all over the world. Mushroom is considered as rich food because it contains protein, sugar, glycogen, lipids, vitamins, triterpenes etc. *Termitomyces globules* is rich in protein, calcium phosphorus and iron(Jonathan Gbolagade *et al* 2006), *Pleurotus tuberregium* shows high content of proteins and low in fat(Kuforiji *et al* 2003), *Volvariella esculenta* is rich source of Cu whereas *Termitomyces microcorpus* is rich in potassium(Fusich. I 1996, Ogundana and Fagade 1982 respectively). The importance of mushroom is as follows:-

- Since they are low in carbohydrates and fats with no starch, therefore these are helpful in lowering bad cholesterol and diabetes. It is good for patients with hypertension and diabetes.
- Low sodium in mushroom also helps to lower cholesterol. In place of cholesterol they possess ergosterol (Chadha and Sharma 1996)
- It is considered as low calorie food hence good for obese.
- Calcium provides free radical protection, which helps the body to absorb iron and assist formation of bones and clotting of blood.
- Bioactive secondary metabolites found in mushroom are phenolic compounds, sterols and triterpenes. These show many

pharmacological effects such as antitumor, antioxidants, antiviral, hypocholesterolemic, hypoglycemic effects. These also have antifungal and antiglycemic effects.(Cheug,2010)

Biotransformation and bio-degraders of agro-industrial waste

Biotransformation or bioconversion means which can convert organic waste into digestible food or energy. Mushrooms are good biological agents which can do this job. Initially it was thought that waste of crops like straws of cereals, stalks and leaves of cotton, jute, sugarcane trash and bagasse, coir waste and other industrial waste of these types require microbial degradation. Although some of these wastes are burned in fields and others are left at the sites of decomposition, causing environmental pollution. Number of systems are available for degradation of these wastes but none of them have reached at the commercial point. As any of such system should be technically feasible, sustainable, environmental friendly as well as commercially viable. For such mushroom cultivation meets almost all the requirements. Most agricultural residues are rich in lignin, cellulosic compounds whose handling and disposal are often problematic due to their chemical structure and their decomposition properties. Some mushrooms have unique oxidative system which together with ligninolytic enzymes is responsible for ligninocellulosic degradation e.g in *Phanerochaete chrysosporium* (Mehdi Dashtban *et al* 2009). These possess unique and extensive array of degrading activity which can degrade from grasses and straw to timber while other organisms are more potent to cellulolytic activity. Some of the different substrates and there degrading mushrooms are:

- Oyster mushroom grows on unfermented cereals and straws.

Pleurotus spp. Grow very well on the agrowastes and their residues.(Ranathan R. et al,1996)

- Button mushroom on composted straw.
- Shiitake and black ear mushroom on sawdust and wood log also helps in biodegradation of Oak (*Quercus alba*) wood (Christopher 2003.)

Agropeat (composted coir dust) is used as manure for horticulture crops as well as casein for button mushroom.

In India *A. bisporus* and *Pleurotus* spp. are popular and their production, if integrated with dairy will represent a unique system of ultimate utilization of agro wastes i.e. protein rich straw left after oyster mushroom production is fed to cattle and the dung is used for biogas production. Similarly spent compost left after button mushroom production can be utilized for biogas production and vermicomposting. Such integrated system with mushroom is needed for profitable, sustainable and environment recycling of agro industrial waste.

A profitable industry

Mushroom cultivation has become a profitable business with the product fetching good returns in the market because of their high demand for edible mushrooms particularly oyster mushroom owing to their nutritional benefits. They are in demand both in national and international markets especially from hotel industries.

Oyster business is most exciting as it yields high income, low investment and high profit. It is also a profitable hobby, with minimal capital investment and requires very less space to work. Sometimes small space as less as a shed, garden or even roof is sufficient enough to cultivate mushroom as small scale industry. Natural calamities such as snow, wind, loo, storm, high temperature etc. have no effect on mushroom cultivation. this is a easy business venture that virtually anyone can start without experience although cultivation of mushroom is not difficult but it requires little bit of technical skill for which basic training should be taken from expert horticultural departments or research centers. Most of the centers give free training to landless farmers, unemployed youth, and

housewives etc. who are interested in setting up their own small scale industry. They could also be benefited by seminars, field trainings, door to door visits etc. for compost making, casing, spawn making etc. They are guided for disease and contamination. Last but not the least cultivation of mushroom is boon for all and can be a profitable industry as it provides maximum gains with minimum efforts.

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Prevention is better than cure: Crucial role of media in awareness drive on concentrated solar power technology before dark ages rebegin

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Abstract—Advancement in media technology is one of the biggest achievements of Science. Both now share a symbiotic relationship, since scientific knowledge can no better be disseminated with media playing a significant role. As electricity is now an indispensable part of media technology, one should not forget that we have finite reserves of the non-renewable fossil fuels. Our present and future have enough reasons for finding renewable and clean energy sources, not just for the sake of our environment but for the fact that even when these sources are exhausted, we would still be energy dependent. [5][2]

The whole civilization bears the responsibility of researching and developing alternative sources to face the looming energy crisis. One of the most acclaimed alternatives to solve this problem and ensure large scale energy production is Concentrated Solar Power Technology (CSPT). This is simply based on the principle of a conventional thermal power plant in which super-heated steam is generated by concentrating solar energy.

The technology is still in its formative phases and ideas for increment in its efficiency of performance and economics according to the prevailing circumstances have to be brought out, shared and enriched. This cannot be achieved without extensive use of media. A number of websites and magazines are dedicated to CSP. A number of countries in the world have started working on projects based on CSPT.

The part which media needs to play includes a number of experiences in its domain. They are-

To acknowledge technological advancement of CSPT from the walls of laboratory to the fields.

To connect existing markets across the world to ensure success, appreciation, cooperation and development of technology.

To discuss the operational practices and strategies based upon on-ground experience.

To popularize the educational and professional scope of the technology.

To develop convincing and advertising methods for instilling adaptive spirit and confidence in general public about the technology.

The presented paper intends to throw light on all the above stated challenges in front of media and how it can fare through them successfully.

KEY WORDS- Concentrated Solar Thermal (CST), Concentrated Photovoltaics (CPV), Green buildings, National Solar Mission (NSM), e3 linkages

I. INTRODUCTION

The CSP technology is about concentrating the dispersed sunlight with the help of mirrors and reflectors to generate electricity. There are two main ways in which CSP can be harnessed. They are- CST (concentrated solar thermal) and CPV (concentrated photo voltaics).

Amidst the scenario which largely involves a boom in demand for sustainable energy sources, CSP is globally proven to be at the verge of huge scale deployment. The coming decade sees CSP as a major investment field. India also competes and stands by the world in promoting solar power. Indian government has announced Jawaharlal Nehru National Solar Mission (JNNSM) in 2009. The mission eyes a target of 20000 MW of solar power by 2022 and is being looked upon as the driving force to accelerate the implementation of CSP plans.[3]

Right from the conception of this idea and throughout the course of action towards its realization, media plays a crucial role.

II. MATERIAL AND METHOD

The very first attribute among the role of media involves dissemination of technology and its achievements from the laboratories to the commercial enterprises. This ensures compatibility between industrial objectives and the technological requirements. The media cell, equipped with its latest techniques and technologies, has to set up the stage for commercial units to frame the right material so that they can successfully coordinate with the research units and engineering departments. This involves the study of proposal, framing of the dissemination text, presentation and critical review of the same, all encased through printed publications or electronic machinery.

It's none but media which has provided a platform to the think tank to react holistically on

different aspects of energy, environment, climate change and vulnerability assessment and adaptation strategy.[4]

Amongst all segments of a country's population, youth plays the most vibrant and active role owing to its creativity, enthusiasm and acceptance towards modern changes. It becomes critical for the strategy of a nation to tap the constructive energy of the 'would be' decision makers of the society and orient it towards new power and energy technology. Various environment education programmes run by universities and institutes and other agencies are brought forward by media through workshops, training programmes, events, campaigns, websites etc. These contribute high upon awareness building and networking of masses for achieving the twin objective of nation building and personality development. [2]The educational field trips and group discussions conducted by enterprise development groups help in close peer interaction over environment concern in the student community. Film and television units may also screen documentaries, films and reports for bringing sensitization over energy saving and developing green buildings. The outreach activities including events, seminars, conferences and workshops are taken up by press to reach labs, institutes and educational concerns over CSPT.[6]

The communication among common people for sustainable development with CSP is fostered by addressing the world through summits and expression forums. This would facilitate a faster uptake of cleaner technology by shifting the focus to policies, their planning and regulation. [1]Media also propagates the investment related study on CSPT which is beneficial for utilities and enterprises at different levels. It not only studies, but also simplifies the complexity of link between environment and CSPT economic profile. This helps to develop the market of CSPT on one side, and develops the cost effective sustainable energy solution on the other side. Moreover, the reports of energy audits of the industries at plant level are brought forward by the media agencies. It also provides an opportunity of knowledge and experience sharing amongst CSPT stakeholders.[3]

Last but not the least, CSPT is an emerging technology. It has stepped into the world and crept into few nations only. To open flood gates for it to rush and establish it across the globe, media has to play central role. Not only can it bring its technological and economic benefits forward, it also throws light on the scope of development in CSPT.[5] Hence it gives way to the possible research opportunities and improves it further.

III RESULT AND DISCUSSION

The fact finally is well established that the brainchild of Science is now working positively to develop Science in a multi-dimensional domain.[4] In a nutshell it can be stated that the e3 linkage, i.e., energy-environment-economics of the present society in terms of both qualitative and quantitative aspects is done by media.

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Parthenium a greatest threaten transforming into a healer for certain diseases, drug producer and farmer's helper

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Abstract—Parthenium hysterophorus is a noxious weed in America, Asia and Australia with no economic importance revealed till last few decades. This weed is considered to be a cause of allergic respiratory problems, contact dermatitis, mutagenicity in humans and livestock. Crop production is drastically reduced because of its allelopathic nature. Certain pulses and cereals were not growing at their full because of the presence of parthenium growing near them. Also dominance of this weed threatens biodiversity which is effecting whole world. Eradication of Parthenium hysterophorus by burning, chemical herbicides, eucalyptus oil and biological control by leaf-feeding beetle, stem-galling moth, stem-boring weevil and fungi have been carried out with variable degrees of success. This eradication was necessary to avoid its harms as it is directly or indirectly affecting social health as well as economy of farmers by causing diseases and reducing crop production. But recently many innovative uses of this notorious plant have been discovered. It confers many health benefits, like remedy for skin inflammation, rheumatic pain, diarrhea, urinary tract infections, dysentery, malaria and neuralgia. Its prospect as nano-medicine is being carried out with some preliminary success so far. Removal of heavy metals and dye from the environment, eradication of aquatic weeds, additives in cattle manure for biogas production, as biopesticide, as green manure and compost are to name a few of some other potentials.

Index Terms—Parthenium, dermatitis, allelopathy, mutagenicity, biopesticide, neuralgia.

I. INTRODUCTION

Parthenium hysterophorus L. popularly known as "Congress grass", "Carrot weed", "Gajarghass" or "Parthenium has drawn much public attention and caused grave concern to administrative machinery of India in recent years. It is a poisonous, allergic, and aggressive weed belonging to Asteraceae(Compositae). This noxious herbaceous plant, a native of West Indies, North and South America, is suspected to have crept into India along with imported wheat from USA under PL-480 programme. (Public Law 480 passed in 1954 to give

food, grains to developing countries) sometimes in early 1950 (Tripathiet.al, 1991).

In general it grows through out the year but optimal temperature for its fast and peak growth ranges from 25-30 degrees celcius. In Haryana and North West India, it germinates mainly in the months of February-March, attains peak growth in June-July and produces seeds at maturity in September-October. This weed is not only threat to agriculture but is also known to cause hazards to human health and also toxic to the cattles. The chemical analysis of this weed indicates that all the parts, including trichomes and pollen contain toxins called 'sesquiterpine lactones', the major component of which the Parthenin and several other ferulic acids.

Keeping in mind its threaten to human beings(including farmers) and livestock it was felt necessary to find out how the congress grass(P. hysterophorus L) could be eradicated, its effects on germination of seeds and plants which grow in its vicinity and to unravel the beneficial aspects of this weed.

Co-relating the population of plants surrounding Partheniumhysterophorus L. species:

A survey of the different locations of Faridabad (Haryana) district was done for various locations as follow :

1.Bhadkal Lake Faridabad:

Total Area : 1 kanal (approx)

The co-relation of plants surrounding P.hysterophorus L. in Bhadkal lake are shown in table:

Table 1

s.no.	Name of plant	Botanical Name	No. of plants
1.	Parthenium hysterophorus	<i>Parthenium hysterophorus</i> L.	25
2.	Ashoka Tree	<i>Saraca indica</i>	8
3.	Ber	<i>Zizyphus jujuba</i>	3
4.	NeelaFulnu	<i>Ageratum conyzoides</i>	50
5.	Khair	<i>Acacia catechu</i>	25

6.	Teak	<i>Tectona grandis</i>	3
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Basal area or ground is covered with lawn grass.

2. Sector- 21 (Vacant Plot):-

Total Area : 100 sq.yards

The co- relation of plants surrounding *P. hystrophorus L* .in Sector -21 are shown in table:

S.no.	Name of plant	Botanical name	No. of plants
1.	Parthenium hystrophorus in vegetative stage	<i>Parthenium hystrophorus L.</i>	150
2.	Khair trees	<i>Acacia catechu</i>	5
3.	Argemone	<i>Argemone maxicana</i>	15
4.	Aak	<i>Calotropis procera</i>	6

Table 2

This was a swampy area in straight line on the road side.

Pulses and oil seeds observed using extract of Parthenium:-

The selected pulse and oil yielding seed like Udaddaal (*Phaseolusradiatus*) and mustard seeds (*Brassica compestris*) are allowed to germinate in petri dish to see the Observation is done after 24 hours.

Preparation of dried leaf extract

We collected the green leaves of *P. hystrophorus L.* species and dried them in an oven at 60 degrees temperature for 24 hours. After that we crushed the dried leaves, and then taken the weight of crushed leaves.

Requirement:

Weight of leaves / volume = 4 gm

Ethanol = 180 ml

Distilled water = 20 ml

ml ethanol and 20 ml of distilled water into the beaker. Leaves the material in the beaker for an hour. Then filter the material. The liquid left out in the beaker after filtering is known as leaf extract of *P. hystrophorus L.* The extract is ready for practical work. The results of dried leaf extract of *Phaseolusradiatus* and *Brassica compestris* are shown in table 3.

Preparation of wet leaf extract:

Now we will prepare wet leaf extract in the same way as we prepared for dried leaf extract. But in this case freshly plucked leaves from the *Parthenium* species and crushed them for the preparation of leaf extract.

Requirement:

Green leaves of *Parthenium* =4 gm

Ethanol =180 ml

Distilled water = 20 ml

Wet leaf extract is ready for work now. The results of wet leaf extract for *Phaseolus radiates* and *Brassica compestris* are shown in table 4

Dried seeds in (dry leaf extract):

No. of pulse seeds and oil seeds = 100 (in each Petri dish)

Example:

Phaseolusradiatus = 100

Brassica

compestris = 100

Water = 10 ml (in each petri dish)

Leaf extract is used in following percentage, 10% , 15% and 20%.

Procedure:

Take 4 gm of dried leaves of *Parthenium* species and crush them until they become powder. Put the powder into a beaker. Add 180

Concentration	Duration	<i>Phaseolus radiatus</i>	<i>Brassica campestris</i>
10%	After 24 hours	Breaking seed coat =5 Ungerminated =95	Nil
15%	After 24 hours	Breaking seed coat =3, Ungerminated=97	Nil
20%	After 24 hours	Breaking seed coat =2 Ungerminated =98	Nil



Table 3

This table shows that the leaves of *P. hysterophorus* L. inhibit the germination of seeds.

Dried seeds in (wet leaf extract):

No. of pulses and oil seeds =100 (in each petri dish)

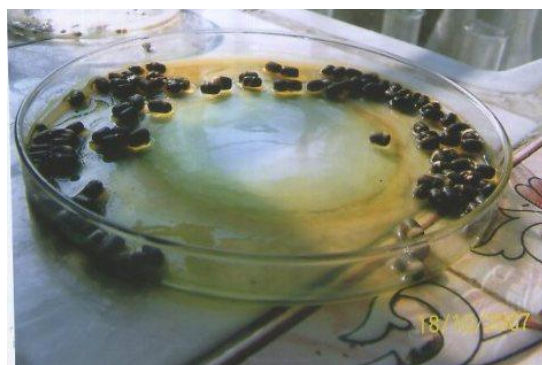
Example =
Phaseolus radiatus = 100

Brassica campestris
=100

Water =10 ml (in each petri dish)

Leaf extract is used in the following percentage, 10 %, 15 % and 20 %.

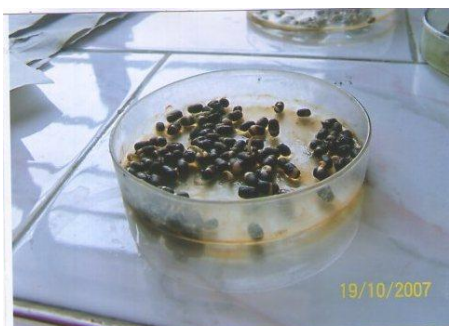
Wet leaf extract using upon dried seeds of *Phaseolus radiatus* in 15 % concentration after 24 hours.



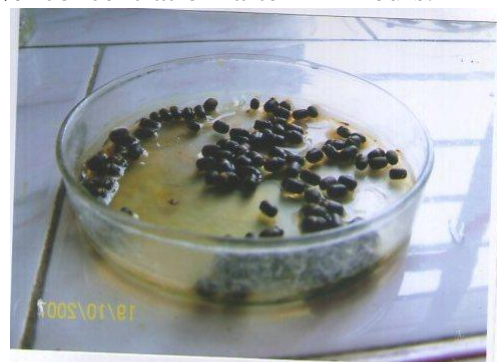
Wet leaf extract using upon dried seeds of *Phaseolus radiatus* in 20 % concentration after 24 hours.

Table

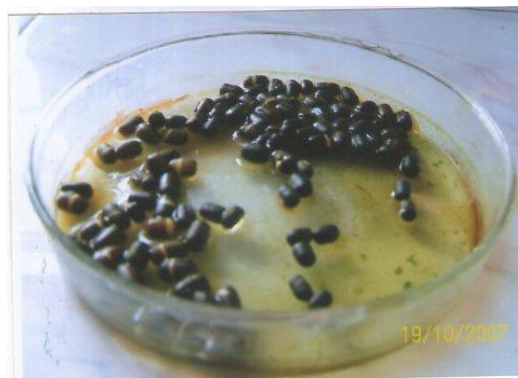
Concentration	Duration	<i>Phaseolus radiates</i>	<i>Brassica campestris</i>
10 %	24 hours	Radicle = 9 breaking, Seed coat =24 and Ungerminated seeds =67	Nil
15 %	24 hours	Radicle =7 breaking, Seed coat =21 and Ungerminated seeds =72	Nil
20 %	24 hours	Radicle 4 breaking, Seed coat =22 and Ungerminated seeds =74	Nil



Dried leaf extract using upon dried seeds of *Phaseolus radiatus* and *Brassica campestris* in 10 % concentration after 24 hours.



Dried leaf extract using upon dried seeds of *Phaseolus radiatus* and *Brassica campestris* in 15 % concentration after 24 hours.



Dried leaf extract using upon dried seeds of *Phaseolus radiates* and *Brassica compestrisin* 20 % concentration after 24 hours.

Health benefits of *P. hysterophorus*

The decoction of *P.hysterophorus* has been used in traditional medicine to treat fever, diarrhoea, neurologic disorders, urinary tract infections, dysentery, malaria and as emmenagogue (Surib-Fakim et al. 1996). Ethnobotanically, it is used by some tribes as remedy for inflammation, eczema, skin rashes, herpes, rheumatic pain, cold, heart trouble

and gynaecological ailments. *Parthenium hysterophorus* has been found to be pharmacologically active as analgesic in muscular rheumatism, therapeutic for neuralgia and as vermifuge (Maishi et al. 1998). This weed is also reported as promising remedy against hepatic amoebiasis. Parthenin, the major constituent of the plant, exhibits significant medicinal attributes including anticancer property (Venkataiah et al. 2003). The methanol extract of the flowers showed significant antitumour activity and parthenin exhibited cytotoxic properties against T cell leukaemia, HL-60 and Hela cancer cell lines (Das et al. 2007). Previously, Ramos et al. (2002) had established the antitumour potential of *P. hysterophorus* extracts in vitro and in vivo with

positive results in terms oftumour size reduction and overall survival of cell lines.

Aqueous extract of *P. hystrophorus* hashypoglycaemic activity against alloxan-induced diabetic rats (Patel et al. 2008). So, flower extract of this weed can be used for developing drug for diabetes mellitus.

Parashar et al. (2009) reported the synthesis of silver nanoparticles by reducing silver ions present in the aqueous solution of silver nitrate complex using the extract of *P. hystrophorus*. This discovery can promote this noxious plant into a valuable weed for nanotechnology-based industries in future. Applications of such eco-friendly nanoparticles in bactericidal, wound healing and other medical and electronic applications makes this method potentially exciting for the large-scale synthesis of other nanomaterials.

Role of *P. hystrophorus* in enhancement of crop productivity Allelopathy can be used to increase crop production at minimal expenses and to diminish the current reliance on synthetic agrochemicals that degrade the environmental quality. The allelochemicals can be exploited as herbicides, insecticides, nematicides, fungicides and growth regulator. Pesticidal potential has been established in terms of ovicidal and anti-feedant effects (Datta and Saxena 2001). The allelochemicals also provide defence against herbivorous predators.

Ki Kishor et al. (2010) prepared compost of *P. hystrophorus* in 14 weeks and assessed its manure value. Compost from this weed on application in soil enhanced its moisture level more than nitrogen, phosphorus and potassium (NPK) alone. Anaerobic digestion of parthenium dried solids biodegrades the plant growth and conserves the NPK content. This can be applied as organic manure (Gunaseelan 1998). Javaid (2008) used *P. hystrophorus* weed as green manure for maize and mung bean production. The highest root and shoot biomass in maize was obtained in 3% green manure treatment, which was significantly greater than that obtained in the control and equivalent to that obtained in the NPK fertilizer treatments.

The effect of *P. hystrophorus* green manure and EM (effective microorganisms), a biofertilizer, on wheat (*Triticum aestivum* L.) cultivation was studied. Highest root biomass was recorded in 3% green manure-amended treatment. Spike length,

number of grains per spike and grain yield gradually increased by increasing the quantity of green manure. There was 43–253% increase in grain yield over control due to various green manure treatments as compared with 96% increase due to NPK fertilizers over control (Javaid and Shah 2010). *Parthenium hystrophorus* being rich in N, P, K, Ca, Mg and chlorophyll content is ideally suited for composting. Ordinary *P. hystrophorus* compost cannot sufficiently reduce the allelopathic effects of high levels of parthenin and phenolics, which impede the early growth, development and dry matter yield of both monocot and dicot plants. For maximum exploitation of the nutrient contents of *P. hystrophorus*, without incurring the ill effects of phenolics, millipede *Harphaphe haydeniana*-mediated novel composting procedure was tried. This milli-compost (MC) was more effective than ordinary parthenium compost (OPC) (Apurva et al. 2010). So, if tapped properly, this weed can contribute to agronomic process.

P. hystrophorus as additive with cattle manure in biogas production

In the wake of oil crisis, energy generation from biowastes by anaerobic digestion has attracted immense attention. Energy crops are likely to be future sources of digester feed stocks for methane generation. *Parthenium hystrophorus* was mixed with cattle manure at a 10% level and allowed to digest anaerobically at room temperature in 3-l batch digesters. The chemical changes during the course of digestion and the effect of digested slurry (inoculum) on biogas production were investigated and significant increase in methane content was achieved. The methane content of the gas varied between 60 and 70% (Gunaseelan 1987). *Parthenium hystrophorus* should be seriously considered as a substrate for the production of biogas in India via anaerobic digestion, considering the abundance of this weed and large quantity of livestock.

P. hystrophorus for welfare of livestock

Parthenium hystrophorus can be used as a flea-repellent for dogs (Maishi et al. 1998). This weed is a valuable source of potash, oxalic acids and high-quality protein (HQP) which can be used in animal feed (Mane et al. 1986).

Discussion

Mechanical, chemical and biological control strategies have been proved futile individually to curb proliferation of *P.hysterophorus*. So, integrated approaches are warranted to restrict the invasion of this weed. To address this problem, public awareness has to be developed and participatory approach to control the invasive weeds should be adopted.

There is the need to encourage the research on the utilization potential of this weed and to evaluate its efficacy on field trials. The target of “control through utilization” can be achieved through joint efforts of researchers, farmers, governmental and non-governmental agencies. The discovery of the uses of this weed also could pave the way for indirect eradication of the weed. At present, although *P.hysterophorus* is considered a weed, its new uses are coming to the forefront. Nanomedicine, biopesticide, green manure potential, agent for bioremediation of toxic metals and dyes, herbicide, cheap substrate for enzyme production and source of biogas are some of the recently discovered implications of *P.hysterophorus*.

This weed is available in four continents in abundance. Their industrial processing costs are low and devoid of any environmental hazards. The increased utilization of *P. hysterophorus* biomass as energy source and raw materials is necessary in the long term, as fossil fuels are limited. Similarly, its use as manure and pesticide can be appreciated in the wake of the problems posed by chemicals. Isolation and chemical investigation of the compounds in *P. hysterophorus* are required to decipher their properties and predict their applications. In this regard, it is touted to become a boon for the human beings, animals and crops in near future.

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Impact of multimedia in education: A modern approach

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Abstract- Multimedia offers exciting possibilities for meeting the needs of 21st century learners. The sophistication of multimedia technologies now a days gives a great challenge to educators in order to continuously play significant roles in the borderless globalization of information era. This challenge should not be regarded as a threat but should be accepted as a great reward to education world, which is able to produce an amazing result if the tools are used correctly and wisely. Thus, the main purpose of this paper is to discuss the use of multimedia in teaching and learning process. The nature of multimedia interactions in distance education discussions has been approached from many different perspectives. This article attempts to synthesize approaches based on distance education theory, cognition research and multimedia development. As a result a composite framework for discussion of multimedia and multimodal interactions in distance education context is proposed, which is based on interactions between the instructor, students and content. This framework should be useful for establishing clearer relationships among the existing interaction literature, for classifying interactions in education instructional design, and as a basis for further research.

Keywords- Multimedia, video, Learning, education, Teaching, Technology, Memory.

I. INTRODUCTION

Educators continually search for more effective ways to engage their students during learning as well as to increase student learning outcomes. Various technologies have been touted as being able to provide the ultimate delivery mechanism to achieve these laudable goals.

However, while the technologies purporting to provide solutions are changing at an exponential pace, the true effect of these technologies on learning outcomes remains unclear. The multitude of student (individual) variables plus the myriad of content and situational variables interact with the delivery mechanisms in such a way as to confound the

applicability of many of the research results.

This paper provides an updated overview of research on the use of multimedia for educational purposes in order to highlight under-researched areas, and offers suggestions for future research projects that will help clarify the appropriate use of multimedia by educators. The paper begins with a review of what educators and researchers consider multimedia and its

importance to the learning process. It then provides a representative though not exhaustive review of research findings to date, and concludes with areas of additional research to guide educators wishing to utilize multimedia tools.

BACKGROUND

Humans receive data through multiple channels, i.e. media, including audio and visual channels as well as touch, taste and smell. Multimedia is most commonly defined as the use of at least two of these elements: sound (audio), and text, still graphics, and motion graphics (visual). To date, the majority of the educational research projects do not include the other media of touch, taste and smell. The importance of multiple channels for delivery of educational content can be found in the theory of multi-channel communication which confirms that when information is presented by more than one channel,

there will be addition reinforcement, resulting in greater retention and improved learning.

HOW PEOPLE PROCESS INFORMATION

Our ability to process information is a multi-step process that involves the perception, attention, selection, organization and integration of information. At the center of this process is long term memory. As the name implies, our long term memory

stores our accumulated knowledge. Our accumulated knowledge is organized into —chunks of information in what are known as schema. Schemas allow us to organize information in meaningful ways and help us integrate and organize new information. In short, our long term memory is where what we know is stored and where we integrate new information. If information does not find its way into long term memory, it is lost. Learning can be thought of as change in our long term memory.

The limitations of working memory:-

Before information can be integrated into long term memory it must be received and processed by our working memory. Working memory is very limited; it can only handle small amounts of information before it has to be integrated into our long term memory or lost. In his landmark article on this subject, George Miller suggested that we can only process about seven pieces of information at one time. And, we must do so quickly, as working memory can only keep information for about 20 seconds.

Brain Processing and Multimedia Learning:-

1. Effective multimedia recognizes that working memory has a limited capacity to process information.

2. Effective multimedia presentations take advantage of both the auditory and visual channels in working memory to deliver content. Using multiple channels increases the overall amount of information the brain can process.

3. Effective multimedia understands that text may be particularly challenging to process, with involvement from both the visual and auditory channels required.

4. Effective multimedia presentations recognize that long-term memory organizes information into meaningful chunks called schema. Presenting information in a way that makes use of existing organizing structures (schema) or that helps students organize the information can greatly assist the learner in incorporating information into Long Term memory.

Good multimedia instruction is driven by an understanding of how the brain processes

information. The most effective multimedia applications take advantage of this knowledge.

Why multimedia is more effective?:-

Words and pictures are better than words alone. Words include written and spoken text, and pictures include static graphic images, animation and video. That using both words and pictures is more effective than words alone should not be surprising in light of what we know about how the brain processes information. Research tells us that the use of both words and pictures lets the brain process more information in working memory.

Extending this basic principle, Mayer and his colleagues tell us that narration and video is much more effective than narration and text. Similarly, narration and video appear to be more effective than narration, video and text. Narration and text rely on the same channel to process information (Baddelley, 1999). It seems that text heavy multimedia presentations may be less effective than those that rely on narration.

Multimedia content should exclude extraneous and redundant information:-

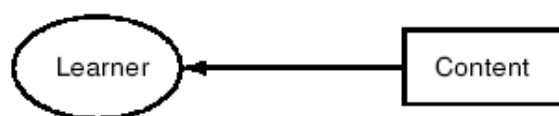
Students learned more when extraneous and redundant information was not included in a multimedia presentation. Learning is most effective when interesting and irrelevant information is eliminated because of the brain's limited information processing resources.

Modals for Multimedia Learning:-

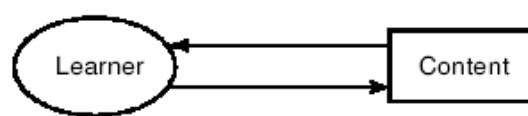
1. The Moore distance education interaction model

We shall begin with the model of distance education interactions proposed by Moore (1989; with Kearsley, 1996). He distinguished three main types of interactions in distance education. They are learner–content interaction, learner–instructor interaction and learner–learner interaction. He argued that articulating and defining these

interactions would help to dispel some of the misunderstandings that had arisen in the debates about educational media.



Learner-content interaction



Two-way learner-content interaction

2. Learner-content interaction

Learner-content interaction is without doubt one of the most fundamental interactions in any educational situations. The intellectual engagement of the learners with material which changes their understanding, attitudes, etc. is basic to all educational processes.

Importance of multimodal or multimedia presentations of learning-content to students in the distance education learner-content interactions if the material to be learned is complex. On the other hand, educational cognition research suggests that if the material is simple interactivity, then presenting it in multimedia form, especially if exactly the same information is presented both verbally and in text or graphics, may make learning more dif. cult due to the redundancy effect.

	Text	Graphics	Video	VR
Sound	Text + Sound	Graphics + Sound	Video + Sound	VR + Sound

Learner-content media interaction dimensions

3. 2-way learner-content interaction via interactive multimedia

In all of the above interactions between the learner and the content, the interaction is assumed to be one-way, i.e. the content is presented to the learners for their consumption, without the learners affecting the content as they internalize it. However, the promise of interactive multimedia has always been an active engagement of the learner with the learning environment. We shall consider how this may be achieved from the perspective of an educational multimedia designer.

4. Total interaction model

This model suggests the following implications for instructional design in distance education:

1. In planning a distance education program all the four interaction aspects must be addressed. This model may form the basis of an instructional design checklist.

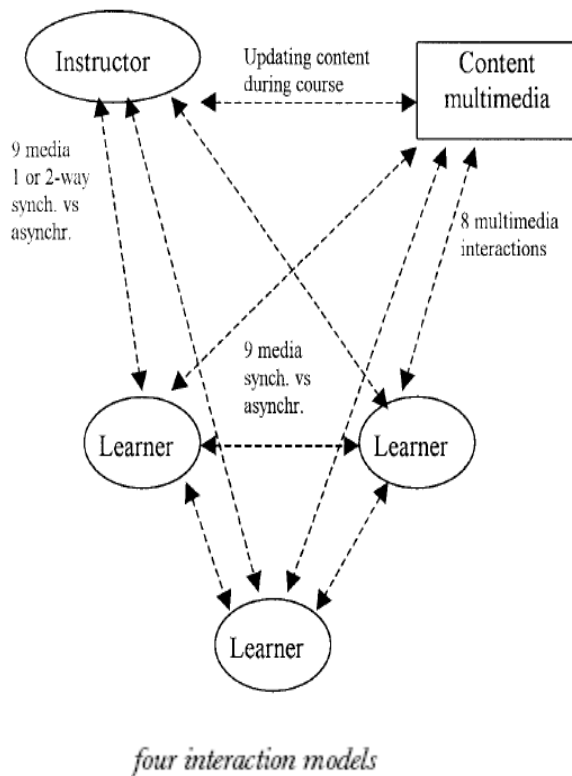
2. The means for interaction may include nine forms of media/technologies, which may be synchronous or asynchronous and 1- or 2-way in nature.

3. The more demanding and complex the content, the more beneficial the multimodal interaction in content presentation, instructor-student interaction and learner-learner interaction.

4. The learner interaction with multimedia content may be at eight different levels.

5. Optimal learning activities depend on the students' prior knowledge. For students with minimal background more structured learning activities are required.

6. Multimedia may be designed to incorporate learner-learner and/or instructor-learner interactions via internet using multiple modalities and either synchronous or asynchronous communications.



Conclusion:-

This paper has provided an overview of the status of research in and application of multimedia in a learning environment. The review provides us with the conclusion that pedagogy must drive educational technology usage, rather than the reverse. The first stage of a new technology is always accompanied by unrealistic expectations of its revolutionary advantages. Including multimedia as part of instruction can significantly enhance student learning. Research has contributed much to our understanding of how the brain processes information, and we know that multimedia that recognizes how the brain processes information is more effective than multimedia that doesn't. This paper highlights several principles that discriminate between effective and ineffective multimedia use for teaching and learning. While multimedia learning technology is not a panacea, it should occupy a prominent place in the 21st century instructional toolbox, as research has shown it to be a significant tool for student engagement and learning.

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Analytical Comparison of different 1-Bit full adder's scheme for 250nm CMOS technology

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Abstract—A full adder is one of the most commonly used digital circuit component in any digital system design, over the years many improvements have been suggested to modify the architecture of a full adder. So far, the full adder of 10-T (transistors) architecture are considered as the most optimized design for performance and area. In this paper, 5 different types of 1 bit full adder namely 28T, 10T, 14T, Modified 14T and 12T adder is compared based on the basis of different parameters. The simulation has been carried out with properly defined simulation runs on a SPICE environment using a 0.25 μ m process. The results may be differ from those previously published, both for the more realistic simulations carried out and the more appropriate figure of merit used. The main objective is to find out Delay, Power and Power delay product (PDP) of different full adders scheme and carry out the comparison.

Index Terms—CMOS Circuit, VLSI, Full adder, SPICE, PDP

I. INTRODUCTION

With the continuously increasing IC complexity and number of transistors, circuit power consumption is growing as well. Technology trends show that circuit delay is scaling down by 30%, performance and transistor density are doubled approximately every two years, and the transistor's threshold voltage is reduced by almost 15% every generation[1]. All of these technology trends lead to higher and higher power consumption in circuits. Higher power consumptions raises IC temperature and directly affect battery life in portable devices as it causes more current to be withdrawn from the power supply. A higher temperature directly affects circuit operation and reliability, as a result complicated cooling and packaging techniques are required.

Full adders are fundamental units in various circuits, especially in circuits used for performing arithmetic operations such as

compressors, comparators, parity checkers and so on. There are several issues related to the full adders. Some of them are, power consumption, performance, area, noise immunity and regularity and good driving ability. Several works have been done in order to decrease transistor count and consequently decrease power consumption and area [2,5,6,8]. Some of them has threshold loss problem that cause non-full swing outputs, low speed and low noise immunity[3]. However, usually they have less power consumption in comparison to full adders with full swing outputs. Not full swing full adders are useful in building up larger circuits as multiple bit input adders and multipliers. With the increasing demand for battery-operated portable applications such as cell phones, PDAs and laptop computers, as well as low-intensity applications such as distributed sensor networks, the need for power sensitive design has grown significantly.

It has been shown that reducing the supply voltage is the most direct means of reducing dissipated power [4,6], and operating CMOS devices in the sub threshold region is considered to be the most energy-efficient solution for low-performance applications [5]. These papers have investigated different approaches for realizing adders using CMOS technology; each has its own pros and cons. To summarize, some performance criteria are considered in the design and evaluation of adder cells. After introducing a novel design methodology, a high-speed CMOS 1-bit adder cells is presented. The paper is organized as follows: Section II explores power consumption in digital CMOS, Section III

explores conventional CMOS design style, 10T SERF adder, 14T full adder, modified 14T full adder, 12T full adder. Section IV shows the simulation results in a 0.25- μm standard CMOS process technology, and finally some conclusions are given.

II. Power Consumption in digital CMOS

The average power dissipated in a generic digital CMOS gate is given by [4], [5]:

$$\begin{aligned} P_{avg} &= P_{dynamic} + P_{short-circuit} + P_{static} \\ &= V_{dd} \cdot f_{clk} \cdot \sum (V_{i\text{swing}} \cdot C_{i\text{load}} \cdot \alpha_i) \\ &\quad + \sum V_{dd} \cdot I_{i\text{sc}} + V_{dd} \cdot I_l \end{aligned} \quad (1)$$

Where f_{clk} denotes the system clock frequency, $V_{i\text{swing}}$ is the voltage swing at node i (ideally equal to V_{DD}), $C_{i\text{load}}$ is the load capacitance at node i , α_i is the activity factor at node i , and $I_{i\text{sc}}$ and I_l are the short circuit and leakage currents, respectively.

When operating CMOS devices in the subthreshold region, the power supply voltage is kept lower than the absolute of the devices' threshold voltage. This ensures that the transistor channel is never fully inverted, but is operated in weak or moderate inversion while the transistor is in its 'on' state. According to [8], subthreshold logic gates have a near ideal voltage transfer characteristic, due to the exponential I-V relationship. We model the I-V relationship of the saturated device in weak inversion through the EKV model [9]:

$$I_{sub} = I_s \left[e^{\frac{V_g - V_{to} - nV_s}{nU_t}} \right] \quad V_{ds} > 4 \cdot U_t \quad (2)$$

Where I_s is the specific current defined by the model:

$$I_s = 2\eta \eta_n(p) \cdot C_{ox} \cdot W/L \cdot U_t^2 \quad (3)$$

Note that all potentials are referred to the local substrate. U_t is the thermal voltage, $\eta_n(p)$ is the carrier mobility for n or p channel devices, C_{ox} is the oxide capacitance, and W and L are the effective width and length of the channel.

III CMOS Design Style

I. Conventional CMOS Style

A basic cell in digital computing systems is the 1-bit full adder which has three 1-bit inputs (A , B and C_{in}) and two 1-bit outputs (sum and $carry$). The relations between the inputs and the outputs are expressed as:

$$sum = (a \oplus b) \oplus c \quad (4)$$

$$carry = a \cdot b + (a \oplus b) \cdot c \quad (5)$$

The above Boolean expressions may be rearranged as:

$$sum = c(a+b+c) + a \cdot b \cdot c \quad (6)$$

$$carry = a \cdot b + (a \oplus b) \cdot c$$

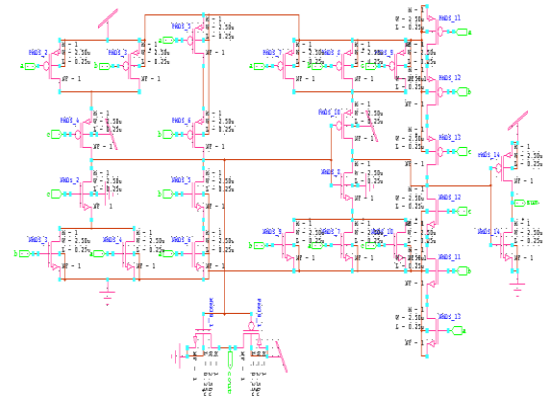


Fig 1 schematic circuit of 28T full adder

In the 1-bit conventional CMOS full adder cell is shown in Fig. 1. The 1-bit full adder cell has 28 transistors.

II 10T SERF adder

As an initial step toward designing low power arithmetic circuit modules Static Energy Recovery Full adder (SERF) cell module [8]

illustrated in Figure 2. The cell uses only 10 transistors and it does not need inverted inputs. The design was inspired by the XNOR gate full adder design. In non-energy recovery design the charge applied to the load capacitance during logic level high is drained to ground during the logic level low. It should be noted that the new SERF adder has no direct path to the ground. The elimination of a path to the ground reduces power consumption, removing the P_{sc} variable (product of I_{sc} and voltage) from the total power equation.

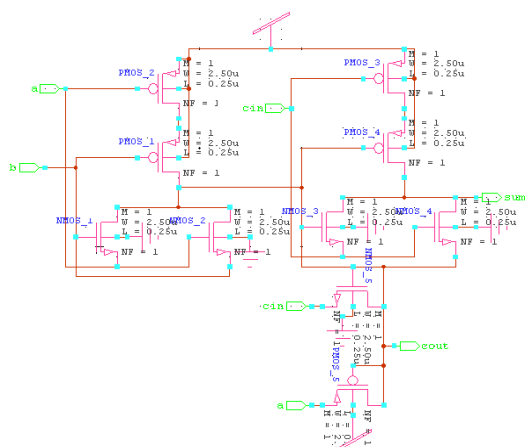


Fig-2. schematic diagram of 10T SERF adder

III. 14T full adder

As the name implies, uses 14 Transistors [7] to realize the adder function (See Fig.3). The 14T full adder cell, like the transmission function full adder cell, implements the complementary pass logic to drive the load. Though SERF adder [4] consumes less power it suffers from threshold loss problem as both sum and carry are generated from pass transistor logic so need for the 14T to improve threshold loss problem.

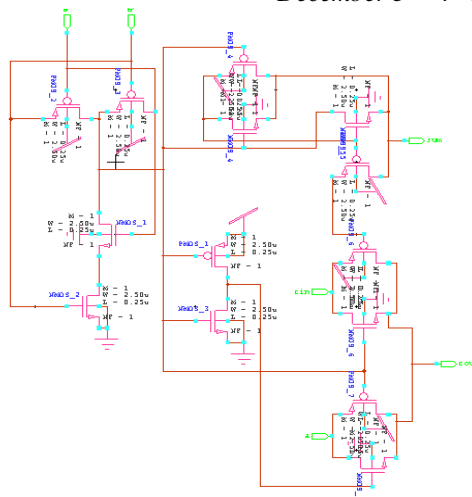


Fig.3 schematic diagram of 14T full adder

IV Modified 14T 1-bit full adder

The new improved 14T adder cell requires only 14 transistors to realize the adder function shown in Fig.4. It produces the better result in threshold loss, speed and power by sacrificing four extra transistors per adder cell. Even though the transistor count increases by four per adder cell, it reduces the threshold loss problem, which exists in the SERF by inserting the inverter between XOR Gate outputs to form XNOR gate

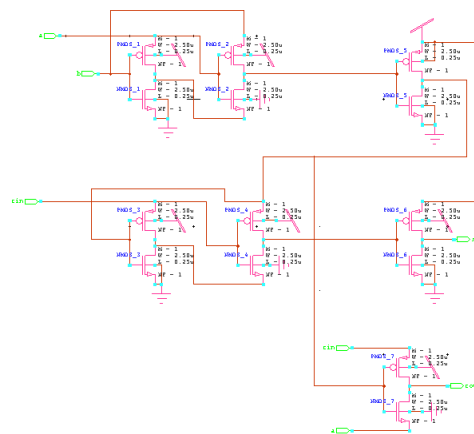


Fig- 4 schematic diagram of modified 14T full adder

In the modified 14T adder has a four transistor xor structure, a four transistor xnor structure and an inverter. Figure.4 shows the xor and

xnor structures used in modified 14T adder. The first xor structure gives a good logic '0' as it has a ground and the xnor structure gives a good logic '1' as it has a VDD. The circuit diagram of modified 14T full adder is shown in Figure. The sum and carry are generated as per the equations given below.

$$sum = (A \oplus B) \cdot C + (A \oplus B) \cdot C \quad (7)$$

$$carry = (A \oplus B) \cdot C + (A \oplus B) \cdot A \quad (8)$$

The sum output logic is pass transistor logic and while the carry output is transmission gate logic. The difference in the full adder structure of the existing 14T Full adder and modified structure [7] is the implementation of the sum equation, which results in the better performance of modified 14T full adder.

V 12T full adder

A full adder is one of the most commonly used digit circuit component, many improvements have been made to refine the architecture of a full adder. So far, the full adders of 10-T (transistors) architecture are considered as the most balanced design regarding performance and area. However, the era of deep sub-micron CMOS process has come which makes the traditional 10-T designs no applicable in the mentioned CMOS process, the 12-T full adder is better than the some prior designs which makes it a better alternative In order to generate correct outputs, 3 steps are adopted.

They are:

- 1) Provide full swing MID signal: We have add an inverting buffer at the output of the XOR block. This will generate a full swing MID signal.
- 2) Modify SUM block: Since the improper MID signals are now inverted, the SUM blocks are modified accordingly to generate correct SUM outputs.
- 3) Modify Cout block: The COUT blocks are also modified to generate correct COUT output. The refined full adders are shown in Fig.5. With 2 extra transistors as well as the improvements above, we manage to provide correct outputs in

TSMC 0.25 μ m CMOS process.

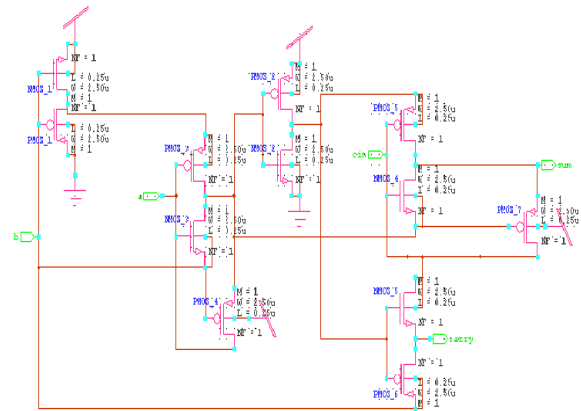


Fig-5 Systematic diagram of 12T full adder

IV Simulation results

Reduction of power consumption makes a device more reliable. The need for devices that consume a minimum amount of power was a major driving force behind the development of CMOS technologies. As a result, CMOS devices are best known for low power consumption. Hence there is a simulation of different full adder scheme. The simulation is done on the 250nm technology. After simulation the main parameters that have calculated is Power, Delay and the power delay Product (PDP).

Each one-bit full adder has been analyzed in terms of propagation delay, average power dissipation and their product. The propagation delay has been measured as the time interval between the time the input signal takes to reach 50% of its logic swing and the time the output takes to reach the same value (for the case of differential input and output, we considered the worst value among the outputs and its complemented value). The power dissipation has been evaluated by averaging the power flowing into the full adder.

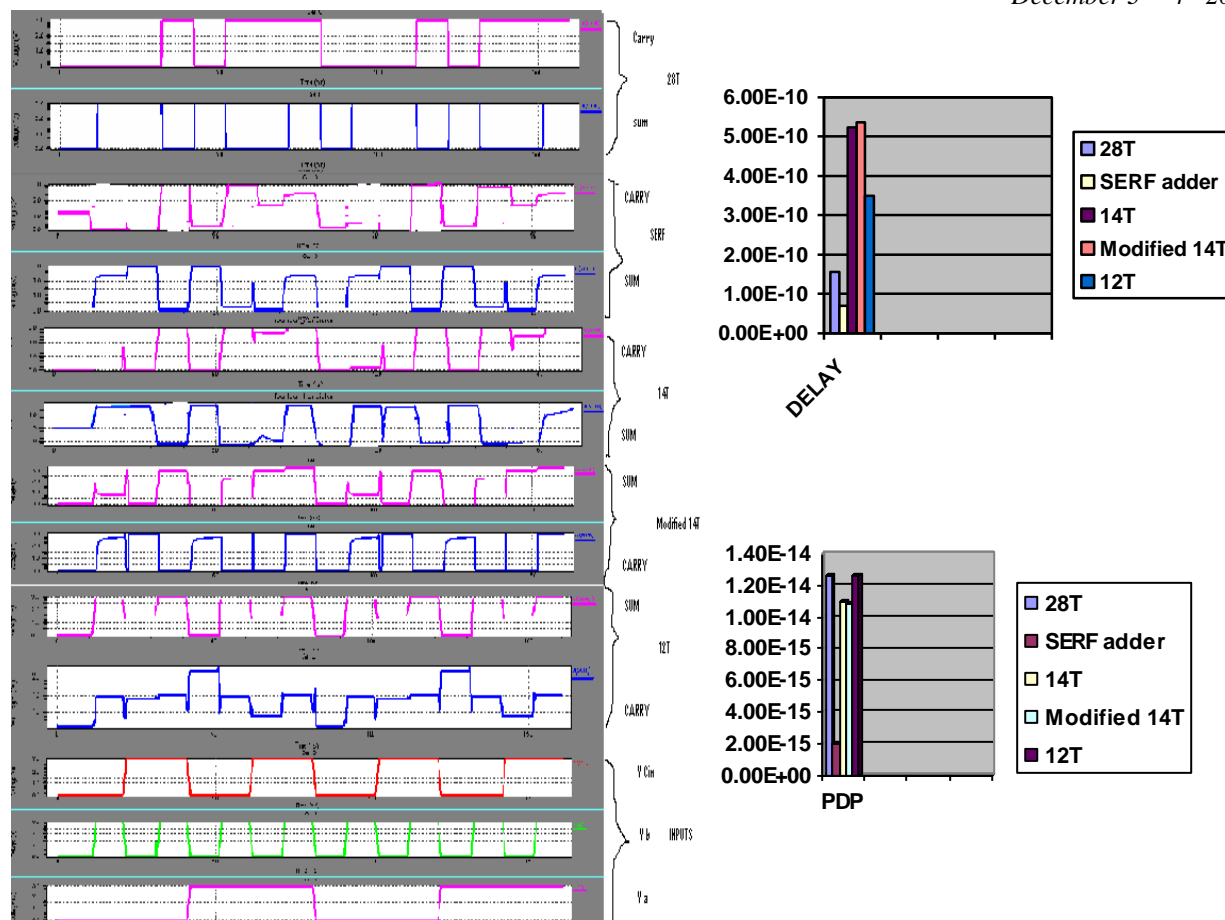
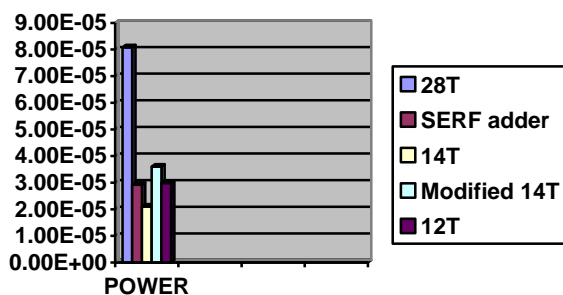


Fig -6 Simulation results of different full adder scheme.

The comparison of different full adder for various parameter like Delay , Power and Power delay product is in the Table -I .



V CONCLUSION

In this paper different full adder circuits are compared to calculate the various parameters like power consumption, delay and power delay product. According to simulations results, the power consumption is minimum in case of SERF adder. The delay is less in 28T but the problem is of power consumption, so it can be used where there is need of high speed and the power consumptions is secondary

S. No	Adder	Delay	Power	Power delay product (PDP)
1	28T	1.56E-10	8.08E-05	1.26E-14
2	SERF adder	6.99E-11	2.92E-05	2.04E-15
3	14T	5.24E-10	2.10E-05	1.10E-14
4	Modified 14T	7.37E-10	2.99E-05	2.20E-14
5	12T	3.49E-10	3.60E-05	1.26E-14

matter. In case of modified 14T the output is

much better than the 14T. The 12T full adder also having some better results as the swing in the circuit is reduced. The results also show that many of them can be suitable for ultra low power applications.

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Role of Plant Growth Promoting Rhizobacteria in Sustainable Agriculture

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Abstract: Research directed towards the development of approaches for sustainable growth is the need of the hour. A key point of focus should be the beneficial interactions between plants and microbes in order to facilitate sustainable agricultural practices. Biotechnology has opened new avenues for the application of beneficial soil-bacteria for the promotion of plant growth and the biological control of phytopathogens. Plant growth promoting rhizobacteria (PGPR) are plant-friendly bacteria that reside in the root-zone of plants and affect it in many direct and indirect ways. PGPR have attracted the attention of scientists throughout the world for their role in improving plant growth and health and the results to date are very promising. Use of PGPR as soil-inoculants for many crops has shown significant improvement in their growth and yield through increased seedling germination, plant vigor, shoot height and weight, chlorophyll content and increased nodulation in legumes. They employ a variety of mechanisms to affect the overall health and growth of plant. The use of PGPR is steadily increasing in agriculture and offers an attractive way to replace chemical fertilizers, pesticides, and supplements.

Key words: Sustainable agriculture; Plant growth promoting rhizobacteria; biological control; Soil-inoculants

I. Introduction

Food demand is growing tremendously across the globe and to combat this ever increasing demand, innovative agricultural tools and methodologies are required. Though remarkable improvement in crop production has been achieved in the last few decades, however at the same time the dependency on agrochemicals like chemical pesticides and fertilizers has also increased manifolds. Chemical based products are generally toxic and non-biodegradable in nature and also exert harmful effects on human, animal and environmental health. Moreover, their continuous use results in generation of resistant strains of pests and pathogens [1]. Unwarranted use of such chemical tools to enhance the crop yield and control plant diseases, has resulted in severe problems like accumulation of chemicals in plant products and thus their entry into the food chain, depletion of soil quality and fertility, contamination of water resources and reduction in population of naturally occurring beneficial organisms [2]. Of late, consumers have shown their concern for soaring usage of agrochemicals in relation to food quality and safety as well as for the effects of modern farming methods on environment.

Key challenge, thus, is to attain twin goals of agricultural growth along with the maintenance and enhancement of environmental quality. This idea of replenishment of natural resources while maintaining economic viability of agricultural system is termed as sustainable agriculture. Sustainable agricultural practices are thus the answers to these multifaceted problems and the concept is even more important for developing countries like India.

Use of microbial agents to improve agricultural production and plant health offers an attractive option, to practice and develop sustainable agricultural practices. Agriculturally important microorganisms have thus been the focus of research during the last few decades and gained much attention as the tools for developing sustainable agriculture.

Plant growth promoting rhizobacteria (PGPR) are the bacteria which reside in the rhizosphere of plant and affect it in a favourable manner. They enjoy a close association with the plant and hence are the most suitable candidates to be developed as tools for sustainable agriculture. They have been shown to play a pivotal role in improving plant growth and health. Huge volume of literature supports their potential to improve plant health and growth. Thus it is very important to understand various aspects of PGPR related to agriculture.

II. Plant growth promoting rhizobacteria

Bacteria that provide benefit to the plant can be either symbiotic or free living in soil, but are found in abundance near roots. Plant growth-promoting rhizobacteria (PGPR) are plant-friendly bacteria that reside in the rhizosphere and enhance plant growth by a wide variety of mechanisms. The term PGPR was coined by Joe Kloepper in late 1970s and was defined by Kloepper and Schroth [3] as “the soil bacteria that colonize the roots of plants by following inoculation on to seed and that enhance plant growth”. PGPR may benefit the host by causing plant growth promotion or biological disease control. The same strain of PGPR may cause both growth promotion and biological control [4]. When Kloepper and Schroth coined the term Plant Growth-

Promoting *Rhizobacteria* (PGPR), it was originally used to describe the biocontrol group.

A wide range of bacteria has been identified as belonging to this category including *Pseudomonas*, *Bacillus*, *Azospirillum*, *Azotobacter*, *Klebsiella*, *Enterobacter*, *Alcaligenes*, *Arthrobacter*, *Flavobacterium*, *Burkholderia*, *Mesorhizobium*, *Serratia* etc. [5] [6] [7]. However, most promising reports for the improvement of plant growth and health have been obtained for two bacterial species in this group i.e. *Pseudomonas* and *Bacillus*.

III. Categorization of plant growth promoting rhizobacteria

Broadly, PGPR may be divided into two categories depending on their effect on plant. First group includes ‘biocontrol agents’ that inhibit the growth of various phytopathogens through a variety of mechanism thus controlling plant diseases. Second group includes ‘biofertilizers’ that improve the availability and uptake of nutrients by the plant resulting in enhanced plant growth. PGPR also enhance the tolerance capacity of the plant to a variety of environmental stresses through production of phytohormones [8] and ACC deaminase [9]. Same strain of PGPR may cause plant growth promotion and disease suppression in many cases [4].

IV. Mechanisms of plant growth promotion

Depending on their category, PGPR may improve plant growth through various direct and indirect mechanisms. A broad overview of these mechanisms is discussed in the following paragraphs.

1) Siderophore production

Siderophores are low molecular weight molecules (400-1000 daltons) which have high affinity for iron ($K_d = 10^{-20}$ to 10^{-50}) and thus bind ferric ions available in the soil [10]. Iron is not readily available to plants as it gets easily oxidized and

exists predominantly in the form of sparingly soluble ferric ions which cannot be utilized directly [11]. Many PGPR strains like *Pseudomonas* [12], *Bacillus* [13] [14], *Acinetobacter* [15], *Serratia* [16] are known to produce siderophores. Thus PGPR improves the availability of iron to plants and also indirectly control the pathogens as they scavenge the rhizosphere of the limited amount of ferric ions available thus inhibiting the pathogens in their immediate vicinity due to iron limitation [17].

2) Phosphorus solubilization

Phosphorous is an essential mineral for the growth and development of plants as it is crucial for many physiological activities like cell division, photosynthesis, development of root system and utilization of carbohydrates etc. Though soils are generally rich in P, the concentration of soluble/bioavailable P is usually very low in soil due to the phenomenon of chemical fixation of phosphate immobilized soon after application and becomes unavailable to plants. However many soil microorganisms are known to release phosphate (P) from the binded or absorbed (nutritionally unavailable) forms present in the soil thus improving the availability of this highly important mineral nutrient to the plants [18] in both acidic and alkaline soils [19]. Besides improving the plant growth through stipulation of optimal P concentrations, phosphate solubilizing bacteria (PSB) also exhibit antagonistic activities against deleterious organisms in the rhizosphere [20] [21].

3) N_2 - fixation

Nitrogen is the major plant nutrient required for many key functions. Biological nitrogen fixation contributes more than 180×10^6

metric tons of nitrogen per year, globally, including symbiotic as well as free-living or associative systems [22]. Symbiotic nitrogen fixing soil bacteria include *Rhizobium*, which is an obligate symbiont in leguminous plants and *Frankia* in non-leguminous plants while major groups of free-living, associative or endophytic nitrogen-fixing bacteria are cyanobacteria, *Azospirillum*, *Azotobacter*, *Acetobacter*, *Azoarcus* etc. Thus, the presence of these N-fixers improves the availability of N to plants.

4) Control of phytopathogens

PGPR are known to suppress plant disease by various mechanisms like increasing plant resistance to fungal [23], bacterial [24] and viral diseases [25] [26], insects [27] and nematodes [28], by production and release of metabolites that reduce the population or activities of pathogens or deleterious rhizosphere microflora [29] e. g. production of siderophores that bind Fe; making it less available to the native pathogens [17], lytic enzymes, diffusible antibiotics, volatile organic compounds (VOCs), toxins and biosurfactants [30] or competing with the pathogens for limited nutrients [31] and suitable sites in the rhizosphere [32] .

5) Phytohormone production

Phytohormones are the secondary metabolites that act as chemical messengers and provide the ability to the plant to respond to environment. They are also termed as growth regulators as they control (stimulate or inhibit) growth in plants. Five major groups of phytohormones are auxins, gibberellins, ethylene, cytokinins, and abscisic acid [33]. Diverse range of PGPR is known to secrete these phytohormones [34] [35]. These PGPR thus favourably influence aspects like seed germination, development of root-system and other plant growth activities.

6) Induced Systemic Resistance (ISR)

Induced resistance may be defined as enhancement of plant's defensive capacity against an array of pathogens wherein the plant's innate defenses are potentiated against subsequent biotic challenges via a stimulus prior to infection [36] [37]. It is plant-mediated, broad-spectrum resistance response that is activated by selected strains of saprophytic rhizosphere bacteria specifically the PGPR. Many PGPR strains have been found to induce systemic resistance in plant-pathogen combinations like *P. putida* WCS358 in *Arabidopsis thaliana* against *P. syringae* and *Fusarium oxysporum* [38], *P. putida* 89B-27 in cucumber against *Fusarium oxysporum* [39] and *P. aeruginosa* 7NSK2 against *Botrytis cinerea* in bean and tomato [40] [41]. Hence PGPR enhance the capacity of plant to resist the presence of pathogens.

V. Conclusion

PGPR are a diverse group of soil bacteria that colonize the root zone of plant extensively and improve the growth and yield of plant through a varied range of mechanisms. Same strain of PGPR may affect the plant in more than one way so as to protect it from deleterious organisms residing in soil and also improve the availability of essential nutrients.

In view of the fact that increased crop-yields are highly required but not at the cost of environmental and human health, eco-friendly agricultural tools are highly needed. Development of PGPR based soil-inoculants to control plant diseases and improve their growth is thus a viable option. Many such kind of bioformulations are already being used either individually or in combination with chemical products. Biocontrol agents are being successfully used as components of integrated pest management programmes.

However, though the results are highly promising under *in-vivo* conditions, more detailed studies are required in order to obtain better on-field output for such bio-inoculants. In order to attain commercial competitiveness with established low-priced and effective chemical tools, these bio-inoculants must give consistent performance under actual field conditions.

Hence, it may be concluded that PGPR based organic farming is the future of sustainable agriculture and the concept is even more important in developing countries like India.

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Particle Swarm Optimization - A new optimization technique

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I. INTRODUCTION

Particle swarm optimization (PSO) is a population based stochastic optimization technique developed by Dr. Eberhart and Dr. Kennedy in 1995, inspired by social behavior of bird flocking or fish schooling.

PSO shares many similarities with evolutionary computation techniques such as Genetic Algorithms (GA). The system is initialized with a population of random solutions and searches for optima by updating generations. However, unlike GA, PSO has no evolution operators such as crossover and mutation. In PSO, the potential solutions, called particles, fly through the problem space by following the current optimum particles.

Compared to GA, the advantages of PSO are that PSO is easy to implement and there are few parameters to adjust. PSO has been successfully applied in many areas: function optimization, artificial neural network training, fuzzy system control, and other areas where GA can be applied.

Background: The term "Artificial Life" (ALife) is used to describe research into human-made systems that possess some of the essential properties of life. ALife studies how computational techniques can help when studying biological phenomena and ALife studies how biological techniques can help out with computational problems. Actually, there are already lots of computational techniques inspired by biological systems. For example, artificial neural network is a simplified model of human brain; genetic algorithm is inspired by the human evolution. Here we discuss another type of biological system - social system, more specifically, the collective behaviors of simple individuals interacting with their environment and each other. Someone called it as swarm intelligence.

The algorithm of PSO emulates from behavior of animals societies that don't have any leader in their group or swarm, such as bird flocking and fish schooling. Typically, a flock of animals that have no leaders will find food by random, follow one of the members of the group that has the closest position with a food source (potential solution). The flocks achieve their best condition simultaneously through communication among members who already have a better situation. Animal which has a

better condition will inform it to its flocks and the others will move simultaneously to that place. This would happen repeatedly until the best conditions or a food source discovered. The process of PSO algorithm in finding optimal values follows the work of this animal society.

Recently, there are several modifications from original PSO. It modifies to accelerate the achieving of the best conditions. The development will provide new advantages and also the diversity of problems to be resolved. arm of particles, where particle represent a potential solution.

The Algorithm:

PSO is initialized with a group of random particles (solutions) and then searches for optima by updating generations. In every iteration, each particle is updated by following two "best" values. The first one is the best solution (fitness) it has achieved so far. (The fitness value is also stored.) This value is called pbest. Another "best" value that is tracked by the particle swarm optimizer is the best value, obtained so far by any particle in the population. This best value is a global best and called gbest. When a particle takes part of the population as its topological neighbors, the best value is a local best and is called lbest.

After finding the two best values, the particle updates its velocity and positions

Let $x_i(t)$ denote the position of particle i in the search space at time t step; unless otherwise stated, t denotes discrete time steps. The position of the particle is changed by adding a velocity, $v_i(t)$ to the current position [1]:

$$x_i(t+1) = x_i(t) + v_i(t+1) \quad (1)$$

$$\text{where } v_i(t) = v_i(t-1) + c_1 r_1 (\text{localbest}(t) - x_i(t-1)) + c_2 r_2 (\text{globalbest}(t) - x_i(t-1)) \quad (2)$$

with $x_i(0) \sim U(x_{\min}, x_{\max})$, acceleration coefficient c_1 and c_2 and random vector r_1 and r_2 . Simple example of PSO, there is a function [3]:

$\text{Min } f(x)$ where $x(B) \leq x < x(A)$, Denote $x(B)$ as a lower limit and $x(A)$ as an upper limit.

The pseudo code :

The pseudo code of the procedure is as follows

For each particle

Initialize particle
END

Do
For each particle
Calculate fitness value
If the fitness value is better than the best fitness value (pBest) in history
set current value as the new pBest

End
Choose the particle with the best fitness value of all the particles as the gBest

For each particle
Calculate particle velocity according equation (1)
Update particle position according equation (2)
End
While maximum iterations or minimum error criteria is not attained
At the i^{th} iteration, find the two important parameters for each particle that is:

a. The best value of $x_j(i)$ (the coordinates of particle at iteration i) and declare as $p_{\text{best}}(j)$, with the lowest value of objective function (minimization case) $f[x_j(i)]$, which found a particle j at all previous iteration. The best value $x_j(i)$ for all particles which found up to the i^{th} iteration, gbest with the value function the smallest goal / minimum among all particles for all the previous iterations, $f[x_j(i)]$.

b. Calculate the velocity of particle j at iteration i using the following formula using formula (2):

Where c_1 and c_2 , respectively, are learning rates for individual ability (cognitive) and social influence (group), and uniformly random numbers are distributed in the interval 0 and 1. So the parameters and represent weight of memory (position) of a particle towards memory (position) of the groups (swarm). The value of c_1 and c_2 is usually 2, so multiply $c_1 r_1$ and $c_2 r_2$ ensure that the particles will approach the target about half of the difference.

c. Calculate the position or coordinates of particle j at the i^{th} iteration by :

$$x_i(t+1) = x_i(t) + v_i(t+1)$$

Evaluation of the objective function value for each particle and expressed as:

$$f[x_1(i)], f[x_2(i)], \dots, f[x_n(i)]$$

The last step, check whether the current solution is convergent. If the positions of all particles leading to an equal value, then this is called convergence. This iteration process continues until all particles converge to the same solution.

If the current solution is convergent, then the iteration will stop. We do not know whether the

final value is the best value. Below are the stopping criteria conditions for the iteration:

- Terminate when a maximum number of iterations, or FEs, has been exceeded.
- Terminate when an acceptable solution has been found,
- Terminate when no improvement is observed over a number of iteration.
- Terminate when the normalized swarm radius is close to zero.
- Terminate when the objective function slope is approximately zero. Although the particle has stopped, we do not know whether the particle will pitch on local optima, local minima, global optima or global optima.

In the original particle swarm optimization, there has also a lack of solution, because it is very easy to move to *local optima*. In certain circumstances, where a new position of the particle equal to global best and local best then the particle will not change its position. If that particle is the global best of the entire swarm then all the other particles will tend to move in the direction of this particle. The end of result is the swarm converging prematurely to a local optimum. If the new position of the particle is pretty far from global best and local best then the velocity will change quickly and turn into a great value. This will directly affect the particle's position in the next step. For now the particle will have an updated position of great value, as a result, the particle may be out of bound of the search area.

Comparisons between Genetic Algorithm and PSO

Most of evolutionary techniques have the following procedure:

1. Random generation of an initial population
2. Reckoning of a fitness value for each subject. It will directly depend on the distance to the optimum.
3. Reproduction of the population based on fitness values.
4. If requirements are met, then stop. Otherwise go back to (2).

From the procedure, we can learn that PSO shares many common points with GA. Both algorithms start with a group of a randomly generated population, both have fitness values to evaluate the population. Both update the population and search for the optimum with random techniques. Both systems do not guarantee success.

However, PSO does not have genetic operators like crossover and mutation. Particles update themselves with the internal velocity. They also have memory, which is important to the algorithm.

Compared with genetic algorithms (GAs), the information sharing mechanism in PSO is significantly different. In GAs, chromosomes share information with each other. So the whole population moves like a one group towards an optimal area. In PSO, only gBest (or lBest) gives out the information to others. It is a one-way information sharing mechanism. The evolution only looks for the best solution. Compared with GA, all the particles tend to converge to the best solution quickly even in the local version in most cases.

Basic Variants of PSO

The lacks of PSO have been reduced with a variation of PSO. Many variations have been developed to improve speed of convergence and quality of solution found by the PSO. The variation is influenced by a number of control parameters, namely the dimension of the problem, the number of particles (swarm size), acceleration coefficients (The acceleration coefficient, c_1 and c_2 together with random vector r_1 and r_2 , control the stochastic influence), inertia weight, neighborhood size, number of iteration, and the random values which scale the contribution of the cognitive and social component. Below are the basic variations of particle swarm optimization.

Velocity clamping

It will control the global exploration of the particle. If the velocity of a particle exceeds the maximum allowed speed limit, it will set a maximum value of velocity $v_{\max}(j)$. So that $v_{\max}(j)$ indicates the maximum allowable speed for a particle in the j^{th} dimension. Speed (velocity) of the particle is adjusted using the equation [2]:

$$V_{ij} = \begin{cases} v_{ij} & \text{if } v_{ij} < v_{\max}(j) \\ v_{\max}(j) & \text{otherwise} \end{cases}$$

High value of $v_{\max}(j)$ will cause global exploration, whereas lower values result in local exploration.

$v_{\max}(j)$ will control the movement of the particle and aspect of exploration and exploitation.

[Exploration is the ability of a search algorithm to explore different region of the search space in order to locate a good optimum. Exploitation, on the other hand, is the ability to concentrate the search around a promising area in order to refine a candidate solution]

Velocity clamping did not influence the position of the particle. This only reduces the size of the step velocity. Changes in the search direction not only can make a particle to perform a better exploration but also has negative effects and the optimum value cannot be found.

The following equation [2] is used to initialize the max and min velocity to the solution:

$$v_{\max,j} = \delta (x_{\max,j} - x_{\min,j}) \quad (4)$$

$$v_{\min,j} = \delta (x_{\min,j} - x_{\max,j}) \quad (5)$$

Where $x_{\max,j}$ and $x_{\min,j}$ are the minimum and maximum positions of the particle in the dimension. δ is a constant factor and is taken from 0 until 1.

The problem is if all the velocity becomes equal to v_{\max} the particle will continue to conduct searches within a hypercube and will probably remain in the optima but will not converge in the local area. Some researchers have developed velocity clamping method, such as : [2], [3]

Inertia weight

It is a mechanism to control an exploration and exploitation abilities of the swarm, and as mechanism to eliminate the need of velocity clamping. The inertia weight,, controls the momentum of the particle by weighing the contribution of the previous velocity – basically controlling how much memory of the previous flight direction will influence the new velocity. For the PSO, the velocity equation [5] changes from equation:

$$V_{ij}(t+1) = wV_{ij}(t) + c_1r_{1j}(t)(y_{ij}(t) - x_{ij}(t)) + c_2r_{2j}(t)(\hat{y}_j(t) - x_{ij}(t)) \quad (6)$$

A similar change is made from the- PSO. Inertia weight presenting how much the amount of memory from the previous flight direction will affect the new velocity. If $w > 1$, then the velocity will decrease with time, the particle will accelerate to maximum velocity and the swarm will be divergent. If $w < 1$, then the velocity of particle will decrease until it reaches zero. The larger value of w will facilitate an exploration, rather small values will promote the exploitation. There are some researchers that have develop inertia weight application, such as : [4], [5], [6], [7]

Constriction Coefficient

Velocity update equation that using constriction coefficient changes to:

$$v_{ij}(t+1) = \chi [v_{ij}(t) + \phi_1(y_{ij}(t) - x_{ij}(t)) + \phi_2(\hat{y}_j(t) - x_{ij}(t))] \quad (7)$$

$$\text{Where } \chi = \frac{2k}{2 - \phi - \sqrt{\phi(\phi - 4)}}$$

$$\text{With } \phi = \phi_1 + \phi_2$$

$$\text{Where } \phi_1 = c_1r_1, \phi_2 = c_2r_2$$

Equation above is used under the constraints that $\phi \geq 4$ and $k \in [0,1]$. The constriction approach was developed as a natural, dynamic way to ensure convergence to a stable point, without the need for velocity clamping. Condition $\phi \geq 4$ and $k \in [0,1]$, of the swarm is guaranteed to convergence.

some researchers have developed constriction coefficient , such as : [7], [8].

Synchronous / Asynchronous Updates

Asynchronous is better for lbest, updates calculate the new best positions after each particle position update and have the advantage that immediate feedback is given about the best region of search space.

Synchronous Updates [9] are done separately from the particle (personal best and neighborhood bests)

position updates, only given one feedback per iteration update, slower feedback and better for gbest .

Basic Variant	Function	Advantages	Disadvantages
Velocity Clamping	Control the global exploration of the particle Reduces the size of the step velocity, so that the particles remain in the search area, but it cannot change the search direction of the particle	VC reduces the size of the step velocity so it will control the movement of the particle	If all the velocity becomes equal to the particle will continue to conduct searches within a hypercube and will probably remain in the optima but will not converge in the local area.
Inertia Weight	Controls the momentum of the particle by weighing the contribution of the previous velocity,	A larger inertia weight in the end of search will foster the convergence ability.	Achieve optimality convergence strongly influenced by the inertia weight
Constriction Coefficient	To ensure the stable convergence of the PSO algorithm	Similar with inertia weight	when the algorithm converges, the fixed values of the parameters might cause the unnecessary fluctuation of particles
Synchronous and Asynchronous Updates	Optimization in parallel processing	Improved convergence rate	Higher throughput: More sophisticated finite element formulations Higher accuracy (mesh densities)

Source: [20]

Modification of PSO

The new and modified form of PSO ensures good performances to obtain Single solution of continuous valued, nconstrained, static, single objective and optimization problem Multiple solutions or niche where large no Of individuals compete for the use of limited resources on physical environment.

Solutions that both optimizes the objective function and satisfies all constraints. If all constraints are not satisfied, the algorithm has to balance the trades iff between optimal objective function value and no of constraint violated.

Solution of the real world problems that simultaneously satisfy no. of objectives, it is different from basic PSO that return only one solution.

PSO in Supply Chain Management

The primary purpose of the supply chain model is controlling the inventory at different sites or stores

while meeting customer service level requirements, therefore quantifying the trade-off between inventory investment and customer service levels. Since the trade-off between inventory investment and service levels may change over time, this will request that the supply chain performance to be evaluated continuously so that the supply chain managers be able to make timely and right decisions. The physical structure of a supply chain clearly will influence its performance, and it is very important to design an efficient supply chain to facilitate the movements of goods.

A hybrid swarm optimizer combines both binary and real valued parameters in one search. It simply operates on binary inputs with binary particle swarm algorithm and treats the continuous variables with real valued particle swarm. Binary PSO algorithm is used to take the location decisions (whether or not to locate a facility at a given candidate site), while the allocation decisions are obtained

by continuous PSO algorithm

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Cyber Laws for e-commerce in India

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Abstract— The paper discusses cyber laws for e-commerce in India. On the basis of analysis of cyber laws for e-commerce, various advantages of cyber laws and challenges in enforcement of cyber laws have been discussed. Amendments from time to time in Indian cyber laws have also been presented. Finally through this paper, authors give suggestions to make cyber laws a win-win situation for all stakeholders.

Index Terms— Cyber Laws, e-commerce

I. INTRODUCTION

Technology has brought many important changes in our lives. Both individuals and companies got benefited by the use of technology. Individuals and Companies are focussing on strong online presence to leverage the commercial benefits of cyberspaces. Electronic commerce has slowly and steadily entered the Indian market. Today from getting information about anything to purchasing of products, everything may take place in an online environment. The rapid growth of electronic commerce has created the requirements for regulatory mechanisms and laws, to make e-commerce a success story. All of these regulatory mechanisms and laws come under the province of cyber laws.

II. CYBER LAWS FOR E-COMMERCE IN INDIA

Both the houses of the Indian Parliament passed the Information Technology Bill in May 2000. The Bill received the consent of the President in August 2000 and came into existence as the Information Technology Act, 2000. Cyber laws are contained in the IT Act, 2000. One of the objectives of the Act is to provide the legal infrastructure for e-commerce in India. The Information Technology Act, 2000 aims to provide the legal framework so that legal sanctity is accorded to all electronic records and other activities carried out by electronic means. As per the Act, an acceptance of contract may be expressed by electronic means of communication and the same shall have legal validity and enforceability. IT Act 2000 is also regulating the functioning of Internet intermediaries in India. Internet intermediaries' law and liability in

India has become very stringent after the passing of the Information Technology (Intermediaries Guidelines) Rules, 2011 of India. These Internet intermediaries liability Rules tells about the rights and responsibilities of internet intermediaries in India. If the Internet intermediaries do not follow the Rules, they may invite legal problems and appropriate action may be taken against them. The legal actions against foreign websites may also be taken.

III. ADVANTAGES OF CYBER LAWS FOR E-COMMERCE

The IT Act 2000 and its provisions contain many aspects from the perspective of e-commerce in India. As per the provisions of Act, email is a valid and legal form of communication in India. Companies can go for e-commerce using the legal infrastructure provided by the Act. Act has also given legal validity to Digital signatures. The Act allows Government to issue notification on the web. The Act enables the companies to file any form, application or any other document with any office, authority, body or agency owned or controlled by the appropriate Government in electronic form by means of such electronic form as may be prescribed by the appropriate Government. The IT Act also deals with the security issues, which are critical to the success of electronic commerce. The Act has given a legal definition to the concept of secure digital signatures. As per the IT Act, a corporate can have a statutory remedy in case if anyone breaks into their computer systems or network and causes damages.

IV. CHALLENGES RELATED TO CYBER LAWS FOR E-COMMERCE

Information Technology Act 2000 was passed 12 years back. But till date awareness among stakeholders related to cyber laws for e-commerce is limited. Lawyers in our country are not very aware of legal provisions of information technology. There are very few e-commerce lawyers and law firms in India that can provide expert guidance related to e-commerce. Police and Law enforcement agencies are also not completely aware about various aspects of Cyber Laws for e-commerce. There is also a challenge to make e-commerce companies understand the

requirement to have techno legal due diligence for establishing e-commerce business. There is limited awareness among the public about the provisions and remedies stipulated under the IT Act in case of fraud or crime. There is no special dispute resolution mechanism such as online dispute resolution to speedily resolve e-commerce disputes in India.

V. CONCLUSION

India is having huge potential for electronic commerce. But, there are many legal and regulatory challenges that are forcing limited growth of electronic commerce in India. E-commerce offers both advantages and disadvantages to its users. The advantages include online sales and purchase at competitive price, convenience, flexibility, online comparisons, time saving etc. The disadvantages come in form of frauds and cyber crimes committed against e-commerce users. In India though cyber laws are on paper but proper enforcement is not there. There is a challenge to make all stakeholders aware about e-commerce laws. Also, there are very few e-commerce lawyers and law firms in India that can provide expert guidance related to e-commerce. There is also a requirement of special dispute resolution mechanism such as online dispute resolution to resolve e-commerce disputes in India. Government and related agencies are also required to introduce training and awareness programs related to cyber laws and associated crimes. Moreover, law enforcement agencies and the police need to be trained about the various aspects of cyber laws related to e-commerce. It is also essential to conduct adequate training of the relevant departments who would draft and implement policies relating to e-commerce. The e-commerce companies are required to have techno legal due diligence for establishing e-commerce business in

India. Finally India needs to have more effective and useful e-commerce laws and their enforcement to make e-commerce a true success.

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Design of optimal pi controller using particle swarm optimization for power quality

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Abstract—This paper presents an application of Particle Swarm Optimization (PSO) to Shunt Active filter for power quality improvement. Synchronous Reference Frame method is employed for the calculation of reference current generation using d-q conversion. The main objective is the reduction of Total Harmonic Distortion (THD) of source current. The present work describes the optimal design parameters of PI controller to maintain the dc link voltage constant using PSO. A MATLAB environment is created using SIMPOWER SYSTEM block-set for three phase source and considering nonlinear load.

Index Terms—Shunt active filter, Power Quality, Total Harmonic Distortion, Particle Swarm Optimization.

I. INTRODUCTION

Increasing number of nonlinear loads results in the deterioration of power quality. Power quality may also be defined as the degree to which both the utilization and delivery of electric power affects the performance of electrical equipment. The issues in this regards of power quality are mostly related to the harmonic contents of source current. Harmonic pollution causes a number of problems. A first effect is the increase of the RMS-value and the peak-value of the distorted waveform. The increase in RMS-value leads to increased heating of the electrical equipment. Furthermore, circuit breakers may trip due to higher thermal or instantaneous levels. In installations with a neutral, zero phase sequence harmonics may give rise to excessive neutral currents.

To overcome the harmonic related problems in the source current Power Filters plays a major role. Traditionally passive filters have been used to limit these unwanted harmonics, but these filters have their own limitations. Passive filter consists of series circuit of reactors and capacitors offering a low impedance path at resonance frequency. A passive filter circuit may only filter one harmonic component. A separate filter circuit is required for each harmonic that needs to be filtered. So another viable solution is the Active filters. Active filters works on the principle of generating actively a harmonic current spectrum in opposition of the phase to the distorting harmonic current [1-2]. Among

different types of Active filters this paper deals with shunt active filter. Fig 1 shows the block diagram of passive and active filter.

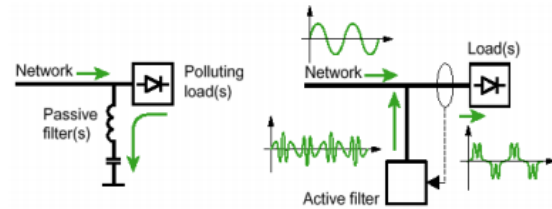


Fig 1 Block diagram of passive and active filters

The shunt active filter consists of a VSI with capacitor on the DC side. Synchronous Reference Frame Theory has been used to generate the reference source current with Hysteresis controller is used to determine the switching signals. The present research work emphasis on the application of Particle Swarm Optimization (PSO) to design the optimal gains for PI controller. Particle swarm optimization (PSO) is a population based stochastic optimization technique inspired by social behavior of bird flocking. PSO is initialized with a group of random particle and then searches for optima by updating generations over the particle's position and velocity.

A MATLAB Simulated environment is created using power system toolbox and it has been analyzed that PSO technique for finding the optimal controller parameters proves to be effective for reducing the THD of source current.

II. SHUNT ACTIVE FILTER AND CONTROL STRATEGY

Shunt active filter consists of three phase Voltage Source Inverter (VSI) with a dc energy source on the dc side. Three phase shunt active filter is connected is connected in the distribution network at the common point of coupling. The most important feature of the active power filter is that the supply current is enforced to be sinusoidal and in phase with the supply voltage despite of the characteristics of the load. Therefore, the shunt APF is harmonics cancellation and reactive power compensation by introducing equal but opposite harmonic and reactive

currents into the supply line.

Various topologies for active harmonic Filter have been proposed for harmonic mitigation[3-7]. Among them Synchronous Reference frame theory has been used here. It has basically two control loops. One loop controls the Dc link voltage of capacitor to compute the losses and the second loop is used to maintain the AC voltage for reactive power compensation. Proportional –Integral (PI) controllers are used to reduce the errors. Fig 2 shows the block diagram of control strategy of active filter using Synchronous Reference Frame Theory.

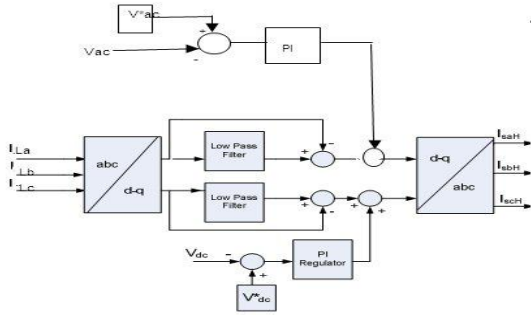


Fig 2 Control Strategy of Active Filter Using Synchronous Reference Frame Theory.

The three phase currents, load currents the PCC voltages and dc bus voltage (vdc) of active filter are sensed as feedback signals. Load currents are transformed into synchronously rotating reference frame d axis and q axis by using $\cos \theta$ and $\sin \theta$ where θ is derived from three phase PLL circuit.

The PI controller consists of proportional term and integral term. PI emphasizes on the difference (error) between the Vdc reference voltage and Vdc bus voltage. PI controller algorithm involves two separate parameters; the Proportional and the Integral. Proportional value governs the reaction to the voltage error; the Integral determines the reaction based on the sum of recent errors. The weighted sum of these two actions is used to eliminate the error. By "tuning" the two constants in the PI controller algorithm, the PI controller offer control action designed for specific process requirements.

The output of PI (proportional-integral) controller at the dc bus voltage of Shunt Active Filter is considered as the current (i_{loss}) for meeting its losses.

$$i_{loss(n)} = i_{loss(n-1)} + k_{pd}(v_{de(n)} - v_{de(n-1)}) + k_{id} v_{de(n)} \quad (1)$$

where, $v_{de} - v_{de(n-1)}$ is the error between the reference(vdc* and sensed (vdc) dc voltage at the nth

sampling instant. K_{pd} and K_{id} are the proportional and the integral gains of the dc bus voltage PI controller.

The reference source current is therefore expressed as,

$$i_d^* = i_{ddc} + i_{loss} \quad (2)$$

Similarly PI controller is used to regulate the AC grid voltage to a reference value ,expressed as

$$i_{qr(n)} = i_{qrs(n-1)} + k_{pq}(v_{te(n)} - v_{te(n-1)}) + k_{iq} v_{te(n)} \quad (3)$$

where, $v_{te(n)} = v_s^* - v_{(n)}$ denotes the error between reference (v_s^*) and actual ($v_{(n)}$) terminal voltage amplitudes at the n sampling instant. K_{pq} and K_{iq} are the proportional and the integral gains of the dc bus voltage PI controller.

The reference supply quadrature axis current is expressed as

$$i_q^* = i_{qdc} + i_{qr} \quad (4)$$

Hysteresis Controller

Fixed band hysteresis current control formulates the switching of the inverter from the comparison of current error to keep the current within the hysteresis band. The switching frequency can be changed by the width of the hysteresis band. The Hysteresis current controllers of the three phases are designed to operate independently. Each current controller determines the switching signals to the inverter. The error signal reference and actual source current are calculated and compared within a small hysteresis band (hb). The switching logic for phase A is formulated as below:
If $i_{fa} < (i_{fa}^* - hb)$ upper switch of VSC TURNED OFF and lower switch is ON

If $i_{fa} > (i_{fa}^* + hb)$ upper switch of VSC is turned ON and lower switch is OFF

In the same fashion, the switching of phase B and C devices are derived.

III. PARTICLE SWARM OPTIMIZATION

PSO is similar to genetic algorithm in a sense that the system is initialized with a population of random solutions. PSO serves as a simple and powerful tool for solving optimization problems. PSO tracks the optimal solution not by survival of the fittest but by a process motivated by the personal and social behavior of a flock of birds. PSO performs the search

process by a population of particles called a swarm. The particle is characterized by D-dimensional vector representing the position of the particle in the search space.[8] The position vectors represent a potential solution to an optimization problem. During the evolutionary process, the particles transverse the entire solution space with a certain velocity. Each particle is associated with a fitness value evaluated using the objective function at the particle's current positions. Each particle memorizes its individual best position encountered by it during its exploration and the swarm remembers the position of the best performer among the population. At each iteration the particles update their position by adding a certain velocity. The velocity of each particle is influenced by its previous velocity, the distance from its individual best position and the distance from the best particle in the swarm[9]. A weighted combinations of these three parameters gives the new velocity. Fig 3 shows the block diagram of PSO algorithm

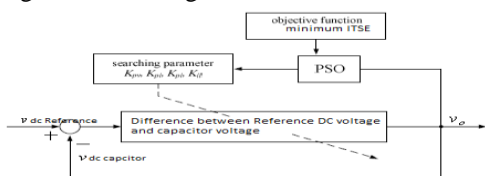


Fig.3 Block Diagram of PSO Algorithm

PSO algorithm will search for the optimal parameters for PI parameters for maintaining the DC link voltage (K_{pv} , K_{iv}) and also for PI gain parameters for maintaining the AC voltage for reactive power compensation (K_{pr} , K_{ir}). The objective function W is defined as

$$w(error) = \min(\int time. (error)^2)$$

Where error is defined the difference between reference dc voltage and capacitor voltage.

ALGORITHM

```

For each particle
  Initialize particle
END
Do
  For each particle
    Calculate fitness value
    If the fitness value is better than the best
    personal fitness value in history, set current value
    as a new best personal fitness value
  End
  Choose the particle with the best fitness value of
  all the particles, and if that fitness value is better
  then current global best, set as a global best fitness
  value
  For each particle
    Calculate particle velocity according velocity
    change equation
    Update particle position according position
    change equation
  End
While maximum iterations or minimum error criteria
is not attained
  
```

The problem formulations adopts the Integral of time square error (ITSE criteria) of DC link voltage as the objective function, to determine the PI control parameters for getting a minimum THD of the source current. The PSO searching method will try to search the best controller parameters until the minimum W is achieved. It means that the controller parameters from the searching process provide the best performance of the response.

IV. STUDY CASE AND SIMULATION RESULTS

This section explains simulation results of a simplified three phase distribution system equipped with Shunt Active Filter. Characteristics of the system resulting from the operation of the Shunt Active Filter are simulated by using the MATLAB simulation. The specification of the test system is given in TABLE 1.

TABLE 1 Parameters of the System

Source voltage and frequency	415 V (L-L) and 50Hz
Three phase linear load	Phase a- 25 ohms Phase b -10 ohms and

	80e-3 H
	Phasec-10 ohms and 80e-3 H
Non- Linear load	Three phase full rectifier drawing 5 A of current
Dc Link voltage	2200e-6 F
Reference voltage	750 V
Hysteresis current	0.2Amp

The dynamic performance of non-linear unbalanced load condition with active filter using SRF is implemented for Harmonic Reduction. The source voltage, source current, loads voltage, load current without filter are shown in Fig 4. Fig 5 demonstrates the constant capacitor voltage.

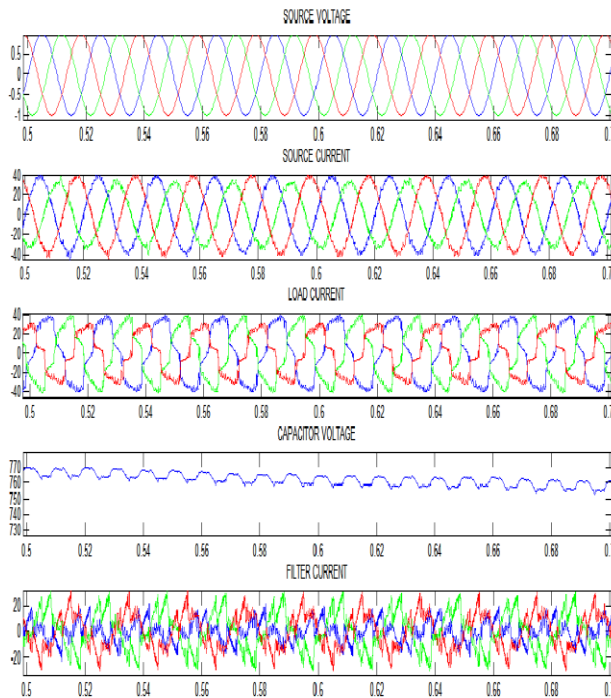


Fig 4 Dynamic performance of Shunt active filter showing source voltage,source current,load current,capacitor voltage,filter current.

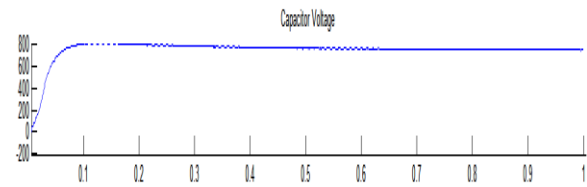


Fig 5 Capacitor Voltage

Harmonic distortion of load current without filter for Phase a is 14.74%..With Shunt Active Filter SRF control strategy, harmonics in source current are reduced to 3.05% for phase 'a', 3.81% for phase 'b', and 3.26% for phase 'c'. The FFT analysis of the phase a, phase b and phase c is shown in Fig 6. Table II gives the obtained value of PI gain parameters using ITSE as the objective function. Table III gives the comparison of the THD of phase a, phase b and phase c before and after filtering.

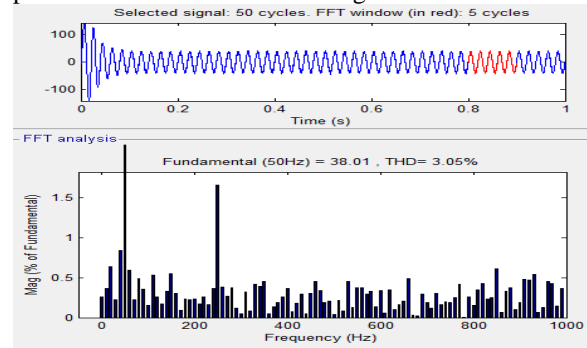


Fig 5(a) FFT Analysis of Source Current for Phase a

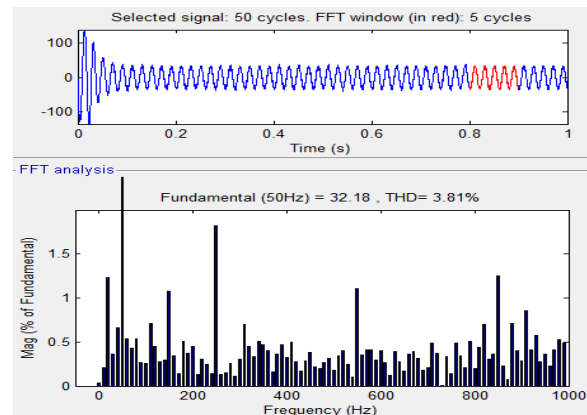


Fig 5(b) FFT Analysis of Source Current for Phase b

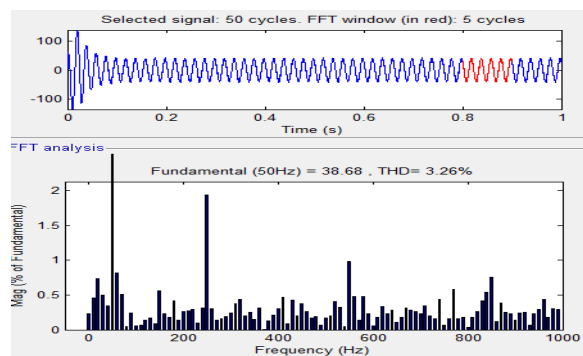


Fig 5(c) FFT Analysis of Source Current for Phase c

TABLE II

Obtained Value of PI Gain Parameters

AIM	Proportional Gain	Integral Gain
To maintain DC-link voltage	0.18	0.6247
To maintain AC voltage	46.3685	1.8371

TABLE III

Percentage of THD for Three Phases

Phase a		Phase b		Phase c	
Before filtering	After filtering	Before filtering	After filtering	Before filtering	After filtering
14.74	3.05	16.27	3.81	19.66	3.26

Fig 6 shows the comparison between the uncompensated reactive power before filtering and the compensated reactive power after filtering. It can be clearly analyzed that after filtering reactive power demand of source is almost negligible.

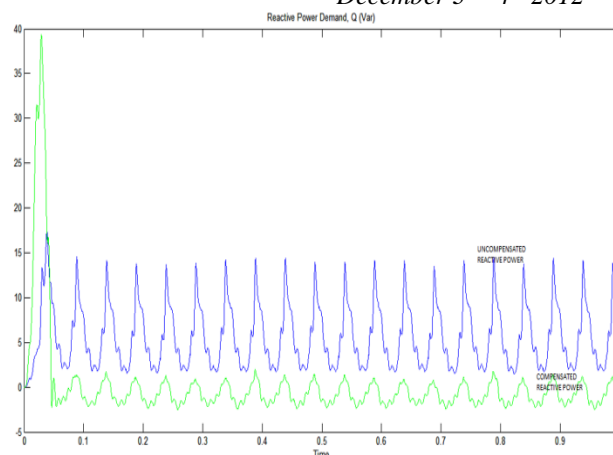


Fig 6 comparison between the uncompensated reactive power before filtering and the compensated reactive power after filtering

V. CONCLUSION

The paper presents the application of PSO with integral of time square error as the objective function for shunt active filter to improve power quality. The proposed technique designs optimal PI parameter gains and is found satisfactory to reduce the Total Harmonic Reduction and thus improves the source current. The performance of the shunt connected active filter is verified under nonlinear load. Proposed active filter topology limits the THD percentage of source current under limits of IEEE-519 standard.

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Human-Robot interaction - Emerging opportunities

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Abstract—Human-Computer Interaction (HCI), as a field, has made great strides toward understanding and improving our interactions with computer-based technologies. From the early explorations of direct interaction with computers, we have reached a point where usability, usefulness and an appreciation of social impact of technology, including its risks, are widely accepted goals in computing. Advances in computer technology, artificial intelligence, speech simulation and understanding, and remote controls have led to breakthroughs in robotic technology that offer significant implications for the human computer interaction community. Human Robot Interaction (HRI) which is defined as the study of humans and robots and the ways in which they influence each other, though is a sister discipline of HCI, is a distinctive case of HCI. A very important aspect in developing robots capable of human robot interaction is the research in natural, human-like communication, and subsequently, the development of a research platform with multiple HRI capabilities for evaluation. Design explorations and research in human robot interaction in the field of robotics existed since at least the mid 1990s. Today, many such developments are taking place in Europe and in Japan. Over the last few years, research on human-robot interaction has gained increasing attention and funding. With the help of the present review we would like to discuss the need and benefits of natural and intuitive Human Robot Communication.

Index Terms—HCI, HRI

I. INTRODUCTION

Human-robot interaction (HRI) is the interdisciplinary study of interaction dynamics between humans and robots. Researchers and practitioners specializing in HRI come from a variety of fields, including engineering (electrical, mechanical, industrial, and design), computer science (human-computer interaction, artificial intelligence, robotics, natural language understanding, and computer vision), social sciences (psychology, cognitive science, communications, anthropology, and human factors), and humanities (ethics and philosophy).

Robots are poised to fill a growing number of roles in today's society, from factory automation to service applications to medical care and entertainment. While robots were initially used in repetitive tasks where all human direction is given a priori, they are becoming involved in increasingly more complex and less structured tasks and activities, including interaction with people required to complete those tasks. This complexity has prompted the entirely new endeavour of Human-Robot Interaction (HRI), the study of how humans interact with robots, and how best to

design and implement robot systems capable of accomplishing interactive tasks in human environments. The fundamental goal of HRI is to develop the principles and algorithms for robot systems that make them capable of direct, safe and effective interaction with humans.

II ORIGIN

Robots got their name in Capek's play R.U.R. (Rossum's Universal Robots, 1921) [1]. In R.U.R., robots were man-made beings created to work for people and, as in many fictional stories thereafter, they went on to rebel and destroy the human race. In the 1950s, Isaac Asimov coined the term "robotics" and first examined the fundamental concepts of HRI [2]. He proposed famous three laws of robotics:

1. A robot may not injure a human being or, through inaction, allow a human being to come to harm.
2. A robot must obey orders given it by human beings except where such orders would conflict with the First Law.
3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Law.

The theoretical implications of how the three laws are designed to work has impacted the way that robot and agent systems operate today [3], even though the type of autonomous reasoning needed for implementing a system that obeys the three laws does not exist yet.

With the advances of artificial intelligence, the autonomous robots could eventually have more proactive behaviors, planning their motion in complex unknown environments. These new capabilities would have to keep safety as a primer issue and as second efficiency. Research ranges from how humans work with remote, tele-operated unmanned vehicles to peer-to-peer collaboration with anthropomorphic robots. Design explorations and research in human robot interaction in the field of robotics existed since at least the mid 1990s. Today, many such developments are taking place in Europe and in Japan. Over the last few years, research on human-robot interaction has gained increasing attention and funding.

2. DESIGN & HUMAN FACTORS

The design of the robot, particularly the human factor concerns, is a key aspect of HRI. Research in these areas draws from similar research in human-computer interaction (HCI) but features a number of significant differences related to the robot's physical real-world embodiment. The robot's

physical embodiment, form and level of anthropomorphism and simplicity or complexity of design are some of the key research areas being explored.

2.1 EMBODIMENT

The most obvious and unique attribute of a robot is its physical embodiment. By studying the impact of physical embodiment on social interaction, HRI researchers hope to find measurable distinctions and trade-offs between robots and non-embodied systems (e.g., virtual companion agents, personal digital assistants, intelligent environments, etc.). Recent findings [4, 5] suggest that there are several key differences between a robot and virtual agent in the context of human-machine interaction. The three conditions explored in that work (a physical robot body, a physical robot located elsewhere through a video link, and a simulation of a robot) were an attempt to control variables in order to isolate the effects of embodiment from realism. The researchers surveyed the participants regarding various properties related to the interaction. The results showed that the embodied robot was viewed by participants as more watchful, helpful, and appealing than either the realistic or non-realistic simulation.

2.2 ANTHROPOMORPHISM

The availability and sophistication of humanoid robots has recently soared. The humanoid form allows for exploring the use of robots for a vast variety of general tasks in human environments. This propels forward the various questions involved in studying the role of anthropomorphism in HRI. Evidence from communications research shows that people anthropomorphize computers and other objects, and that anthropomorphism affects the nature of participant behavior during experiments [6]. HRI studies have verified that there are differences in interaction between anthropomorphic and non-anthropomorphic robots. Biomimetic, and more specifically, anthropomorphic form allows human-like gestures and direct imitation movements, while non-biomimetic form preserves the appeal of computers and mechanical objects.

Several examinations have been performed of the effects of anthropomorphic form on HRI [7]. These include studies of how people perceive humanoid robots compared to people and non-humanoid robots [8], possible benchmarks for evaluating the role of humanoid robots and their performance [9], and how the design of humanoid robots can be altered to affect user interacts with robots [10].

2.3 SIMPLICITY/COMPLEXITY OF ROBOT DESIGN

The simplicity/complexity of the robot's expressive behavior is related to the biomimetic/anthropomorphic property. Researchers are working to identify the effect that simple/complex robot behavior has on people interacting with robots. It has been observed that the more realistic or complex a robot was, the more watchful it seemed. However, it was

also found that participants were less likely to share personal information with a realistic or complex robot.

2.4 OTHER ATTRIBUTES

As researchers work to better understand human-robot interaction, human factors insights from HCI can be valuable, but may not always be relevant. The users experienced a stronger sense of social presence from the agent when the voice type and personality matched, than when they did not. An HRI study showed that when a robot's expressive personality matched the user's personality, task performance was better than when the personalities were mismatched [11]. Ongoing research is also exploring how cultural norms and customs can affect the use of computer agent and robot systems.

3. ROBOT TEACH PROGRAMMING

Robot-Teach Programming is one of the most frequent human-robot interactions, thus an in-depth understanding of these methods is essential. The most important human elements in robot programming are safety, productivity and required human skills. Almost all modern robots are computer based systems, and as such, they always have human elements within their task performance cycles. A person may interact directly with the hardware and software, conducting a dialogue that drives the function of the system; in all cases people are responsible for the development, support and maintenance of the system.

There are two different classes of robot teaching: teach by "showing" teach by "telling". "Showing" includes methods that guide the robot step by step through the task. "Telling" exploits high-level language structures for efficient programming, providing the ability to deal with real-time decision making in response to sensor – based information. Of the two teaching methods, the use of high-level robot programming languages and covers a wider range of applications. Human factors are important since they influence the selection of the appropriate teaching method for a given robotics application.

Teaching a robot is in fact programming it to perform a specific task. A larger part of robot programming involves defining a path for the robot to take. There are two main approaches considered in robot teaching – online programming and offline programming. When using online methods, the robot itself is used during programming. It provides direct interaction between human and robot and appears to be the most natural method of robot teaching. The off-line approach allows the user to program the task on a different computer system and download the task application program into the robot's control system.

Depending on the particular application of robot, different teaching methods may be used. The basic goal in modern robot design is to make the teaching process as user friendly as possible considering the safety issues.

4. ETHICAL ISSUES FOR HRI

As HRI systems are being developed, their impact on users and society at large are increasingly being considered. Currently, it is difficult to compare robotic systems designed for different problem domains, yet it is important to do so in order to establish benchmarks for effective and ethical HRI design.

One of the most challenging aspects of establishing such benchmarks is that many aspects of HRI are difficult to measure. Establishing whether or not a robot can make eye contact with a person is comparatively simple (if not always easy to implement), but evaluating how the person reacts to and is affected by the robot's gaze and behaviour is much more difficult. Does the user get bored or frustrated? Does the user consider the robot helpful and effective? Is the robot perceived as competent? Is it trusted to perform its intended tasks? These and related questions lead to ethical considerations and legal guidelines that need to be addressed when developing HRI systems. Not only do roboticists need to act ethically, the robots themselves must do so as well.

Challenges to be considered include unintended uses of the robot, allowable tasks, and unintended situations that might be encountered. For example, if the user needs emergency attention, what is the robot's responsibility? Furthermore, the issue of control has important implications. While it is assumed the user is in control, in a variety of situations (dispensing medicine, dealing with cognitively incapacitated users) the control responsibility must rest with the machine. The issue of control and authority thus extends to all involved with the machine, including caretakers, and even designers and programmers. Well-studied ethical challenges are gradually making their way into HRI as the systems are growing in complexity and usefulness, and as their likelihood of entering human daily life increases.

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Comparison of symmetric and asymmetric key cryptography: A study

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Abstract—Cryptography a word with Greek origin means “secret writing”. However we use term to refer to the science and art of transforming messages to make them secure and immune to attacks. Two types of approaches are mainly used today symmetric and asymmetric key cryptography. The symmetric key cryptography requires a shared secret key that will be used for encryption and decryption on the other hand asymmetric key cryptography requires public and private keys. The public key is used for encrypting the data while the private key is used for decryption. This paper is an effort to compare both the techniques mentioned above using MATLAB-11 as the simulation tool. The results show that the time complexity of asymmetric key cryptography is quite high but is very much secured.

Index Terms— Cryptography, Public key, private key, time complexity

I. INTRODUCTION

With increase in demand for data communication requirement over the past few decades, the attacks on the internet and internet attached systems have grown more sophisticated. To protect the systems against these attacks various cryptographic mechanisms have been developed. Cryptography [1] is the science of using mathematics to encrypt and decrypt data. Cryptography enables you to store sensitive information or transmit it across insecure networks (like the Internet) so that it cannot be read by anyone except the intended recipient. Broadly cryptography algorithms can be divided into two categories [2]:-Private Key and Public key cryptography as shown in Fig 1.

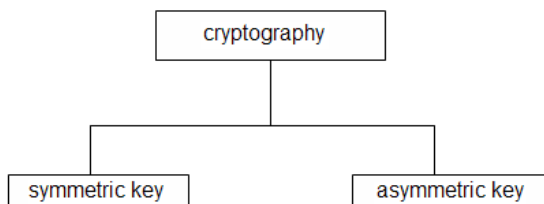


Fig 1 Types of cryptography

In Symmetric key (Private Key) [4] cryptography, same key is used by both the parties. The sender uses this key and an

encryption algorithm to encrypt the data and the receiver uses the same key and corresponding decryption algorithm to decrypt the data. The key is shared. The procedure is shown in Fig 2.

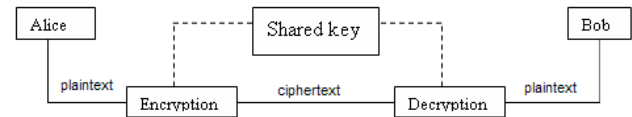


Fig 2 symmetric key cryptography

In asymmetric key (Public key) [3] cryptography, there are two keys: a private and a public key. Private Key is kept by receiver and public key is announced to the public. In Fig. 3, Alice uses the public key to encrypt message. Bob use private key to decrypt the message.

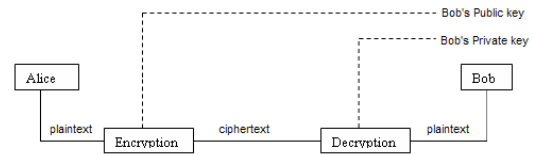


Fig 3 Asymmetric key cryptography

This paper tries to compare the performances of symmetric and asymmetric key cryptography algorithms. For this purpose a simulator was designed in MATLAB and time complexities of the both the mechanisms were calculated.

The rest of the paper is organized as follows: Section 2 provides the literature of the symmetric and asymmetric key cryptography. Section 3 provides the simulation set up parameters. Section 4 provides the result of both the cryptographic techniques followed by conclusion and references.

II. CRYPTOGRAPHIC ALGORITHMS INTO CONSIDERATION

a. RSA Encryption

RSA, named after its inventors Rivest, Shamir, and Adleman. It uses two numbers e and d, as public and private keys [4].

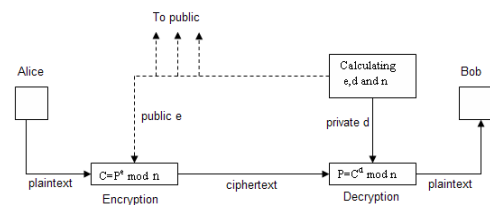


Fig 4 Block diagram of RSA key algorithm

RSA algorithm

1. Select two prime numbers p and q .
2. Find $n=p*q$, Where n is the modulus that is made public. The length of n is
consider
3. Choose a random number ' e ' as a public key in the range $0 < e < (p-1)(q-1)$..
4. Find private key d such that $e \times d \equiv 1 \pmod{(p-1)(q-1)}$.

Encryption

Consider the device A that needs to send a message to B securely.

5. Let e be B 's public key. Since e is public, A has access to e .
6. To encrypt the Plaintext P , represent the message as an integer in the range
 $0 < M < n$.
7. Cipher text $C = P^e \pmod n$, where n is the modulus.

Decryption

8. Let C be the cipher text received from A .
9. Calculate Message $P = C^d \pmod n$, where d is B 's private key and n is the modulus

b. Data Encryption Standard

DES was designed by IBM and adopted by U.S. government as the standard encryption method for non-military and non-classified use.

This algorithm [3] encrypts a 64 bit plain text block using a 64 bit key as shown in fig. DES has two transpositions blocks (P blocks) and 16 complex round ciphers. Although 16 iteration round ciphers are conceptually the same, each uses a different key derived from original key.

The initial and final permutations are keyless straight permutations that are the inverse of each other. The permutation takes a 64-bit input and permutes them according to predefined values. DES function applies a 48 bit key to the rightmost 32 bits R_i to produce a 32 bit output.

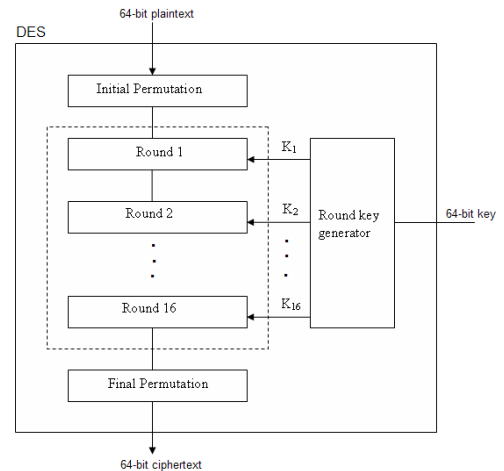


Fig 5 Block diagram of DES algorithm

3. Simulation Set up

a) Simulation Set up parameters

Table1: Set up parameters

Set Up parameters	
Processor	2.4 Ghz, i3 2370 M CPU
RAM	4 Gb
Operating system	64 bit
Key Size	64 bit
Tool used	MATLAB

b) Metrics Used

To measure the efficacy of the cryptographic algorithms, time complexity and brute force search time were calculated. Which are defined as follows:

- i. Time Complexity: Defined as the total time taken for the complete encryption and decryption of a particular file.
- ii. Brute Force search time: Time taken by cryptanalyst to decrypt the data without knowing the key used.

These parameters are very useful while designing any cryptographic algorithm since any cryptographic algorithm should take minimal time for encryption at the same time should have very high brute force search time.

4. Results

a) Impact on Time complexity :

Fig. 4 shows the impact of varying text size on the time complexity of symmetric and asymmetric key cryptographic mechanism. The following inferences can be drawn

- As the size of text file increases, the time complexity of both the algorithm increases linearly (approximately).
- The time complexity of asymmetric key cryptography is nearly three times compared to symmetric key cryptography.

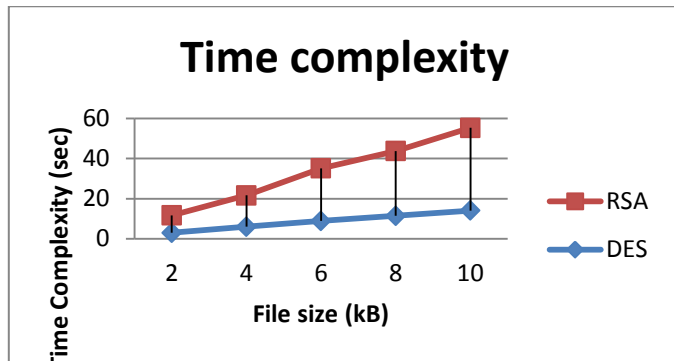


Fig. 4 : Time complexity for RSA and DES

b) Impact on Brute force search time

The brute force search time in both the cases will be same as the key size was taken to be 64 bit.

The average brute force search time for both the algorithms can be calculated as follows:

Table 2: Brute force search time calculation

Key size	Number of alternate keys required	Time required at 10^6 encryption / microsecond
64	2^{64}	$(2^{64} \times 10^{-12})/2$ Average time taken

Overall Conclusion

From the above results, the following things can be inferred

- The time complexities of asymmetric key cryptographic algorithms is quite high since they involve large mathematical calculations
- The average brute force search time of both the algorithms was same for the same key size.
- The symmetric key algorithms require third party or asymmetric key algorithms for creation of secret key whereas it is not so with asymmetric one.

The above results show that the asymmetric algorithms mechanism makes the process too slow. Hence it is advisable to use these mechanisms for smaller data sizes. They can also be very useful for secret key sharing between two nodes.

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Information Hiding Using Least Significant Bit

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A study on time complexity of least significant bit steganography

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Abstract—Steganography is the art of concealing private or sensitive information within a carrier for all intents and purposes, appears innocuous. It increases the level of privacy and security by making the confidential communication invisible. The most popular technique used is Least Significant Bit (LSB) substitution steganography. In this method, the least significant bits of pixels of cover image are replaced by secret data bits. This paper is an effort to find the impact of varying the number of least significant substitution bits of pixels by designing a simulator in MATLAB-11. The results show that as the number of LSB bits embedded is increased, the time complexity and capacity to embed secret data increases.

Index Terms— Confidentiality, LSB, Time Complexity

I. INTRODUCTION

With the recent advances in Internet computing and its invasion in our day to day life, the need for confidential and personal communication has increased. Privacy in digital communication is desired when confidential information is being shared between two entities via the computer communication. Existing technologies like cryptography [1-2] offer a solution by scrambling the confidential information in such a way that it cannot be read by anyone else except the intended recipient. However the issue with encryption is that the significance of the communication is highlighted because cryptographic data lacks the required logical sense [3] and can be easily recognized. Such illegible data can attract undue attention from eavesdropper, which is a threat for private and confidential communication. Thus privacy and confidentiality is lost by the nature of cryptographic solutions. This has caused concerns for those people who desire private and confidential communication. In an attempt to address above security issue, information hiding techniques like steganography have shows some promising solutions. Steganography communication is difficult to trace and hence it makes the job of the hacker difficult because the hacker now has to track all network communication rather than just encrypted communication. This steganography feature increases the level of privacy and security by making the confidential communication invisible.

One of the simplest and oldest steganography techniques is least significant bit substitution [4-8]. This technique involves

replacing the least significant bit of a first few pixels of the image with that of the bits of the data. In this paper we try to find the impact of varying the number of substitution bits on time complexity, capacity of the image to embed the data and image quality by designing a simulator in MATLAB-11.

The rest of the paper is organized as follows: Section 2 provides the algorithm of LSB. Section 3 gives the simulation set up parameters and the metrics used. Section 4 provides the results followed by conclusion and references.

Least Significant Bit (LSB) Steganography algorithm

Before discussing the algorithm we present some terminology used in the LSB algorithm.

- j is index of pixel of cover image
- c_i is cover image pixel on to which secret text data is embedded.
- s_i is stego image pixel
- m is number of bits in message pixel

Algorithm 1: Embedding process of LSB Substitution

```

for  $i = 1 \dots l(c)$  do
   $s_i \leftarrow c_i$ 
end for

for  $i = 1 \dots l(m)$  do
  compute index  $j_i$  where to store  $i$ th
  image bit
   $s_{j_i} \leftarrow c_{j_i} \leftrightarrow m_i$ 
end for

```

Algorithm 2: Extraction process of LSB Substitution

```

for  $i = 1 \dots l(m)$  do
  compute index  $j_i$  where to store  $i$ th image
  bit is stored
   $m_i \leftarrow \text{LSB}(c_{j_i})$ 
end for

```

The embedding process consists of choosing the subset $\{j_1$

to j_m of cover elements and performing the substitution operations $c(j_i) = m_i$ on them which changes the LSB of the $c(j_i)$ by m_i (m_i can be either 0 or 1). One could also imagine substitution process which changes more than one bit of the cover i.e. by changing two or more message bits in the least significant bits of the cover image which is done in our case.

In the extraction the LSB [9-10] of the selected cover elements are extracted and are lined up to reconstruct the secret message.

Simulation Set up :

a) Simulation Set up parameters

Table1: Set up parameters

Set Up parameters	
Processor	2.4 Ghz, i3 2370 M CPU
RAM	4 Gb
Operating system	64 bit
Number of bits substituted	1-4 bit
Tool used	MATLAB
Image type	TIF
Cover image size	512 X 619 pixels

b) Metrics Used

To measure the efficacy of the steganography algorithms, time complexity and capacity to embed secret data are used and defined as follows:

- Time Complexity: Defined as the total time taken by processor to complete the embedding and extraction process.
- Capacity: The number of bits which can be embedded into the cover image. It should be clear that as the number of embedding bits increases the image quality deteriorates significantly.

Results

a) Impact on time complexity

Fig. 1 shows the time complexity when the number of embedding bits are varied. The following inference can be drawn:

- As the number of embedding bits in the cover image increases, the time complexity increases significantly since the capacity to embed data increases.
- The image qualities deteriorates slightly as the number of embedding bits increases

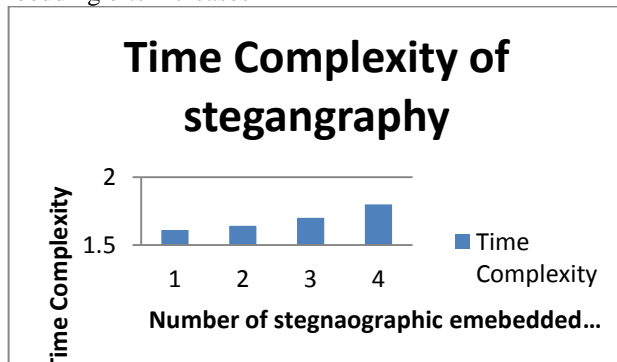


Fig 1 : Time complexity of Steganography



Fig 2 : Original image



Fig 3 : Result of applying 1 bit substitution



Fig 4 : Result of applying 2 bits substitution



Fig 5 : Result of applying 3 bits substitution



Fig 6 : Result of applying 4 bits substitution

b) Impact on capacity

Fig. 7 shows the impact on capacity by varying the number of embedding bits. We observe that the capacity doubles when the number of embedding bits is varied from one to two.

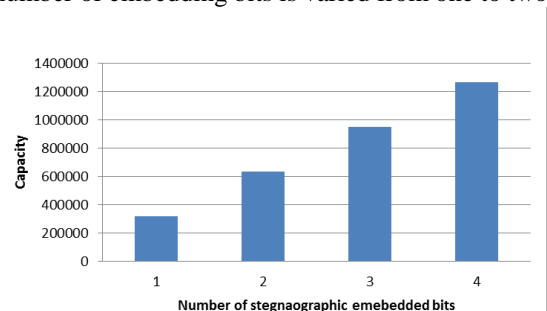


Fig 2: Capacity of the image to embed data for steganography process

1. Conclusion

The LSB modification technique provides an easy way to embed information in images. From the above results the following inferences can be drawn:

- The time complexity increases as the number of bits to be embedded in the cover image increases
- It may not be easily detectable by hackers when the number of bits embedded is increased up to four.
- The capacity increases as the number of bits to be embedded in picture increases.

These results can be very fruitful to researchers working in the direction of image processing and steganography

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Design and Simulation of PID controller of nanopositioner for minimum integral of error

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Abstract — “NANOTECHNOLOGY is the design, characterization, production and applications of structures, devices and systems by controlling shapes and size at nanometer scale.” One of the most important requirement of nanotechnology is precision control and manipulation of devices and materials at nanoscale i.e. nanopositioning. Nanopositioners are precision mechatronic system designed to move objects over a small range with a resolution down to a fraction of an atomic diameter. In particular, desired specifications of any nanopositioners are fast response with no or very little overshoot, large travel range with very high resolution, extremely high precision and high bandwidth. This paper presents design and identification of nanopositioning device consisting of flexure stage, piezoelectric actuator and displacement laser sensor. Open loop behavior of the nanopositioning device on the basis of time and frequency responses is studied. To improve the system characteristics feedback controllers are used. The key of the controller is to design a system with good dynamic characteristics as well as to maintain the desired stability margins. Despite continuous advancement in control theory, Proportional Integral Derivative (PID) controller is the most popular technique to control any process. To provide consistent, reliable and safe solution to the industrial control problems work, in this paper, Proportional (P), proportional- Integral (PI) and PID controllers are designed to minimize integral of errors. System performances for the desired parameters in closed loop are investigated. Comparative analysis of different controllers on the basis of time and frequency response is given. Simulation of results for the performance analysis is carried out in MATLAB.

Keywords— Nanopositioning, Piezo-actuators, closed loop system, controller, Integral of errors.

I. INTRODUCTION

Nanopositioners are important device of a huge family of SPMs that has emerged since the invention of the Scanning Tunneling Microscope (STM) and atomic force microscope (AFM). To achieve very high resolution a large number of nanopositioning device geometries have been proposed [5-9]. To require nanoscale precision, flexure based nanopositioning stage driven by stack piezoelectric actuators (PAs) are widely used. Flexure based mechanism eliminates back-lash, friction and lubricant requirement for the device and provide precise and repeatable motions. Use of piezoelectric actuators provides high stiffness, mechanical simplicity, compact size and effectively infinite resolution [9-12]. In general a nanopositioning device comprised of flexure stage, an

evaluation stage, a piezo actuator, sensor and control system. Typically, nanopositioning stage is actuated by an assembly of piezoelectric stacks and voltage amplifier. This assembly is placed in the slot of the flexure stage. The amplified output of displacement sensor (laser) after proper control action is applied across the piezo stack which leads to its deformation and imparting motion to the flexure stage and hence to the sample. Schematic block diagram of closed loop nanopositioning system is shown in figure 1, where Piezo-actuator, flexure stage, evaluation stage and sensor represents the nanopositioning system.

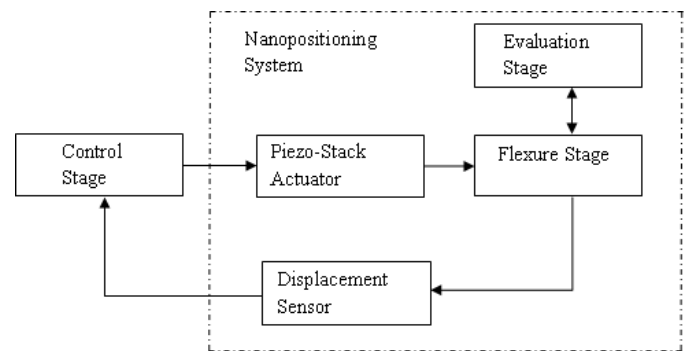


Figure 1. Block diagram of closed loop Nanopositioning System

II. DYNAMIC CHARACTERISTICS OF NANOPositioning SYSTEM

Nanopositioning system described above is modeled when it operates in the linear region of its characteristics. The piezo amplifier can produce output voltage of 0-75 V. Piezoelectric actuator is driven by step input of 4.25 volts. Device is modeled using its response in time domain. Actually the relationship between the applied voltage u and resulted displacement x (transfer function) is nonlinear mainly due to the hysteresis non-linearity in the PAs. But to design a controller, a second order linear dynamics of the system similar to mass- spring damper system can be assumed by ignoring the effect of hysteresis. The presented model adequately represents the dynamics of the system which can be approximated by the linear second order transfer function given as [13]

$$G(s) = \frac{X(s)}{U(s)} = \frac{9.055 \times 10^6}{s^2 + 229.8s + 5.11 \times 10^5} \quad (1)$$

Open loop analysis of the system involves finding poles and zero location in terms of system parameters and investigating the controllability and observability of the system. The locations of poles and zeros of open loop system can be found by open loop transfer function of the system. Poles are roots of denominator polynomial and zeros are the roots of numerator polynomial. Poles (eigenvalues) of open loop system are symmetric about imaginary axis consisting of pair of complex conjugate values, $(-1.15 \times 10^2 \pm 7.06 \times 10^2 i)$. As seen both eigenvalues have negative real part, which implying that system is asymptotically stable from the stability criteria. Damping ratio of 0.16 gives highly oscillatory response with natural frequency of 715.47 rad./sec. DC gain of the system is 17.72. The time and frequency response of the open loop nanopositioning system is given by figure 2 and 3 respectively.

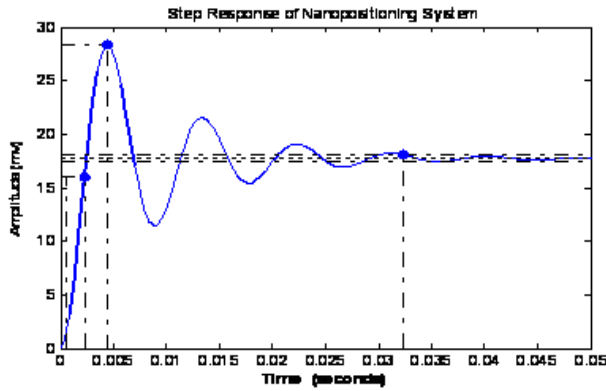


Figure 2. Time response of open loop Nanopositioning Device

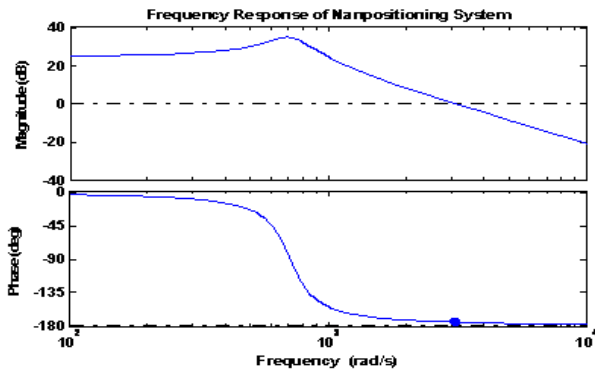


Figure 3. Frequency response of open loop Nanopositioning Device

Time response analysis gives the rise time of 1.7 msec, settling time of 0.0323 seconds and overshoot of 59.90 which is very large and must be avoided by applying suitable control

techniques. It can be seen that speed of the system i.e. settling time of the transient response is governed by the dominant poles of the system. By analyzing the frequency response, it has been observed that open loop system has phase margin of 4.5 degree at gain crossover frequency of 3.09×10^3 rad/sec and infinite gain margin.

III. STATE SPACE ANALYSIS OF NANOPositionER

Open loop system using State space representation can be described by state equation and output equation [14] given as

$$\dot{x} = Ax + Bu \quad \text{State equation} \quad (2)$$

$$y = Cx + Du \quad \text{output equation} \quad (3)$$

Where x is state vector of the system

u is control signal, y is output signal

A is $n \times n$ state matrix (n is the number of states or order of system)

B is $n \times 1$ input matrix

C is $1 \times n$ output matrix

D is direct transmission matrix (scalar)

A. Controllability

A system is said to be controllable if it is possible by means of input vector $u(t)$, to take a system from any initial state $x(t_0)$ to any final state $x(t_f)$ in a finite time $(t_f - t_0)$ where $t_0 \leq t \leq t_f$. For a completely controllable system every state must be controllable [12].

Based on controllability matrix C_t , a system given by equations (2) and (3) is said to be completely controllable if and only if the rank of controllability matrix C_t is equals to the order of system [14,15].

$$C_t = [B : AB : \dots : A^{n-1}B] \quad (4)$$

A system is said to be stabilizable if matrices A and B are controllable. In the present case the rank of controllability matrix is 2 and hence system is completely state controllable.

B. Observability

An unforced system (input vector $u(t) = 0$) is said to be completely observable if any initial state $x(t_0)$ can be determined by the observation of output $y(t)$ over a finite interval $t_0 \leq t \leq t_1$. Sometimes all state variables are not accessible for direct measurement, in such situations the concept of observability is very useful to reconstruct immeasurable state variables from the measurable variables in a very short period of time.

Based upon observability matrix O_t , a system described by state space equations (3) and (4) is said to be completely observable if and only if the rank of observability test matrix O_t is equals to the order of system.

$$\mathbf{O}t = [\mathbf{C}^T : \mathbf{A}^T \mathbf{C}^T : (\mathbf{A}^T)^2 \mathbf{C}^T : \dots \dots (\mathbf{A}^T)^{n-1} \mathbf{C}^T] \quad (5)$$

A system is detectable if matrices A and C are observable. For the system given by equation (1), the rank of observability matrix is 2 which is equal to the order of system hence from the observability test theorem the system is completely observable.

IV. CONTROLLER DESIGN

The primary objective of the control design is to achieve precise tracking of arbitrary input signals with high bandwidth in spite of external disturbance. The feedback laws should be design so that it provides control signal that is within actuator saturation limits. Both feedback and Feedforward controls are important for achieving precise positioning with high resolution. The most popular technique for the control of commercial nanopositioning system is the sensor based feedback using an integral or proportional integral control. These controllers are simple, robust to modeling error and effectively reduce the piezoelectric nonlinearities because of having high loop gain at low frequencies [16,18]. In the applications where high performance and accuracy are not critical constitutive, nonlinearities of piezoelectric nanopositioning stage and hysteresis can be compensated by standard Proportional Integral (PI) or Proportional Integral-derivative (PID) controllers.

Different types of control approaches can be used to improve the positioning performance of nanopositioning devices. Different applications may require different specifications. Generally, the desired specifications for the time response include small rise time and settling time, zero steady state error, zero or very small overshoot (not more than 25%) and no oscillations. For stability requirements, phase margin (PM) and gain margin (GM) must be positive.

In closed loop system a part of actual output of the system is feedback to the input where it is compared with set point or reference signal. The error signal (difference between actual output and reference input signal) is applied to the controller. Controller controls the manipulated variable so that there is zero deviation between actual output and desired output y. The feedback control system can use Proportional P controller, Proportional integral (PI) or Proportional Integral - Integral (PII) controller or Proportional- Integral -Derivative (PID) to minimize control error e so that actual output y tracks the reference signal r. Fast speed, increases in bandwidth, sub-nanometer resolution and reduction of effects of nonlinearity are the prime objectives of feedback system.

PID controller is the most widely used controller to control many industrial or non industrial processes because of simple structure and satisfactory performance [13]. To obtain desired performance parameters, PID controller is tuned. The values of the tuning parameters depend upon the dynamics characteristics of the device and the desired closed loop

specifications. Tuning of a controller is the adjustment of its control parameters such as proportional gain Kp or band for proportional controller, integral gain Ki or reset time (integral time constant) Ti in integral controller and derivative gain Kd or rate (derivative time constant) Td in case of derivative controller. To tune PID controller, all these three parameters are to be adjusted to obtain desired performance specifications of the system [13,14]. PID controller behaves like a PI controller at low frequencies and like a PD (proportional Derivative) controller at high frequencies. So PID controller is most suitable for mid range frequencies where it behaves both as PI and PD controller.

In the time domain the output u(t) of the controller can be written as:

$$u(t) = K_p \left[E(t) + \frac{1}{T_i} \int_0^t E(t) dt + T_d \frac{dE(t)}{dt} \right] \quad (6)$$

Based on Integral error criteria, controller tuning relation optimizes the closed loop response of a simple process model for disturbance rejection and set point change. The optimum setting minimizes the integral error criteria and utilizes the entire response of the process. The integral of the square (ISE) criteria penalizes the large error and Integral of the time weighted error absolute (ITAE) criteria penalizes the error that persist for long period of time. In general ITAE ia also a preferred criteria because it results in most conservative controller design setting. For the suppression of small error, integral of the absolute value of the error (IAE) is better than ISE.

V. SIMULATION AND ANALYSIS OF CONTROLLERS

The design objective is to determine a controller Gc(s) to obtain good set point response and system's stability margins In this paper, to minimize integral errors such as IAE, ISE, ITAE and ITSE, P, PI and PID controllers are designed using MATLAB SISO design toolbox. The proportional controller gain for all error criterions is same and the time and frequency response performance parameters for proportional controller are given in table 1.

Table 1. Performance characteristics of system using proportional controller

Integral error	Rise time (sec.)	Settling time (sec.)	Maximum overshoot	Gain margin (db)	Phase margin
IAE = ISE	0.000357	0.0335	88.7%	8	6.47

As seen from the table 1, the use of P controller improved the transient response characteristics and stability characteristics. There is a drastic improvement in the rise time of the system response from 0.001666 to 0.000357 sec. but

this controller also increases the value of maximum overshoot. To decrease maximum overshoot, an integral term can be attached to the proportional controller. The performance parameters of PI controller for different error criterion are given in table 2.

Table 2. Performance characteristics of system using PI controller

Integral error	Rise time (sec.)	Settling time(sec.)	Maximum overshoot (%)	Peak Gain (db)	Phase margin (degree)
IAE	0.000383	0.0666	83	27.5	3.28
ISE	0.0017	0.0562	14.6	13.5	10.2
ITAE	0.0628	1.22	0	5.48	38.3
ITSE	0.000383	0.0666	83	27.5	3.28

Analysis of table 2 depicts that PI controller improves the maximum overshoot but at the cost of increase in rise time. Moreover the response of closed loop nanopositioning system for IAE and ITSE are same. The use of PID controller improves the system performance effectively. The time and frequency response of PID controller is shown in figure 4. The analysis of these responses of the nanopositioning system using PID controller to minimize all errors is tabulated in table 3. Again the PID controller transfer function and performance of system is same for all error criterions.

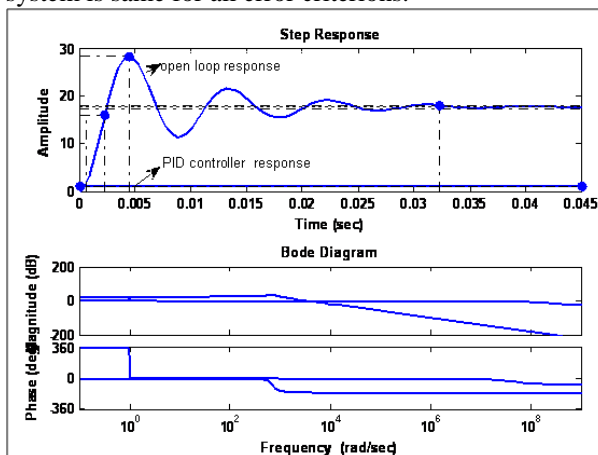


Figure 4. Time and frequency response of nanopositioning system

Table 3. Performance characteristics of nanopositioning system using PID controller

Integral error	Rise time (sec.)	Settling time(sec.)	Maximum overshoot (%)	Gain margin (db)	Phase margin (degree)
IAE	4.86×10^{-8}	2.39×10^{-9}	0	21.1	80

VI. CONCLUSIONS

The open loop response of the system shows that it has very slow response with high value of maximum overshoot. The transient response characteristics and stability margins of the system have been improved using different controller on the

basis of minimization of the integral of error. Use of proportional controller hardly improves the system performance. PI controller for IAE gives good results regarding transient response parameters. For ITAE, PI controller totally eliminates the maximum overshoot. Drastic improvement in the system performance has been achieved using PID controller. This controller gives rise time of 4.46×10^{-8} sec. as compared to 0.00166 sec. of open loop system and totally eliminates the maximum overshoot.

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Combined heat and power applications of solar energy

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I. INTRODUCTION

Solar radiation can be converted to more useful forms of energy principally heat, mechanical or electrical power. Solar heat is being carried out by means of a variety of solar thermal collectors. Solar heat after getting converted into light is being used for variety of end uses including water pumping, lighting and refrigeration. Solar energy technology conversion can be achieved by solar thermodynamic and solar photovoltaic routes.

When radiant energy strikes the surface of an object, a proportion depending upon the angle of incidence and the nature of the surface is reflected, a part is absorbed and some of it is transmitted through the object. Assemblies of photovoltaic cells are used to make solar modules which generate electrical power from sunlight. Multiple cells, in an integrated group all oriented in one plane, constitute a solar photovoltaic panel or module. A group of connected solar modules is called an array. Solar cells can be made from several different semiconductor materials, and these materials are available in a variety of physical states – single crystal, polycrystalline or amorphous. High power concentrating photovoltaic (HCPV) multijunction Ga As cell battery, with a broad absorption spectrum, high efficiency, good temperature characteristics, low power manufacturing process etc., so that it can focus on high power high temperature environment remains under a high photoelectric conversion efficiency. HCPV products include the extension of multijunction solar cell materials, photovoltaic conversion chip, optical receiver components, condenser, PV modules, dual – axis tracker and so on. Battery chip multi junction technology a substantial increase in photoelectric conversion efficiency compared with silicon based materials, based on III-V semiconductor multijunction solar cell

has the highest photoelectric conversion efficiency of silicon solar cells. The cost of a PV device is determined by several factors which include the kind of materials used, the amount of materials required, the choice of substrates, the device design and the fabrication processes. The choice between higher efficiency and lower fabrication cost often boils down to a choice between crystalline and thin film materials. Crystalline devices are generally more efficient, but thin film devices cost less.

The goal of PV technology is to generate large amounts of power in conjunction with the existing utility grid, thereby displacing fossil fuel use. Voltage support systems are defined as centralized PV systems, between 250 and 1000KWp in size are deployed with the existing utility transmission grid to support the electrical service quality (voltage, power factor etc.) during periods of peak demand. Stand alone micro utility shares many of the characteristics of the voltage support systems. Apart from optimization and associated incremental improvements in cell efficiency, the areas which need attention are – reducing the quantity of silicon used through thinner wafers and more efficient ingot sawing, developing new high volume, energy efficient routes for purifying silicon to provide low cost solar grade silicon and optimizing cell processing to achieve production efficiencies approaching 20% for standard crystalline silicon cells and upto 16% for cells made from low purity upgraded metallurgical grade silicon.

II. LITERATURE REVIEW

Solar thermal : Solar power plants use the Sun's rays to heat a fluid from which heat transfer systems may be used to generate steam that in turn is used to drive a turbogenerator or the fluid may be used to operate an engine directly. Fuel is direct heat energy

rather than stored energy in the form of fossil fuels , from which the heat energy needs to be released by combustion.

The land requirement of solar thermal plants is worth consideration. The current calculated cost for electricity production at solar electric generating stations plants varies between various plants due to the difference in quoted capital costs. Economies of Scale in manufacture should result in further lowering of costs.

Solar photovoltaics: Converting light energy directly to electrical energy using photovoltaic devices. Photovoltaic modules are made from a number of materials and fabricated in a variety of different designs. The wavelength of the sunlight absorbed depends on the band gap of the material. The materials are designed so that the electrons can not return to these sites easily except by flowing through an external circuit thus generating a current. A typical solar cell consists of a layer of semiconductor material sandwiched between conducting top and bottom layers. Modules can be further interconnected to form arrays. Nontracking arrays that remain in a fixed position and tracking arrays that follow the Sun's movement across the sky.

III. ADVANTAGES AND DISADVANTAGES COMPARISON FOR PHOTOVOLTAICS

ADVANTAGES	DISADVANTAGES
Fuel source is vast.	Fuel source is diffuse.
No emissions, no combustion or radioactive fuel for disposal.	High installation costs.
Low operating costs.	Poorer reliability of auxiliary elements including storage.
No moving parts.	Lack of economical efficient energy storage.
Ambient temperature operation.	
High reliability in modules.	
Safe	

First Generation Photovoltaics : Silicon wafer based photovoltaic is the dominant technology for terrestrial applications. Single crystalline and multi crystalline wafers , allow power conversion efficiencies upto 25%.

Second Generation Photovoltaics : Based on the

use of thin film deposits of semiconductors , such as amorphous silicon, cadmium telluride , copper indium gallium diselenide or copper indium sulfide. The efficiencies of thin film solar cells tend to be lower compared to conventional solar cells , around 6% to 10% , but manufacturing costs are also lower , so that a price in terms of \$/watt of electrical output can be reduced.

Third Generation Photovoltaics: dye sensitized nano crystalline or Gratzel solar cells , organic polymer based photovoltaics , tandem solar cells , hot carrier solar cells , multiband and thermophotovoltaic solar cells.

Photovoltaic cells can be defined as photodiodes , which are operated under forward bias. They are designed to capture photons from the solar spectrum by exciting electrons across the band gap of a semiconductor , which creates electron hole pairs that are then charge separated typically by p-n junction introduced by doping. The space charge at the p-n junction interface drives electrons and holes in opposite directions , creating at the external electrodes a potential difference equal to band gap. A semiconductor can only convert photons with the energy of the bandgap with good efficiency. Photons with lower energy are not absorbed and those with higher energy are reduced to gap energy by thermalisation of the photogenerated carriers.

In addition to PV modules we must purchase balance of system (BOS) equipment. This includes Battery charge controllers , batteries, Inverters , wires, conduit, grounding circuit , fuses , safety disconnects , outlets , metal structures for supporting the modules and any additional components that are part of the PV system. A PV system may have to be sized to store a sufficient amount of power in the batteries to meet power demand during several days of cloudy weather. BOS Cost = Business Processes Cost + Structural system + Electrical system.

Estimate of the sizing of PV array and batteries can be calculated using the following design rules: (1) Determine the total load current and operational time. (2) Add system losses. (3) Determine the solar irradiation in daily equivalent sun hours. (4) Determine total solar array current requirements. (5) Determine optimum module arrangement for solar array. (6) Determine battery size for recommended

reserve time.

Blocking diodes are installed in solar arrays to prevent reverse current flows into the modules, which may damage the modules and cause energy losses. By-pass diodes are incorporated into modules to prevent damage of arrays when some cells or modules become shaded.

IV. CONCLUSION

Increase in PV market will also play an important part in cost reduction because of economies of scale and incentives for innovation in manufacturing. The incentive to PV manufacturers decrease costs substantially, which will occur only if the market increases are large enough to enable the industry to recoup its investment in PV research and development. Other future issues of importance in PV industry are the supply of raw materials as the crystalline silicon PV market expands beyond the waste silicon available from the semiconductor industry. Emphasis has been on photovoltaic modules, when the balance of System components form 40 % to 60% of the total cost. Economies of scale and extensions in component lifetimes are expected to be the 2 main factors in reducing these costs. Batteries are an expensive component with shortlifetime and needs replacement.

The Effect of Technological Advancements on the Life of a Farmer

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Abstract—The human race has not worried much about climate in the past few years but now everyone is worried. And, why not? The climatic changes will slowly hit the most important thing to mankind – food. And the worst part is that the human race is responsible for this climatic change.

I. INTRODUCTION

Even after many movements to better the planet, there has never been actual worry in the minds of humans regarding climate change. Obviously, the changes have slowed down but in the past few years, it has really hit humans how they have ill-treated the planet. And during this payback time, the resource that has been hit the worse is food. But it is not just the climate that we need worry about. The population is also rising. It has increased to almost 6 billion and in the next 50 years, it is expected to double! How will mankind manage to deal with both these changes – climate and the population? How will the increasing demand of grain going to be met with.

Famines in Somalia, the floods in Pakistan in 2010, droughts and other frustrating natural calamities bother not only the people but also the farmers. The need of the moment is an integrated research to adapt to the climatic changes and also ensure that farmers are aware of these changes and they can be prepared. Each country will need a different solution or rather it would be better to say that climate will need a different agricultural solution. With this in mind, a number of solutions are already in place. But they have their benefits and pitfalls.

Genetically Modified Foods (G.E.M)

One of the changes in place is the genetically modified foods that first began as an experiment to resolve the hunger caused by increase in population, while preserving the environment by reducing dependency on herbicides and chemical pesticides. It also sought to solve any malnutrition problems.

G.E.M have a lot of advantages –

1. **Pest Resistant Crops** – A lot of crop losses occur from pests, resulting in starvation and losses to farmers. Farmers use a lot of chemical pesticides to protect the crops but consumers do not wish to eat these types of foods to protect their health. Now what is the solution? The solution is to grow GM crops like B.t corn. This has a double advantage – use of pesticides is eliminated and the cost of marketing the crop is reduced. Both the farmer and the consumer is happy.

2. **Herbicide Tolerance** – In the U.S, farmers are transitioning from traditional methods of farming to organic farming. And so, they are changing to producing feed grains using organic methods. But organic farming has its pitfalls – one of the biggest being weeds. A 4-year study by Penn State University and University of New Hampshire discovered that for weed management, full tillage was needed. But it is not a cost effective method. So, using herbicide is the solution. But, the herbicide should not harm the crops.

This is where genetically engineered crop plants that are herbicide-tolerant can help. One example is of the genetically modified soybean strains created by Mosanto that are unaffected by herbicides. So, when the farmer growing these soybeans can use weed-killers that will kill the weeds without affecting the crop. The result is increased productivity and reduced costs of production.

3. **Disease Resistance** – The genetically modified crops used are also disease resistant. The bacteria, fungi and viruses that attack plants are ineffective against G.E crops.

4. **Climate tolerance** – Climatic changes such as frost, drought, salinity and others do not affect these genetically modified plants. For example, plants like potato and tobacco have been 'introduced with an anti-freeze gene from a fish that helps them to tolerate low temperatures. Similarly, the example of Subamarino rice, bred by International Rice Research Institute of Phillippines, that managed to recover even after being submerged for nearly 14 days during the flooding in parts of Phillippines,

shows how beneficial G.E.M can be.

5. **Nutrition** – In the 3rd world countries, malnutrition is a major problem. In these countries, the staple diet is rice, which does not contain adequate nutrition, resulting in malnutrition. Genetically engineered rice, containing essential minerals and vitamins can alleviate the nutritional deficiencies. One example is the ‘golden’ rice created by researchers of Swiss federal Institute of Technology Institute for plant sciences that contain a high quantity of beta-carotene. Consumption of this form of rice can alleviate Vitamin A deficiency. This rice has not yet been marketed as yet due to protests in Europe. But it is hoped that the Institute’s hopes for offering this ‘golden’ rice free of cost to the third world countries will soon come to effect.

But the farmers of the 3rd world countries who grow rice to earn their living will lose out till they are able to make the transition from the traditional rice to this ‘golden’ rice.

G.M. crops are also adversely affecting the lives of farmers. One of the biggest disadvantages of G.M. plants is that they cannot always be grown as crops as underwater pollution and contaminated soil can result in their damage. Although some plants like the poplar trees have been engineered to clean the soil, till the time that soil pollution can be eliminated, these will be grown in controlled conditions. This is not good news for the farmers for the consumers will surely prefer the G.M. crops.

Environmental Hazards of G.E.M and Solution

While G.E crops are beneficial, they also have some environmental hazards like affecting mortality rates of some organisms, the reduction in effectiveness of pesticides and gene transfers to species that are not targeted.

It is a concern that some insects will become B.t resistant or to other crops genetically produced. It is also a concern that the herbicide tolerant plants and weeds may cross-breed resulting in transfer of the herbicide resistant gene to the weeds that will not be responsive to herbicides.

But there is a solution to these problems. One is to modify G.M. crops and create male sterile plants so that the carried pollen does not have the new gene. Hence, cross-pollination can be prevented and other harmless species can be protected.

Also, creating buffer zones around the GM crop fields can ensure that beneficial pests are

unharmd and the crop destroying pests do not develop B.t pesticide resistance. But this solution does not seem to be feasible for farmers as it can be expensive. It will required a lot of acreage so that buffer zones can be created.

Economic Concerns of G.E.M

Marketing - Marketing the G.E crops is an expensive and lengthy process. Agri-biotech companies can make a tidy profit out of these crops but what of the farmers? The crops are undoubtedly, of superior quality but can the farmer afford to buy the seeds for G.E crops? They will be expensive because of the cost that goes into their creation. The biggest fear is that the gap between the poor and the wealthy will widen noticeably. Farmers of the third world countries and small farmers will not be able to afford these seeds.

Patent Enforcement - Patent enforcement is another concern. Farmers contend that the Monsanto strains involuntarily grew in their farms when they were cross-pollinated. To resolve the patent infringement issue, the only solution seems to be to introduce a ‘suicide gene’ so that the plants do not regrow after one season. The farmers will have to buy genetically engineered seeds to grow crops in the next season. But this will place a financial burden on the farmers, leading to financial disasters.

Tillage - In the US, in the cropping experiments conducted in Central Pennsylvania, it was found that the growers wishing to change to organic production would face varying economic success as it involved compost and manure costs. It would depend on the source of manure – whether it was purchased or available on-site.

At present, G.E.M foods are not very prevalent in the market, which show that not too many farmers have adapted to these techniques owing to the costs involved and the fact that there are only a few crops or plants that have completed the federal requirement for commercialization.

Use of Wind Farms in Agriculture

When it comes to dealing with climatic changes, wind farms help grow some crops like soybean and corn grow better. The wind turbines coll the surrounding areas during the day, thereby reducing the temperature. A study conducted by the University of Colorado on

soybean and corn crops also found that wind turbines preventive autumn and spring frosts resulting in reduction of action of the pathogenic fungi that grow on leaves of these crops.

It was also found that the reduction in temperature made a positive difference to the maize cultivation.

But the noise, especially during night-time, is causing health concerns. In UK, the permitted noise levels is 42 decibels, but can still cause stress related disturbances, especially, since the wind turbines are so close to the houses.

The wind-farm industry has been recently attacked and if the directive goes through, will it sound the death knell for them? These farms are, no doubts, very useful as they generate energy and wind power, which is subsidized. What will it mean for the farmers who depend on wind farms for their source of energy and for their crops?

Farmers in countries are slowing making use of science in agriculture. Although the transition from traditional methods to scientific methods is slow, it is hoped that soon all the troubles involved in the transition can be resolved to the mutual satisfaction of both the consumer and the farmer.

Weed Management

How is it possible to talk of agriculture without any mention of weeds? This unwanted plant is something that the farmer dreads as it can cause harm to the plants or crops that he needs for his survival. Sometimes, excess growth of weeds can also be harmful to livestock. However, the good news is that weed control is possible by various methods.

1. **Organic Gardening** – This form of weed control makes use of systems like Square foot gardening, humus, mulch and fertilizers to control the growth of weeds. While square foot gardening can be time-consuming and leads to wastage of space, using humus, mulch and fertilizers is another way to control weed growth. These organic products are effective and inexpensive. Also, they can be made using materials that the farmer has.

2. **Application of Various Herbicides** – Herbicides, on the other hand, is another form of weed control that may or may not be effective. The reason why the herbicides become ineffective is that weeds develop

resistance after some time. However, researchers have come up with a way to reduce weeds – by strategically applying herbicides in different ways. It may be an expensive way to control and reduce weeds but it is immensely effective.

One of the herbicides commonly used was glyphosate. Horseweed, a type of weed, developed a resistance to this herbicide and the product started losing its effectiveness.

A five-year study, conducted by Purdue University, shows that if farmers keep rotating various herbicides, then they can easily control weeds. It was found that fields using 3 kinds of herbicides reported nearly 95% decrease in horseweed, thereby proving that application of various herbicides can control weeds.

For the farmer, this is good news as decreased weeds means increased crop yield.

Climatic Changes

Before the farmer starts worrying about weeds, there is another danger looming – climate change. The increase in temperatures is no doubt, going to change to face of the planet but another thought is how it is going to affect our food production. It is going to mess with global agriculture leading to famines and hunger. This is when people are talking about global agriculture.

So, what is global agriculture and what does climate change actually mean for the farmer?

If you are talking about global agriculture, then the need is to ensure there is an increased production of food globally as the population is increasing.

And, since the world is becoming a warmer place to live, changes will have to be made so that agriculture adapts to this new world soon so that no one goes hungry. Whether it is the 2010 floods in Pakistan or the droughts of East Africa, unless agriculture adapts, the human race has no hope of surviving.

The burden now falls on the farmer to continue producing crops and keep feeding the human race. In this, he has help from the researchers who have worked to grow crops that are not easily damaged.

Growing Wheat

Wheat is one of the most important crops in the world. Scientists have now found the hidden components of its genetic code. This discovery will help in breeding more varieties of disease and climate resistant wheat that will help reduce crop losses. This discovery is a major breakthrough in the field of agriculture.

Wheat resistant to Stripe Rust

Researches in wheat have been continuing since long and researchers have already discovered a gene that is resistant to stripe rust. Yr36, the resistant gene, was extracted from wild wheat and introduced into domesticated bread wheat. This wild wheat is native to Fertile Crescent, Israel, where many varieties of wheat have been grown since ancient times.

Stripe rust is one of the major diseases that wipes out wheat crop. Stripe rust outbreaks have occurred since the 1950s. Since the fungus causing this disease spreads by wind, it ruins crops during wet summers and springs and mild winters. Yr36 provides protection against this dreaded fungus and is effective in fighting Stripe rust.

Wheat Resistant to Rot

Crown rot is yet another disease that results in major crop losses every year in Australia. It is a chronic problem in the country, caused by *Fusarium*, a fungus. Scientists in Brisbane are working to find and develop wheat strains that are resistant to Crown Rot. Their success will help farmers grow wheat that can feed the country and also, escape losses.

Salt Tolerant Wheat

Meanwhile, wheat farmers in Australia have cause to rejoice. Researchers have developed wheat that is not only salt-tolerant but also yields 25% more crop in saline soils.

Salinity was a big environmental issue in Australia that affected its wheat-growing regions. The saline soil destroyed durum wheat. The introduction of genes that left out salt in durum wheat enabled the crop to survive in a saline environment. This genetic modification of salt-tolerant wheat is good news for all the saline wheat growing regions in the world. These experiments are not only for wheat but also for rice and the results are very promising. Soon farmers in saline areas will not have to experience crop losses.

Genetically modified food is good on one hand for the farmers who will not have to suffer crop losses due to climatic and other reasons. But what stand do the governments of various countries take on these GM foods? How are they regulated?

A regulatory process is yet to come into place for GM foods. Governments have to

work out ways to monitor and approve newer varieties of crops that provide more yield and are disease resistant.

In Japan, GM food testing is voluntary and supermarkets are offering both unmodified and modified food.

The Indian government has yet to take a stand, as GM crops are not grown in the country. Therefore, these foods are not available in the supermarket. But, considering India's endemic poverty and population explosion, the country will have to take drastic measures that can counteract the poverty and feed the population. If given the chance, Indian farmers can grow various crops like wheat and rice, that are disease resistant and those that can grow in various climatic conditions.

In total contrast to Japan, there are some Brazilian states where there is a ban on GM crops. It is believed that importing GM crops into the country will cause economic harm and the country will not be able to compete globally with other agricultural countries.

Europe has its share of anti-GM workers too. US regulations are confused about GM crops.

Conclusions

There is no doubt that adapting agriculture to the climatic changes and growing genetically modified crops will benefit human race. Will it benefit the farmers too? Yes, if they are given sufficient economic support. It is the farmers who will be growing these crops and it would not be fair to burden them economically. The governments have to find a way to introduce these globally beneficial crops into the country without harming them that grow the crops.

Growing GM crops does not mean just getting GM seeds and sowing them. It also means using different pesticides, managing weed and monitoring the effects of this new generation of crops. The results of crops grown in fields may be different from those grown in labs.

The government and the researchers share the responsibility with the farmers for producing crops that can benefit mankind without destroying other plants or species.

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The God Particle: A Brief Idea

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Abstract—Standard model of particle physics describes that the matter is made up of quarks and leptons. The basic interacting forces between these Fermions are Electromagnetic force, weak force and strong nuclear force. These forces are mediated by photon, W and Z bosons and gluons. All the above mentioned particles predicted by standard model of particle physics were observed experimentally except the one boson, which plays a vital role in acquiring the mass to these above mentioned constituent particles. This particle was first proposed in the 1960s by the English physicist Peter Higgs. After decades of careful experiment, physicists found the existence of the Higgs boson, a subatomic particle so important to the understanding of space, time and matter that the physicist Leon Lederman nicknamed it “The God Particle”.

I. INTRODUCTION

During the last five decades, all the experimental investigations on particle physics validate the theoretical predictions of the standard model of particle physics. Standard model describes that the matter is made up of six quarks and six leptons. Quarks and Leptons are Fermions, since they follow Ferm-Dirac statistics. The basic interacting forces between these Fermions are Electromagnetic force, weak force and strong nuclear force. The electromagnetic force is mediated by a photon, the weak force is mediated by W and Z bosons and the strong nuclear force is mediated by gluons. These mediators or force carrying particles follow Bose-Einstein statistics hence called as bosons. According to the standard model, the Higgs boson is the particle manifestation of a force field which is prevailing around us. This force field is also called as Higgs field. The quarks and leptons and force carrier particles predicted by standard model have now been observed experimentally except the Higgs boson. The Higgs boson particle was first proposed in the 1960s by the English physicist Peter Higgs. The international effort to find it has taken decades.

II. THE LARGE HADRON COLLIDER (LHC)

The Large Hadron Collider (LHC) is the world's largest and highest-energy particle accelerator built by the European Organization for Nuclear Research (CERN) from 1998 to 2008, to test the predictions of different theories of particle physics and high-energy physics, and particularly prove or disprove the existence of the

hypothesized Higgs boson. The LHC is expected to address some of the most fundamental questions of physics, advancing human understanding of the deepest laws of nature. It contains six detectors each designed for specific kinds of exploration.

The LHC was built in collaboration with more than 10,000 scientists and engineers from over 100 countries, as well as hundreds of universities and laboratories. It lies in a tunnel 27 kilometres in circumference, as deep as 175 metres beneath the Franco-Swiss border, Geneva, Switzerland.

Large Hadron Collider's synchrotron is designed to initially collide two opposing particle beams of up to 7 TeV per nucleon, or lead nuclei at an energy of 2.76 TeV per nucleon-pair. Collision data was also anticipated to be produced at an unprecedented rate of tens of petabytes per year, to be analysed by a grid-based computer network infrastructure connecting 140 computing centers in 35 countries (by 2012 the LHC Computing Grid was the world's largest computing grid, comprising over 170 computing facilities in a worldwide network across 36 countries).

III. OBSERVATIONS:

By November 2012 the LHC had discovered two previously unobserved particles ($\chi_b(3P)$ bottomonium state and a massive boson awaiting identification but suspected to be a Higgs boson), created a quark–gluon plasma, and recorded the first observations of the very rare decay of the B_s meson into two muons ($B_s^0 \rightarrow \mu^+\mu^-$), a major test of supersymmetry.

After decades of careful experiment, physicists say they have found the "strongest indication to date" to prove the existence of the Higgs boson -- a subatomic particle so important to the understanding of space, time and matter that the physicist Leon Lederman nicknamed it "the God particle."

Roser, a Fermilab physicist, said he expected the CERN scientists to offer more evidence of the Higgs particle, though they will also be cautious. "The Higgs particle, if it's real, will show itself in different ways. We need for all of them to be consistent before we can say for sure we've seen it". Scientists who used the Tevatron have been sifting through the masses of data they collected by sending subatomic particles crashing into each other at nearly the speed of light.

"During its life, the Tevatron must have produced

thousands of Higgs particles, if they actually exist, and it's up to us to try to find them in the data we have collected," said Luciano Ristori, a physicist at Fermilab and the Italian National Institute for Nuclear Physics, in a statement. "We have developed sophisticated simulation and analysis programs to identify Higgs-like patterns. Finding the Higgs particle would not be of practical value, at least not yet, but Roser argued that when the electron was first discovered in 1897, nobody guessed how it would lead to the high-tech, wired world we have today.

Physicists say the Higgs boson would help explain how we, and the rest of the universe, exist. It would explain why the matter created in the Big Bang has mass, and is able to coalesce. Without it, as CERN explained in a background paper, "the universe would be a very different place.... no ordinary matter as we know it, no chemistry, no biology, and no people."

IV. CONCLUSION:

The collection of the data from the Large Hadron Collider experiments predicts that there they observed a new particle, which could be Higgs Boson. The collection of further data will enable a more rigorous test of the conclusion that the newly observed particle is standard Model Higgs Boson.

ACKNOWLEDGMENTS:

The article published in Physics News by Prof. J.B. Singh, Discovery of Higgs boson like particle at the Large Hadron Collider (CERN), Bulletin of the Indian Physics Association, Vol.42, No.3, July 2012 and "http://en.wikipedia.org/wiki/Large_Hadron_Collider" helped a lot in writing this article.

Performance improvement of bus suspension using PID controller

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Abstract—This paper deals with the nonlinear system of Bus Suspension system. This paper presents identification and modeling of bus suspension system with the disturbance. When the suspension system is designed, a 1/4 bus model (one of the four wheels) is used to simplify the problem to a one dimensional spring-damper system. The open loop behavior of the system on the basis of time and frequency response is analyzed. State space modeling of the device is done to analyze its state space behavior. A good bus suspension system should have satisfactory road holding ability, while still providing comfort when riding over bumps and holes in the road. When bus experiences any road disturbance such that pot holes, cracks, and uneven pavement, the bus body should not have large oscillations or oscillations should dissipate quickly. The system should have short settling time and also have the ability to absorb all the bumping. To achieve all these objectives closed loop system is required. To design a controller, bus suspension system is linearized. Despite continuous advancement in control theory, Proportional Integral Derivative (PID) controller is the most popular technique to control any process. In this paper, Proportional- Integral – Derivative (PID) Controller is also designed and tuned to give the smooth response for the bus suspension system. System performances for the desired parameters in closed loop are investigated. The simulation and implementation of the controllers are done using MATLAB/SIMULINK software.

Keywords— Bus suspension system, dynamic modeling, PID control, state-space model, MATLAB /Simulink.

I. INTRODUCTION

Today, a struggling race is taking place among the automotive industry to produce highly developed suspension models. One of the performance requirements is advanced suspension systems which prevent the road disturbances to affect the passenger comfort while increasing riding capabilities and performing a smooth drive. The main purpose of this system is to increase the comfort of vehicle occupants (passengers and drivers), to maintain the contact between the tire and the road surface and to eliminate (minimize) dynamic forces which act on the load bearing vehicle structure and road surface along which the vehicle is moving. While the purpose of the suspension system is to provide a smooth ride in the bus and to help maintain control of the vehicle over rough terrain or in case of sudden stops, increasing ride comfort results in larger suspension stroke and smaller damping in the wheel-

hop mode [1]. Numerous applications of different control strategies have been proposed to overcome these suspension problems. Many active control strategies such as Linear Quadratic Gaussian (LQG) control, adaptive control, and nonlinear control are developed and proposed so as to manage the occurring problems [2-4]. Among the recent control methods, PID control methods grab nowadays the attention of many researchers. A PID has excellent capability in a nonlinear system description and is particularly suitable for the complex and uncertain systems.

II. SYSTEM IDENTIFICATION AND MODELING

A mathematical model is an abstract model that uses mathematical language to describe the behaviors of a system. From the bus suspension system model, we can directly get the dynamic equation by using the Newton's law. Then, this dynamic equation will be transfer into the Matlab to get the transfer function using the built in function. In this project, there are two outputs because of the mass of the system plus the bus mass.

State-Space Model

The one dimensional spring-mass-damper system given in Figure 1

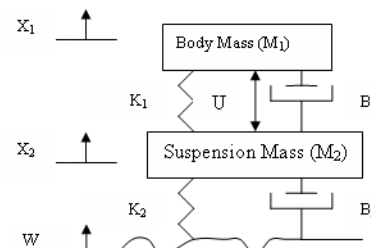


Fig. 1 1/4 Model of Bus Suspension system

The followings are constants and variables of the system we are going to design:

- $M_1 = 2500$ kg, (body mass)
- $M_2 = 320$ kg, (suspension mass)
- $K_1 = 80,000$ N/m, (spring constant of suspension system)
- $K_2 = 500,000$ N/m, (spring constant of wheel and tire)
- $B_1 = 350$ Ns/m, (damping constant of suspension system)

- $B_2=15,020$ Ns/m, (damping constant of wheel and tire)
- U = force from the controller

To derive the dynamic equations of this system, we used Newton's second law of motion and the equations below are presented.

$$M_1\ddot{X}_1 + B_1(\dot{X}_1 - \dot{X}_2) + K_1(X_1 - X_2) = U \quad (1)$$

$$M_2\ddot{X}_2 = B_1(\dot{X}_1 - \dot{X}_2) + K_1(X_1 - X_2) + B_2(\dot{W} - \dot{X}_2) + K_2(W - X_2) - U \quad (2)$$

To transform the motion equations of the quarter-bus model into a state-space model, the equation (4), including variable vector, input vector and the disturbance vector is formed after some algebraic operations.

$$\dot{X} = [A][X] + [B]W, Y = [0010] \begin{bmatrix} X_1 \\ \dot{X}_1 \\ Y_1 \\ Y_2 \end{bmatrix} + [00] \begin{bmatrix} U \\ W \end{bmatrix}, Y = [C][X] + [D]W \quad (3)$$

$$\begin{bmatrix} \dot{X}_1 \\ \dot{\dot{X}}_1 \\ \dot{Y}_1 \\ \dot{Y}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 & 0 \\ \frac{-B_1 B_2}{M_1 M_2} & 0 & (\frac{B_1}{M_1}(\frac{B_1}{M_1} + \frac{B_1}{M_2} + \frac{B_2}{M_2})) - \frac{K_1}{M_1} & \frac{-B_1}{M_1} \\ \frac{B_2}{M_2} & 0 & -(\frac{B_1}{M_1} + \frac{B_1}{M_2} + \frac{B_2}{M_2}) & 1 \\ \frac{K_2}{M_2} & 0 & -(\frac{K_1}{M_1} + \frac{K_1}{M_2} + \frac{K_2}{M_2}) & 0 \end{bmatrix} \begin{bmatrix} X_1 \\ \dot{X}_1 \\ Y_1 \\ Y_2 \end{bmatrix} + \begin{bmatrix} 0 & 0 \\ \frac{1}{M_1} & \frac{B_1 B_2}{M_1 M_2} \\ 0 & \frac{-B_2}{M_2} \\ (\frac{1}{M_1} + \frac{1}{M_2}) & \frac{-K_2}{M_2} \end{bmatrix} \begin{bmatrix} U \\ W \end{bmatrix} \quad (4)$$

Since the distance X_1-W is very difficult to measure, and the deformation of the tire (X_2-W) is negligible, we will use the distance X_1-X_2 instead of X_1-W as the output in our problem. The road disturbance (W) in this problem will be simulated by a step input. This step could represent the bus coming out of a pothole.

III. OPEN LOOP ANALYSIS

We have used MATLAB to display how the original open-loop system performs without any feedback control. We see the response of unit step actuated force input and unit step disturbance input.

From the graph of the open-loop response for a unit step actuated force, we can see that the system is under-damped. People sitting in the bus will feel very small amount of oscillation and the steady-state error is about 0.013 mm. Moreover, the bus takes very unacceptably long time for it to reach the steady state. The solution to this problem is to add a controller into the system's block diagram to improve the performance.

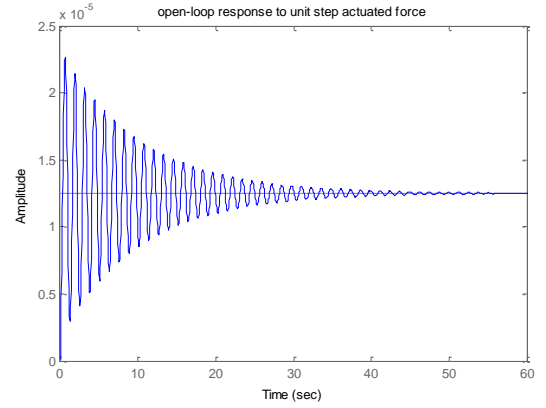


Fig. 2 open-loop response to unit step actuated force

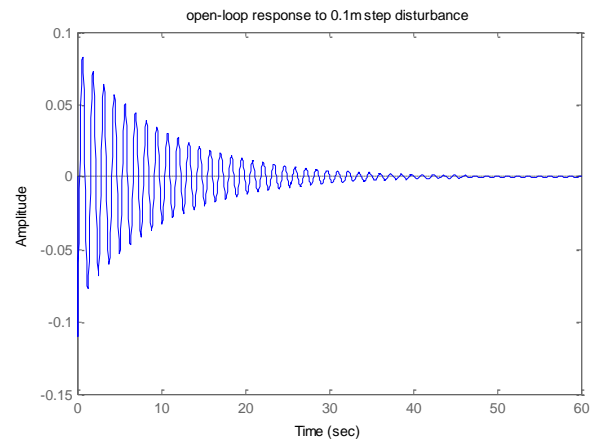


Fig. 3 open-loop response to 0.1m step disturbance

IV. CLOSED LOOP RESPONSE

The schematic of the closed-loop system is the following:

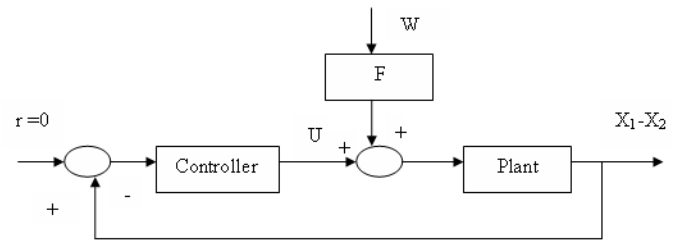


Fig. 4 Closed-loop system with disturbance.

A. Controller: Proportional-Integral-Derivative Controller (PID controller)

A proportional-integral-derivative controller (PID controller) is a generic control loop feedback mechanism widely used in industrial control systems - a PID is the most commonly used feedback controller. A PID controller calculates an "error" value as the difference between a measured process variable and a desired set point. The

controller attempts to minimize the error by adjusting the process control inputs. In the absence of knowledge of the underlying process, PID controllers are the best controllers.

The PID controller is probably the most-used feedback control design. PID is an acronym for Proportional-Integral-Derivative, referring to the three terms operating on the error signal to produce a control signal. If $U(t)$ is the control signal sent to the system, $y(t)$ is the measured output and $r(t)$ is the desired output, and tracking error $e(t) = r(t) - y(t)$, a PID Controller has the general form

$$u(t) = K_p e(t) + K_i \int e(t) dt + K_d \frac{d}{dt} e(t) \quad 5$$

The desired closed loop dynamics is obtained by adjusting the three parameters K_p , K_i and K_d , often iteratively by "tuning" and without specific knowledge of a plant model.

The PID controller calculation involves three separate parameters, and is accordingly sometimes called three-term control: the proportional, the integral and derivative values, denoted P, I, and D. The proportional value determines the reaction to the current error, the integral value determines the reaction based on the sum of recent errors, and the derivative value determines the reaction based on the rate at which the error has been changing. The weighted sum of these three actions is used to adjust the process via a control element such as the position of a control valve or the power supply of a heating element.

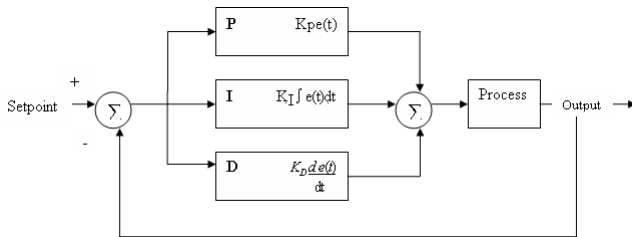


Fig 5 Block Diagram of PID Controller

B. Tuning

Tuning a control loop is the adjustment of its control parameters i.e. gain/proportional band, integral gain/reset, derivative gain/rate to the optimum values for the desired control response. Stability is a basic requirement, but beyond that, different systems have different behavior, different applications have different requirements, and some desiderata conflict. Further, some processes have a degree of non-linearity and so parameters that work well at full-load conditions don't work when the process is starting up from no load; this can be corrected by gain scheduling. PID controllers often provide acceptable control even in the absence of tuning, but performance can generally be improved by careful tuning, and performance may be unacceptable with poor tuning. PID tuning is a difficult problem, even though there are only three parameters and in principle is simple to describe, because it must satisfy complex criteria within the limitations of PID

control. There are accordingly various methods for loop tuning, and more sophisticated techniques are the subject of patents; this section describes some traditional manual methods for loop tuning.

C. Tuning Methods

There are several methods for tuning a PID loop. The most effective methods generally involve the development of some form of process model, then choosing P, I, and D based on the dynamic model parameters. Manual tuning methods can be relatively inefficient, particularly if the loops have response times on the order of minutes or longer. The choice of method will depend largely on whether or not the loop can be taken "offline" for tuning, and the response time of the system. If the system can be taken offline, the best tuning method often involves subjecting the system to a step change in input, measuring the output as a function of time, and using this response to determine the control parameters.

Manual Tuning

If the system must remain online, one tuning method is to first set K_i and K_d values to zero. Increase the K_p until the output of the loop oscillates, then the K_p should be set to approximately half of that value for a "quarter amplitude decay" type response. Then increase K_i until any offset is correct in sufficient time for the process. However, too much K_i will cause instability. Finally, increase K_d , if required, until the loop is acceptably quick to reach its reference after a load disturbance. However, too much K_d will cause excessive response and overshoot. A fast PID loop tuning usually overshoots slightly to reach the set point more quickly; however, some systems cannot accept overshoot, in which case an over-damped closed-loop system is required, which will require a K_p setting significantly less than half that of the K_p setting causing oscillation.

Ziegler-Nichols Method

Another heuristic tuning method is formally known as the Ziegler-Nichols method, introduced by John G. Ziegler and Nathaniel B. Nichols. As in the method above, the K_i and K_d gains are first set to zero. The P gain is increased until it reaches the ultimate gain, K_u , at which the output of the loop starts to oscillate. K_u and the oscillation period P_u are used to set the gains as shown:

TABLE I
EFFECTS OF INCREASING A PARAMETER INDEPENDENTLY

Control Type	K_p	K_i	K_d
P	$0.50 K_u$	-----	-----
PI	$0.45 K_u$	$1.2 K_p / P_u$	-----
PID	$0.60 K_u$	$2 K_p / P_u$	$K_p P_u / 8$

Where,

K_u = Ultimate Gain = $1/M$

M = amplitude ratio of system's response at crossover frequency

P_u = Ultimate period = $2\pi / \omega_{co}$

ω_{co} = system's crossover frequency.

The closed - loop Ziegler-Nichols method consist of following steps:

1. With P-only closed loop control, increase the magnitude of the proportional gain until the closed loop is in a continuous oscillation. For slightly larger values of controller gain, the closed loop system is unstable, while the slightly lower values the system is stable.

2. The value of controller proportional gain that causes the continuous oscillation is called the critical gain, K_u . The peak-to - peak period is called critical period P_u .

3. Depending upon controller chosen, P, PI, or PID, use the value in table1 for tuning parameters, based on the critical gain and period.

Response

we should see the response (X1-X2) to a step W

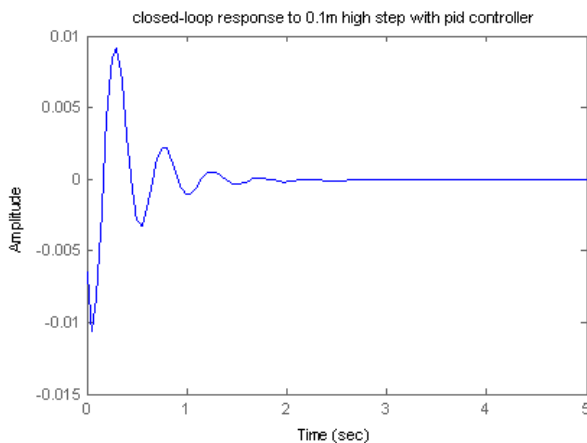


Fig 6 closed-loop response to step with PID controller

we can see that the system has larger damping than required, but the settling time is very short. This response still doesn't satisfy the overshoot requirement.

This can be rectified by manual tuning to find better response, figure 7 where the maximum overshoot is approximately 0.0048 m and the settling time is about 1.5 seconds.

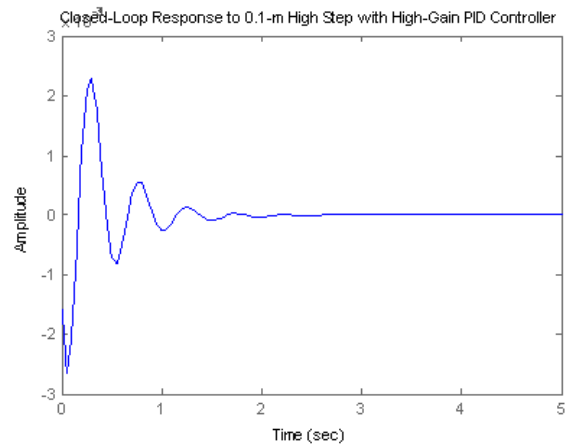


Fig 7 closed-loop response to step with high gain

V. CONCLUSIONS

In this study, a PID controller is designed and employed for controlling an active suspension system of a ¼ bus model. The proposed model is aimed to developed and carry the response of PID controller up to a better level by simply changing only the gains of a PID controller using Manual Tuning method.

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Issues of industrial diversification: The key for global manufacturing competitiveness.

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Abstract—*Manufacturing is considered to be a driving force of any country's economic development by creating more employments and social income. However, in this era of rapid technological change every country struggling to increase more market shares and to remain competitive in the international scene. This paper shows the issues of Industrial diversifications which are the key factors of global manufacturing competitiveness.*

Key words: competitiveness, benchmarking, manufacturing

I. INTRODUCTION

As a key economic activity, manufacturing production has been used as a growth determinant, reflecting the stage of country's development in terms of availability of human resources, capital, country's natural endowment and other raw materials.

National industrial competitiveness describes the performance of manufacturing and exports in an international context. While national data can provide information on the growth of manufactures and exports in the country, benchmarking enable to make comparisons with similar countries or competitors to place these growth and development trends into context relative to other countries in order to identify country's immediate competitors, future competitors and the role model[1].

Industrial diversification is a strategy that involves choosing to structure a company operation in a manner that promotes involvement in a wide range of revenue producing activities. An approach of this type may have to do with the production of goods and services associated with the business, or may focus more on how the company chooses to arrange its investment portfolio. The goal of any type of industrial diversification is increase the chances of returns by diversifying or spreading assets over a wider range of activities, while also helping to minimize the potential for failure or loss[2]

As it relates to production operations, industrial diversification has to do with providing goods and services that appeal to multiple markets rather than focusing on a product line that

appeals to mainly one market. For example, a company may operate plant facilities that produce clothing items at one location, while also manufacturing bedding and other types of household textiles at another. At times, the diversification may involve completely unrelated products[3].

II. REVIEW OF THE LITERATURE

Nowadays, a significant portion of companies diversify their productive activities, either across multiple lines of business, i.e. industrial diversification, across different geographic markets, i.e. international diversification or globalization, or both [4]. The purpose of this section is to review some of the main theoretical arguments as well as empirical findings on the effect of industrial diversification and globalisation on R&D activities and firms' economic performance.

Studies in the literature report potential benefits as well as costs for R&D and the economic performance of both types of diversification strategies. On the one hand, industrial diversification positively affects productivity performance through economies of scope [1] and an excess of technological resources. These new technological opportunities are in turn deployed in new directions and industries.

III. ISSUES OF INDUSTRIAL DIVERSIFICATION

The issue in the empirical framework is the data limitation regarding subsidiaries only observed in a cross-sectional dimension. This prevents the use of within or first difference transformations for the production function to capture unobserved individual heterogeneity other than industry or country effects, which are taken into account in our estimates[3]. Another concern is the causality in the relationship between R&D productivity and diversification. While there are theoretical reasons to explain that diversification may enhance or alter the productivity of R&D activities, one may also expect firms with a higher R&D productivity to adopt a diversification

strategy.

4. CONCLUSION

Industrial diversification is increase the chances of returns by diversifying or spreading assets over a wider range of activities. This papers concludes that the issues are very important which helps in transformations.

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Impact of information technology on supply chain of indian industries

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Abstract—Over the past decade, an important focus of researchers has been on supply chain management (SCM), as many organizations believe that effective SCM is the key to building and sustaining competitive advantage for their products/services. To manage the supply chain, companies need to adopt an SCM strategy (SCMS) and implement appropriate SCM practices. However, different SCM strategies and practices require support from appropriate information technology (IT) applications and their usage. To effectively manage the supply chain, there is therefore a need for aligning these applications and their usage with the supply chain strategy and practices of the firm. While the literature on IT-business alignment has mainly focused on various aspects of the alignment between information systems strategy and business strategy, it is largely deficient in offering an understanding of how specific supply chain strategies should be aligned with relevant IS strategies. Similarly, prior studies on SCM have developed considerable detail on supply chain strategies, without enunciating the implications of these strategies for the use of IT. Additionally, many studies have examined the importance of implementing SCM practices and their impact on supply chain and firm performance without identifying the corresponding Information systems usage that might be required for executing those practices in a more effective manner. Thus, there is need to studies that can explore the relation between SCM and the usage of IT. This study is an attempt to study and understand the phenomenon by which IT has been used for integration purposes in the supply chain context and to examine how Information Systems Integration significantly affect the performance of supply chain management.

Index Terms— Information Technology, Supply chain Management, Indian industries

I. INTRODUCTION

Information Technology (IT) is plays significant role in the success of the supply chain of industries. It is essential to integrate the Information technology with elements of supply chain management. IT is backbone for the success of supply chain of industries. It is impossible to achieve an effective supply chain without IT. It is essential to integrate the activities both inside and outside of an organization for success of supply chain management. An integrated information system (IS) is required for this which can share the information related to value-adding activities

[1]. IT utilization has changed its role in present scenario of competing between supply chains which grows more intense due to high global competition. Firms have started to utilize IT to directly influence the processes of comprising the value chain. Increasingly, IT is used to facilitate internal coordination within a firm and enhance external integration with external constituencies (e.g., customers and suppliers) and also to enhance decision making among supply chain members [2]. This phenomenon is evident by the increased usage of information systems for integration purposes; for instance, information systems infrastructure (e.g., data communication tools, network connection, standard data structure, and unified coding standards), information systems software (e.g., enterprise-wide information system such as SAP), and information systems applications (e.g., centralized database management systems, electronic data interchange (EDI), web-based or internet-base information systems). Although the advances in formation technologies are considered a key driver of supply chain integration; what is the best way to deploy these technologies and to coordinate supply chain-wide activities is still under research. The concept of Information Technology can be captured using two main sub-constructs (e.g., internal IT and external IT) and can be conceptualized at three levels (1) Strategic, (2) Operational, and (3) Infrastructural. Studying the effects of IT in these levels can help researchers and executives understand how IT practices at different levels contribute to overall supply chain effectiveness [4]. The implications of such an understanding may bring significant benefits to both operations researchers and practitioners. Such benefits may include making better decisions about which IT to utilize, which information systems (IS) practices to emphasize, and what level of information system to attain. This study examines the impact of information technology on supply chain functions.

II. PAST STUDIES

Sharing information is important for the functioning of the supply chain. However, sharing quality information between members of the supply chain is important as well. For instance, sharing information within the entire supply chain can create flexibility, but this requires accurate and timely information (Jarrel, 1998). Moberg et al. (2002) argue that accuracy, timeliness, and proper formatting of the information determine the quality of the information. They suggest that supply chain members emphasize the importance of having accurate, timely, and properly formatted information to fully realize the value of information exchange among them. Hence, managers may not even use information coming from their partners if the information has poor quality. Li et al. (2005) emphasize the importance of information sharing to SCM practice. The main principle of SCM is sharing of information within supply chains (Moberg et al., 2002). By sharing information with members of the supply chain, an organization can respond more quickly to the customer's changing needs (Li and Lin, 2006). Information sharing is defined as the extent to which critical and proprietary information is communicated to one's supply chain partner (Li et al., 2005; Li and Lin, 2006; Li et al., 2006; Mohr and Spekman, 1994). Mohr and Spekman (1994) suggest that information sharing and being knowledgeable about each other's business help partners maintain their relationship for a longer time. Thus, it will reduce uncertainties in the market if supply chain members have more information and knowledge about other members (Yu et al., 2001). Furthermore, Frazier et al. (1988) suggest that organizations should share and exchange information with their suppliers regarding production plans, core product, process design, schedules, and product development to create synergies between the organization and its suppliers. This synergy will increase the ability of supply chains to react effectively to sudden changes and uncertainties in the market (Lee, 2000).

Porter and Millar (1985) argue that every value activity in the value chain requires usage of information in some way that differs from other activities. For example, a logistic activity utilizes IT for scheduling promises, transportation rates, and production plans to ensure timely and cost effective delivery. On the other hand, a company could use IT to enhance its ability to exploit internal activities as well as external activities i.e. coordinate their activities

closely with suppliers and customers. In another study, Kyobe (2004) argues that IT resources such as hardware and software can be strategically utilized to achieve competitive advantage. Companies might focus on utilizing IT for internal operations or for external relationships i.e., improving customer services and links with suppliers by sharing useful information and obtaining reductions in cost. Information quality is defined as the extent to which information exchange is accurate, timely, complete, relevant, and credible. Inaccurate and missing data will add costs to the supply chain and can drive poor performance. Chopra and Meindl (2001) argue that information must be accurate, accessible in a timely manner, and valuable when making supply chain decisions. Inaccurate and missing data will make it very difficult for managers to make good decisions as it will not provide the manager with a true picture of the situation of the supply chain. For example, Wal-Mart collects data in real time on what products are being purchased at each store of its stores and send these data back to the manufacturers to determine how much inventory to hold at each store and to decide when to ship new loads of products from the manufacturer. Chopra and Meindl (2001) provide many examples of how inaccurate and missing data results in an increase in materials inventory and adds costs to the supply chain. Furthermore,

III. CASE STUDY

This paper examines the impact of information technology on performance of supply chain of Indian industry. In addition, it also highlights the benefits obtained from introducing the information system in supply chain. A motorcycle manufacturing plant located in north India is considered for case study, whose overall managerial control has been transferred from an Indian company to Japanese company in 2001. The company was started the production of motorcycles with collaboration of a Japanese company in mid 1980, and subsequently entered into a joint venture, based on 50:50 capital investments. In mid 1990, Japanese company decided to face competition independently by parting ways with Indian company, with which it had a tie-up for over one decade. In 2001, the plant became a 100% Japanese subsidiary after acquiring the 50% stake of Indian company. The Japanese company has now two manufacturing units which employs the 3800 employees. Quality control department has 145 employees and 48 executives. On other hand, purchasing department has 34 employees and 5 executives. 68% parts are purchased from vendors. 75% of purchased parts are received directly

on shop floor. To conduct a case study, A questionnaire was prepared to study the impact of information technology on supply chain management. The feedback obtained from this questionnaire indicate

Table 1: Impact of IT on performance of suppliers of company

Sr. no.	Factors	Less (1) → High (5)				
1	Suppliers deliver what we need.					X
2	Suppliers deliver when we need				X	
3	Suppliers adopt quality practices as per our requirement.				X	
4	Suppliers manage quality as per our requirement.			X		
5	Suppliers inspect product frequently.					X

Table 2: Impact of IT on responsiveness in supply chain of company

Sr. no.	Factors	Less (1) → High (5)				
1	Suppliers respond quickly to our changing requirements of cost			X		
2	Suppliers respond			X		

that company is significantly benefited though implementation of different information system. These benefits are explained in table 1 to table 15.

	quickly to our changing requirements of delivery time					
3	Suppliers respond quickly to our changing requirements of cost design			X		
4	Supplier respond effectively to our changing requirements of cost				X	
5	Supplier respond effectively to our changing requirements of delivery time				X	
6	Supplier respond effectively to our changing requirements of design			X		

Table 3: Impact of IT on 'Assembles to order strategy' in supply chain of company

Sr.	Factors	Less (1) → High				
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no.		(5)				
1	Suppliers customize our product by adding feature modules as per requirements.			X		
2	Suppliers produce modular products				X	
3	Suppliers respond to customization requirements quickly			X		
4	Suppliers delay the products final assembly until customers make an order				X	

Table 4: Impact of IT on efficiency of supply chain

Sr. no.	Factors	Less (1) → High (5)				
1	Information systems improve the efficiency of operation between our supplier and us				X	
2	Information systems manage material				X	

	requirement planning of our facility					
3	Information systems manage production control between our supplier and us				X	
4	Information systems coordinate (Production and information) efficiently across suppliers and product lines					X

Table 5: Impact of IT on flexibility of supply chain

Sr. no.	Factors	Less (1) → High (5)				
1	Information systems help to introduce new product and service in our market			X		
2	Information systems help to quickly share information within our firm				X	

3	Information systems help to monitor change in our market condition			X		
4	Information systems help to respond to changes in the market			X		
5	Information systems help to change the design of our product				X	

Table 6: Impact of IT in comprehensiveness decision making

Sr. no.	Factors	Less (1) → High (5)				
1	Information systems help to provide sufficient information to support careful decision making			X		
2	Information systems help to provide support for decision making		X			
3	Information				X	

	systems help to adopt a well analyzed view when making major decisions					
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Table 7: Impact of IT on strengthen partnerships with supplier

Sr. no.	Factors	Less (1) → High (5)				
1	Information systems help to select supplier based on their quality			X		
2	Information systems help to solve problems jointly with our suppliers				X	
3	Information systems help to include our key suppliers in planning and goal setting activities				X	
4	Information systems help to help our suppliers to improve their product quality				X	

Table 8: Impact of IT on customer relationship practices

Sr. no.	Factors	Less (1) → High (5)				
1	Information systems help to				X	

	interact with customers to set reliability, responsiveness, and other standards for us					
2	Information systems help to measure and evaluate customer satisfaction			X		
3	Information systems help to determine future customer expectations				X	
4	Information systems help to facilitate customers ability to seek assistance from us			X		

Table 9: Impact of IT on lean system practices of company

Sr. no.	Factors	Less (1) → High (5)				
1	Information systems help to reduce manufacturing set up time			X		
2	Information			X		

	systems help to build and maintain continuous quality improvement programs					
3	Information systems help to streamline ordering, receiving and other paperwork from supplier			X		
4	Information systems help to push suppliers for shorter lead times			X		

Table 10: Impact of IT on postponement practices

Sr. no.	Factors	Less (1) → High (5)				
1	The company can delay final product assembly activity until customer order have actually been received				X	
2	The company can delay final product assembly activities until the last possible position in the supply chain				X	

3	The company can store our parts/products at distribution points closer to the customer			X		
4	The company can design products for modular assembly				X	

Table 11: Impact of IT information sharing practices

Sr. no.	Factors	Less (1) → High (5)				
1	The company can inform our trading partners in advance of our changing needs				X	
2	The company can manually share business knowledge of core business processes with our trading partners				X	
3	The company can mutually share proprietary information with our trading partners				X	

Table 12: Impact of IT on information quality practices

Sr. no.	Factors	Less (1) → High (5)				
1	The company can exchange information with our trading partners in a timely manner					X
2	The company can exchange information with our trading partners in a accurate manner					X
3	The company can exchange information with our trading partners in a complete manner				X	
4	The company can exchange information with our trading partners in reliable manner				X	

Table 13: Impact of IT on Supply chain integration

Sr. no.	Factors	Less (1) → High (5)				
1	There is high level of communication and coordination between all				X	

	functions in our firm					
2	Cross function teams are frequently used for process design and improvement in our firm				X	
3	There is great amount of cross over activities of our firm and our trading partners.					X
4	There is high level of integration of information systems in our firm.				X	

Table 14: Impact of IT on Responsiveness to customer

Sr. no.	Factors	Less (1) → High (5)				
1	Fill customer order on time				X	
2	Has short order to delivery cycle time				X	
3	Has fast customer response time					X

Table 15: Impact of IT on overall performance of company

Sr. no.	Factors	Less (1) → High (5)				
1	Increase in Market share				X	
2	Increase in Return to investment				X	

3	Growth in return on investment				X	
4	Profit margin on sales				X	
5	Improvement in overall competitive position			X		

IV. DISCUSSION

Today companies are often not considered independent entities, but parts of multi-company, multi-echelon networks, i.e. supply chains, delivering goods and services to the final customer. Supply chain management (SCM). Literature proposes that integrated control of these multi-company networks can provide significant benefits. The utilization of information technology (IT), in turn, is considered an imperative requirement for managing these networks, and has been associated with significant supply chain efficiency improvements.

Although the importance of IT for efficient SCM is widely acknowledged, research assessing how IT is in practice used for the purposes of SCM is narrow. More specifically, majority of the prior research has focused either on modeling the benefits of inter-organizational information technologies and information sharing, or on assessing the impact of specific technologies on supply chain efficiency. Consequently, the actual uses of IT in supply chain management as well as the reasons for using IT in a specific way still remain unclear. Due to these identified limitations in the previous literature we address the following research problem: "How and for what purposes do companies use information technology in supply chain management?" This study systemically investigate the complex causal relationships between information systems integration and other related constructs such as information technology utilization, supply chain integration, firm's operational performance, suppliers' operational performance, and firm performance. Its objective to discuss the issues like what are the key dimensions of information systems integration?, What are the key dimensions of information technology utilization? , What factors indirectly and directly affect operational performance and firm performance? How are customers and

suppliers involved in the process of supply chain integration? What is the highest priority level of integration for firms to gain ultimate benefits from their supply chain? There is no clear definition of constructs and conceptual frameworks on information systems integration in the current literature and study mainly focuses on the physical aspects of information systems integration such as data integration and network connectivity within a merger and acquisition context. The few studies that have attempted to study the concept of information systems integration are not clearly focused and mainly relate to infrastructural integration. The current study provides a complete set of benefits for information systems integration consisting of strategic integration, operational integration and infrastructural integration. This study provides a theoretical framework that identifies the detailed dimensions of information systems integration, information technology utilization, supply chain integration, firm's operational performance, suppliers' operational performance, and firm performance.

This study presents a framework to study the management of information technology enabled supply chains. This paper studies the impacts of information technology and digitization on supply chain and supply chain management. It is found that digitization and information technology have made some changes to how firms operate but the fundamentals of economics are still the same. In a nutshell, improving internal process with the help of integration demonstrates that the higher level of IT use alone will not necessarily result in the higher level of supply chain integration if not accompanied by other factors, such as internal information systems integration and external information systems integration.

V. CONCLUSION

This paper studies the impact of IT on supply chain management through case study. This study highlights the importance of integrating both internal and external systems in the supply chain to make the coordination of activities easier. In literature review, some authors illuminated that not all available information needs to be shared but the relevant information as too much confuses people. The authors have demonstrated that although many parties, with their own internal technologies, are involved in the supply chain management the chain can be made information technology enabled if top management support is endowed and technologies for integration are selected carefully. The study provides

the supply chain and by connecting to other supply chain members the business parties can be integrated and connected in a digital manner to form transparent supply chains. This study is exploratory in nature and thus is not without limitations. The results highlight the critical role of customers and suppliers in facilitating supply chain integration. Effective relationships with customers and suppliers will directly lead to a higher level of supply chain integration and in turn lead to a higher level of operational performance for both firms and suppliers. Moreover, relationships with trading partners will directly and indirectly influence firm performance through firm's and suppliers' operational performance. This is a very valuable finding since partner relationships have received little attention by top management. This study reveals that the nature of the information systems integration process occurs in a sequential manner. The integration process starts with collaborating activities between departments such as collaborating and developing business plans, identifying new markets, adjusting manufacturing and logistics process, setting up network connectivity, and etc. Once the internal integration is firmly rooted, the process of external information systems integration is begun by involving their trading partners. Therefore, internal integration process is crucial and a pre-requisite for the success of a supply chain. Moreover, the indirect influence of IT use on supply chain

the inferences made from an instrument that is valid and reliable for the current study's context. The measurement instruments include four constructs: 1) information technology utilization, 2) internal information system integration, 3) external information system integration, and 4) supply chain integration. Finally, in order to better understand the complex phenomenon of supply chain management, the research on the use of IT in SCM should be complemented by research on the other means of supply chain coordination.

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Transgenic approaches to crop improvement

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Abstract- The transgenic approaches to crop improvement have become a vital area of agricultural research, as it can address various burning issues like increased yield from the crop, and ability to withstand severe environmental conditions. In the transgenic approaches, a genetically engineered plant is generated by altering its genetic composition by adding one or more genes to a plant's genome using genetic engineering techniques like biolistic method (particle gun) or *Agrobacterium tumefaciens* mediated transformation. Transgenic crops are now grown commercially on several million hectares, principally in North America. The predominant crops are maize (corn), soybean, cotton, and potatoes. In addition, there have been field trials of transgenics from at least 52 species including all the major field crops, vegetables, and several herbaceous and woody species. Some of the important transgenic crops include FlavrSavr tomato (Improved Shelf Life), GM Cassava and Corn (Improved nutrition), Golden Rice (Stress Resistance and Improved Nutrition), papaya, potato, squash and cucumber (virus resistant), Cowpea and BT Brinjal (Yield enhancement). Even though there has been substantial progress in transgenic crops during last two decades, immediate attention is required on next generation GM crops, which could be -

1. Nutritional biofortification in staple crops and sweet potato.
2. Resistance to fungus and virus pathogens in potato, wheat, rice, banana, fruits, vegetables.
3. Resistance to sucking insect pests in rice, fruits, vegetables.
4. Improved processing and storage in wheat, potato, fruits and vegetables.
5. Drought tolerance in staple cereal and tuber crops.

Appropriate research in the above areas would make the vital crops more stable, resulting in better yield.

Index Terms— Transgenic, Crop Improvement, Nutritional Biofortification, Drought Tolerance

1. INTRODUCTION

In the recent past, there have been serious concerns about sufficient global production from the crop plants in future. This is primarily due to increasing world population, decreasing arable land because of soil erosion, degradation etc. and global climate change, resulting in frequent droughts, floods, heat waves etc. Availability of water is also declining. Adding to the concern is the fact that a large chunk of arable land is now being utilized for bio-fuel plantation.

In order to ensure sufficient availability of food, it is important to improve the crops to increase the yield from both, irrigated and non-irrigated land and create novel varieties that are more tolerant to abiotic stresses.

Transgenic approaches not only increase the yield, but may also result in improved shelf life, improved nutrition and virus resistance. Transgenic crops are now grown commercially on several million hectares, principally in North America. The predominant crops are maize (corn), soybean, cotton, and potatoes. In addition, there have been field trials of transgenics from at least 52 species including all the major field crops, vegetables, and several herbaceous and woody species. Some of the important transgenic crops include Flavr Savr tomato (Improved Shelf Life), GM Cassava and Corn (Improved nutrition), Golden Rice (Stress Resistance and Improved Nutrition), papaya, potato, squash and cucumber (virus resistant), Cowpea and BT Brinjal (Yield enhancement).

There has been significant progress in the research areas of genetically modified crops, and several futuristic developments are already on offing at various parts of the world. This paper primarily focuses on the areas, which need immediate attention and need to be addressed within next 5-8 years, which will form a stepping stone for next stage of development.

The areas of focus are -

1. Nutritional biofortification in staple crops and sweet potato.
2. Resistance to fungus and virus pathogens in potato, wheat, rice, banana, fruits, vegetables.
3. Resistance to sucking insect pests in rice, fruits, vegetables.
4. Improved processing and storage in wheat, potato, fruits and vegetables.
5. Drought tolerance in staple cereal and tuber crops.

1. Nutritional biofortification in staple crops and sweet potato

Deficiencies of vitamin A, iron, and zinc affect over one-half of the world's population. Progress has been made to control micronutrient deficiencies through supplementation and food fortification, but new approaches are needed, especially to reach the rural poor. Biofortification (enriching the nutrition contribution of staple crops through plant breeding) is one option. Scientific evidence shows this is technically feasible without compromising agronomic productivity. The challenge is to get producers and consumers to accept biofortified crops and increase their

intake of the target nutrients. With the advent of good seed systems, the development of markets and products, and demand creation, this can be achieved.

Biofortification

Biofortification is the development of micronutrient-dense staple crops using the best traditional breeding practices and modern biotechnology. This approach has multiple advantages. First, it capitalizes on the regular daily intake of a consistent and large amount of food staples by all family members. Because staple foods predominate in the diets of the poor, this strategy implicitly targets low-income households. Second, after the one-time investment to develop seeds that fortify themselves, recurrent costs are low, and germplasm can be shared internationally. This multiplier aspect of plant breeding across time and distance makes it cost-effective. Third, once in place, the biofortified crop system is highly sustainable. Nutritionally improved varieties will continue to be grown and consumed year after year, even if government attention and international funding for micronutrient issues fade. Fourth, biofortification provides a feasible means of reaching undernourished populations in relatively remote rural areas, delivering naturally fortified foods to people with limited access to commercially marketed fortified foods that are more readily available in urban areas. Biofortification and commercial fortification, therefore, are highly complementary. In fact, biofortification may have important spin-off effects for increasing farm productivity in developing countries in an environmentally beneficial way.

2. Resistance to fungus and virus pathogens in potato, wheat, rice, banana, fruits, vegetables.

Development of transgenic crop varieties resistant to viral diseases

In the case of virus resistance, conventional strategies to control viral diseases are limited to the production of virus-free propagation material and to the control of insects transmitting virus pests. While some crop gene pools harbour resistance to viruses, there are crop gene pools which are completely lacking in resistance against key virus pathogens. The few examples of large-scale plantings of virus resistant GM varieties should be monitored to determine if resistance breaking variants of the virus pathogens are being selected over a number of growing seasons for large scale crop populations. In Africa, only three crops, sweet potato, potato and maize, have so far been targeted for transgene-mediated virus resistance. The FAO-BioDeC indicates only two transgenic varieties that to date have been tested in a field trial, namely, a sweet potato variety for resistance to sweet potato feathery mottle virus (SPFMV) in Kenya and a potato variety for resistance to potato leaf roll virus (PLRV) in South Africa. The FAO-BioDeC currently reports only three

other research initiatives in an experimental phase in South Africa, namely, the development of potato for resistance to potato virus Y (PVY) and potato virus X (PVX), and development of maize resistant to the maize streak virus (MSV). The inventory indicates that no virus resistant GM varieties have been commercially released in Africa.

In the Eastern and Central Africa region, maize is a major staple of the rural and urban poor. In the same region, potato has become a major highland cash crop and a food staple in some urban areas. Sweet potato is an important crop in the countries surrounding Lake Victoria (Burundi, the Democratic Republic of the Congo, Kenya, Rwanda, United Republic of Tanzania and Uganda).

Development of transgenic crop varieties resistant to fungal diseases

Some of the most devastating and universal crop diseases are caused by fungal pathogens. For instance, the rust fungi are the most widespread and generally cause the largest crop losses per season. Crop losses can be considerable due to fungal pathogens. For example, the fungal agent of rice blast disease (*Magnaporthe grisea*) destroys 157 million tonnes of cultivated rice each year, enough rice to feed 60 million people worldwide (Pennisi, 2001).

The negative effects of some fungal pathogens can be limited by the use of chemical fungicides. Demand for fungicides amongst farmers is high, indicating that for many farmers there are few available alternatives. The United States, Western Europe and Japan together accounted for 75 percent of the total world market. Small grains constitute the largest market for fungicides worldwide. This sector accounted for an estimated 27 percent of the total world market in 1999, followed closely by tree and vine crops (24 percent), rice (16 percent), and vegetables and potatoes (10 percent). Other crop markets accounted for 17 percent of the world fungicide market, and non-crop markets accounted for 6 percent.

In many countries, fungicides as crop protection products are subject to strict legislative regulation and undergo a rigorous and expensive process of registration for public sale. While fungicides can provide a level of control, this chemical option is often limited for many farmers, particularly in developing countries, by high costs and lack of knowledge about application. In addition, the negative effects of fungicide applications on human health, with special reference to the labourers and the environment can be considerable. There is a need to find more environmentally benign alternatives to fungicides to control fungal diseases of crops.

Genes can be identified that confer resistance to fungal

<i>Fungal diseases of some important crops worldwide</i>	
Cereals	Powdery mildew, rusts, leaf-spot diseases, common bunt of wheat, loose smuts
Rice	Blast, sheath blight and other leaf spot diseases
Vegetables	Leaf rot, brown rot, grey mould, powdery mildew and downy mildew, leaf spot and fruit spot diseases (e.g. <i>Alternaria</i>)
Potatoes	Late blight, early blight (<i>Alternaria</i>), black scab (<i>Rhizoctonia</i>), silver scurf
Grapevine	Powdery mildew (<i>Oidium</i>) and downy mildew (<i>Peronospora</i>), grey mould (<i>Botrytis</i>)
Peanuts	White mould (<i>Rhizoctonia</i>), <i>Sclerotinia</i> stem rot, leaf spot, rust
Banana	Sigatoka leaf spot
Coffee	Coffee rust

pathogens. For instance, many genes have been found that provide resistance to specific races of each rust pathogen. In many cases, resistance genes are available in the gene pool of cultivated plants and can be transferred to them by cross-breeding programmes. The incorporation of plant-derived resistance genes against fungal pathogens into susceptible varieties could allow development of resistant varieties which can deliver high yields in the absence of fungicide applications.

A few countries in Latin America, mainly Argentina, Brazil and Cuba, are carrying out a number of activities on transgenic resistance to fungi, particularly on tropical fruit trees, with some results already being tested in the field. In this region, most of the activities for transgenic fungal resistance are reported in Cuba, in particular involving field trials of transgenic potato for late blight resistance, and fungal-resistant sugar cane. Other field trials in the Latin America region for transgenic fungal resistance are reported for maize, sunflower and wheat in Argentina, and tobacco in Mexico. Other crops subject to transgenic R&D for fungal resistance in Cuba are banana, plantain, pineapple, tomato, papaya, citrus and rice. Other countries involved in transgenic fungal resistance research are Argentina on alfalfa, Brazil on rice, barley and cocoa, Chile on grape and apple, Colombia on tree tomato, Peru on potato for late blight resistance and Venezuela on sugar cane.

Resistance to sucking insect pests in rice, fruits, vegetables

Insects are found in all types of environment and they occupy little more than two thirds of the known species of animals in the world. Insects affect human beings in a number of ways. Many of them feed on all kinds of plants including crop plants, forest trees, medicinal plants and weeds. They also infest the food and other stored products in godowns, bins, storage structures and packages causing huge amount of loss to the stored food and also deterioration of food quality. Insects inflict injury to plants and stored products either directly or indirectly in their attempts to secure food. Insects that cause less than 5 % damage are not considered as pests. The insects which cause damage between 5 - 10% are called minor pests and those that cause damage above 10% are considered as major pests. Insects that cause injury to plants and stored products are grouped into two major groups namely chewing insects and sucking insects. The former group chews off plant parts and swallow them thereby causing damage to the crops. Sucking insects pierce through the epidermis and suck the sap. Many of the sucking insects serve as vectors of plant diseases and also inject their salivary secretions containing toxins that cause severe damage to the crop. Introduction of high yielding varieties, expansion in irrigation facilities and indiscriminate use of increased rates of agrochemicals such as fertilizers and pesticides in recent years with a view to increase productivity has resulted in heavy crop losses due to insect pests in certain crops. This situation has risen mainly due to elimination of natural enemies, resurgence of pests, development of insecticide resistance and out-break of secondary pests. There is an urgent need to develop GM crops, which could withstand the sucking insects and pests.

Agrobacterium-mediated genetic transformation has been optimized in indica rice susceptible to sap-sucking insects, viz., brown planthopper (BPH) and green leafhopper (GLH). Snowdrop lectin gene (*gna*) from *Galanthus nivalis*, driven by phloem-specific rice-sucrose-synthase promoter, along with herbicide resistance gene (*bar*) driven by CaMV 35S promoter, was employed for genetic transformation. Embryogenic calli--after co-cultivation with Agrobacterium strain LBA4404 harbouring Ti plasmid pSB111-*bar-gna*--were selected on the medium containing phosphinothricin. PCR and Southern blot analyses confirmed the stable integration of both the genes into genomes of transgenic (T0) rice plants. Northern and Western blot analyses revealed the expression of *gna* in the transgenic plants. In the T1 and T2 generations, the *gna* and *bar* transgenes showed co-segregation at a ratio of 3 : 1. Plant progenies expressing *gna*, in T1 and T2, exhibited substantial resistance against BPH and GLH pests. This is the first report dealing with transgenic indica rice exhibiting high resistance to both insects.

Improved processing and storage in wheat, potato, fruits and vegetables.

In India, where crop production is still largely dependent on nature, there are years of over production and drought. Further, food grains have to travel the vast geographical boundaries of the country. So it becomes very important to have efficient food processing and storage units, which can store food for 3 months to 2 years and protect it from any form of pest, rotting etc.

Food processing and preservation is a set of physical, chemical and biological processes that are performed to prolong the shelf life of foods and at the same time retain the features that determine their quality, like colour, texture, flavor and especially nutritional value. Food preservation is achieved by destroying enzymes and micro organisms using heat (blanching, pasteurization), or preventing their action by: removal of water, or increasing acidity or using low temperatures.

Main methods of food processing include Cooking, Preserved food, Oiling, Adding chemical preservatives, Sterilizing, Freezing, Drying, Salting, Fermenting, Germinating etc. Some protection measures against pest include –

Using layers of sand alternated with grains : The idea is to fill the empty spaces between the stored grains in a given container (for beans, corns, etc.), removing in this way the air spaces and eventually, avoiding the development of insects.

Mixing wood ashes with grains: The ash forms a protecting layer against the insects. When the insect enters in contact with the ash, it will cause the insect's skin dehydration and eventually its death.

Keeping in Chilli or Margoza powder: Chilli and Margoza prevents the development of different pests.

Protect the ears (Corn) with eucalyptus, tobacco or lantana camara leaves : The eucalyptus citrodurus, tobacco, or lantana camara leaves, repel plum curculios in the granary

Keep with flowers/repelling leaves: Plant chrysanthemum flowers or catharanthus or other plant with repelling leaves (such as: Tagetes minuta of Myrtaceae family and Datura stramonium of Solanaceae family) around the granary in order to make escape the insects because of the bad smell exhaled from the repelling plants.

Drought tolerance in staple cereal and tuber crops

Drought is a condition in which the available moisture at a certain location falls sufficiently short of the normally expected such as to constrain the agricultural activities that have been adapted to the particular location. Drought remains the single most important factor threatening the food security

of peoples in the developing world. Drought stress arising from uneven distribution of rains during the rainy season or total cessation of rains during the growing period may occur at any of the four distinct growth stages(i.e. seedling, vegetative, pre-anthesis and post-anthesis) especially in cereals. Of these four phases, moisture stress at the post-anthesis phase is considered to be crucial to food production as this often leads to failure of pollen to germinate and consequently, poor seed set resulting in partially or wholly unfilled ears at harvest. Among the economic implications of drought worldwide are: (i) severe food shortage with its associated spiraling of food prices,(ii) famine, (iii) destruction of export crops which ruins the export economy, (iv) forced emigration of victims to more favourable environments which may be of different culture and organization as well as(v) refugee problems(Enabor,1 985).

Arrauudeau (1989) identified five terms often used by breeders in drought research. These are drought resistance, drought escape, drought avoidance, drought tolerance and drought recovery. Drought resistance is the ability of the plant to live, grow and yield satisfactorily with limited water supply or under periodic water deficit while the plant's ability to mature before water stress becomes a serious limiting factor is referred to as drought escape. Drought avoidance on the other hand is the ability to maintain high water status during drought.

Drought tolerance refers to ability to withstand water deficit as measured by degree and duration of low plant water potential while drought recovery is the ability of a plant to resume growth and yield after drought stress, with a minimum of irreversible yield loss

Approaches to drought research:

The approaches to drought research include (i) growing more DT crops,(ii) breeding more drought resistance into crops, (iii) breeding for heat tolerance in crops,(iv) incorporating genes for resistance to prevalent diseases in DT genotypes and (v) the use of complementary crop management practices that promote the adoption of cultivating DT genotypes.

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Development – constructive or destructive

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Abstract— The never ending demand of the so called modern and civilized society for their comfort and prosperity is fulfilled by using the natural resources in various forms. The rapid growth of human population is demanding more and more natural resources and thereby causing fast depletion of our natural resources. Manufacturing of various goods and services for human use results in pollution, waste, emission and generation of toxic substances. Efforts are therefore required to reduce the amount of these undesirable substances. Only the conservation of natural resources and their judicious use can ensure the very survival of our present as well as future generations. Developments have to take place but at the same time it has to be 'Sustainable' so that it can take care of our environmental needs. Innovations in the field of science and technology will definitely help in this direction by ensuring the judicious use of materials for fulfilling our basic needs as well as to improve the overall quality of life. This paper highlights the needs and ways to achieve a proper balance between the environment, economic growth and welfare of the society for a sustainable future.

Keywords —Progress and development, Environment, Energy, Technology, Industrialization, Sustainability, Product Life cycle.

I. INTRODUCTION

As per Alfred Russel Wallace (1892) the word 'progress' may either mean an advancement of material civilization or advancement in mental and moral nature of man. He had mentioned that each generation is benefited from the trials and failures of the preceding generation. As per him the discovery of printing caused very fast pace of progress in our mankind as it helped in facilitating and circulating all new knowledge.

'Progress' never stops! The human population is progressing since the birth of Adam and Eve. But this progress is ultimately dependent on various materials from our mother earth. The manufacturing sectors today are under great pressure to meet the ever increasing demand of various goods and services for meeting the society's demand. These demands are to be met by using various natural resources either in virgin form or after suitable processing.

II. HUMAN PROGRESS AND DEVELOPMENT

There has been a steady development of the human population since the dawn of creation. As per John McCarthy (1995), the human progress in the last few centuries comprised of the followings:

- Increased access to material goods

- Increased life span
- Reduced childhood death
- Increased opportunities for education
- Safe water supply
- Societies that people choose to migrate to
- More individual choice of occupation, lifestyle and avocations
- More opportunity to enjoy both culture and nature
- Cleaner environment
- Increased consideration for the values in nature, e.g. for the preservation of biological diversity
- Increased concern for less advanced people and their cultures
- More and more new goods and services available to more and more people.

III. ROLE OF SCIENCE AND TECHNOLOGY IN HUMAN PROGRESS

Science and Technology has a very important role in the progress of the mankind. The human being is progressing very fast with the advancement of science and technology. As per John McCarthy (1995) humanity has progressed over hundreds of thousands of years, but until about the seventeenth century, progress was rare and slow. As per him the greatest rate of progress for the average person occurred around the end of the 19th century when safe water supplies, telephones, automobiles, electric lighting, and home refrigeration came in short order.

According to Stephen E. Little (1999) Science and Technology development is increasingly driven by the requirements of a globalizing world economy and the advent of information/communication technologies that had supported this globalization process.

IV. PROGRESS VS. ENVIRONMENT

Due to consistent and relentless efforts human being were able to progress continuously. In spite of tremendous progress and development one wonders whether this progress is constructive or destructive in nature. Constructive development signifies development which is 'sustainable'. A detailed analysis shows that the developments are destructive i.e. not sustainable in many instances. Various human activities for meeting their growing demands and the rapid population explosion have resulted in over-exploitation of natural resources, environmental degradation and various associated problems. Some of these are:

- Global warming and climate change
- Exhaustion of natural resources including fossil fuels
- Soil, water and air pollution.

There is an urgent need to protect our environment from any further degradation. Conservation of natural resources, protection of the environment and reduction of environmental degradation might be possible by some of the following ways:

- Adopting integrated and holistic approach
- Commitment from top decision making body/ government
- Educating the Public and making them aware of their environment.
- Framing various standards, environmental policies, regulations and their strict implementation
- Involvement of citizens, industries, educationists, scientists and the government in making various policy decisions
- Emphasis on Research and development for technological up gradation
- Allocation of budgets for carrying out research and developmental tasks.

V. INDUSTRIALIZATION AND SUSTAINABILITY

To meet the ever increasing demand of the market, rapid industrialization is the need of the hour. The society's growing concern for the environment has a great role in pressurizing the manufacturers to comply with the environment friendly practices. Stricter government norms and regulations are also forcing the manufacturers for adopting better, alternate and innovative ways of manufacturing. Under such compulsion the manufacturers are left with no other choice but to improve their practices in order to survive and compete in the market. These trends and practices will ultimately lead towards sustainable growth and development.

According to Bruntland Commission report published in 1987 any development may be termed as 'sustainable' if the needs of the current generation do not impinge on the ability of future generations to meet their needs. The term sustainability contains the idea that humans on this planet should live in such a way, that the needs of the present are satisfied without risking the need for the future. This is possible only through a proper balance between ecological, economic and social dimensions.

A. Technology vs. Sustainable development

There are limited natural resources on our earth. As the human population is growing at an alarming rate there is an ever increasing need for natural resources. These increasing demands can be met through the use of technologies especially innovative technologies and through the judicious use of resources.

Roger C. Herdman (1994) was of the opinion that Technology can affect sustainability in a positive way by reducing throughput and waste and by increasing efficiency and finding alternatives to scarce resources. As per him environmental benefits are not the sole measure of a technology's contribution to SD (Sustainable development) but appropriateness of scale, use of local resources, and equity are important considerations as well.

B. Sustainable consumption and manufacturing

The rapid growth of world population has a great demand for variety of products for human use. These are obtained from scarce natural resources either in the form of virgin materials obtained directly from nature or in the form of finished goods that are manufactured in industries using the virgin materials and by using energy in some form or the other. The consumption level of energy and goods are increasing at an alarming rate and there may be an acute shortage of raw materials in the near future. Moreover the consumption pattern is also changing in the society. Hence there is an urgent need of sustainable consumption for sustainable growth. The manufacturing sectors are required to develop Sustainable manufacturing practices that can promote a good quality of life which will lead towards a sustainable development. Some of these steps might be the followings:

- Adoption of sustainable technologies and practices
- Efficient and effective use of natural resources
- Effort to minimize undesirable environmental effects
- Use of alternate materials for making better products
- Use of clean and efficient technologies
- Use of recycling technologies
- Focus on research and development for developing innovative technologies.

Till recent past many of the industries and their manufacturing practices were causing harm to the environment leading to its gradual degradation in a variety of ways. It is likely that the environment concerned society and the government will not tolerate these malpractices and damages caused by the manufacturers any further. It is also likely that the competition and challenges will continuously increase amongst the manufacturing industries in the future. Therefore only the manufacturers adopting sustainable technologies and sustainable work practices will be able to survive and thrive in the years to come.

It can be said that manufacturing will be truly 'sustainable' only through the active participation and commitment of the Government, the society and the manufacturing organizations.

VI. SOME RECENT TRENDS FOR CONSTRUCTIVE DEVELOPMENTS

Responsible technocrats, researchers and manufacturers are expected to develop various technologies that will bring a cleaner, healthier, safer and sustainable global environment. The recent trend is to develop alternate materials for

manufacturing, focus on innovation, development of micro and nano technologies, product development through recycling, analyzing energy during manufacturing with the aim of reducing it by process optimization or by better product design or by using advanced technologies.

A. Development of alternate materials and better design

The recent trend is to look for alternate materials that may require less energy to produce goods and may reduce the generation of scrap, waste, emission, toxic substances. As per Blawert C et al. (2004) recent global trends are driving the automotive industry to manufacture lighter, more environmentally friendly, safer and cheaper cars. Mustafa Kemal Kulekci (2008) stated that, in the past, aluminum and plastic were been used extensively as the preferred material for many automobile parts but in the recent years the use and applications of magnesium in the auto sector are increasing. He also highlighted that recent research and development studies of magnesium and magnesium alloys have focused on weight reduction, energy saving and limiting environmental impact. The leading automakers are concentrating on the reduction of car weight and limiting the amount of exhaust emissions due to legislative compliances and consumer preferences for safer, cleaner vehicles and environment friendly products (Friedrich et al. 2001).

B. Development of new and innovative technologies

The recent trend is to develop newer and innovative technologies that may give birth to the concept of sustainable manufacturing holistically. According to Dr. Hans-Gunter Vieweg (2012) innovation processes are characterized by the convergence of interdisciplinary inputs from the fields of science, technology, geography and many other fields. Nanotechnology, materials technology, information technology and flexible manufacturing are considered as key drivers of innovation. In order to achieve sustainable development, environmental protection constitutes an inherent part of the development process and, therefore, cannot be considered in isolation. Ways to improve the existing designs and processes in order to reduce consumption, wastage and prevent residues from damaging the environment have to be found. As a result, scattered but strong pools of knowledge have been developed in the areas of Lean Manufacturing, Sustainability, Waste Reduction, Energy Efficiency and related issues. However, these pools of knowledge are not synergized and inadequate, or no linkages exist between these diverse knowledge bases. As a result, conflicting interests between different knowledge bases pose a severe hindrance in the development and use of these technologies. A holistic techno-managerial blue print may be required to find the resolution of such conflicts. The development of sustainable products by using multi-disciplinary knowledge inputs will not only ensure a large economic impact but will also fulfill the all-important obligation towards achieving the objectives

as envisaged in the definition of sustainable manufacturing.

C. Macro, Micro and Nano manufacturing technologies

In recent years, manufacturing industry has witnessed a rapid increase in demand for macro, micro and nano products and components in many industrial sectors including electronics, optics, medical, biotechnology and automotive sectors. This reflects the current trend of product 'miniaturization'. All 3 platforms i.e. macro, micro and nano must be able to perform multiple functions either singly or in a combination thus allowing function integration (i.e. combination of different functions) and length-scale integration (i.e. mixing of the macro, micro and nano dimensions). This would result in tremendous cost and environment benefits (E. B. Brousseau et al., 2010).

John Allen (2010) highlighted the need for developing versatile miniature machine tools for in situ repair/maintenance work on large mechanical systems. As per T. Eriksson (2008) a Micro factory is a concept that refers to extreme miniaturization of a manufacturing system. It was pointed out that if the equipment could be miniaturized without compromising the manufacturing capability, it would result in a dramatic reduction of space and energy consumed by a factory. As a consequence the environmental impact would also be reduced.

D. Recycling for Sustainability

Recycling is a concept that many a times help in reducing environmental degradation as the same material is used again and again. The cost of the recycled product is generally much lower as compared to that produced with virgin materials. According to Butler and Hooper (2000) and Fleischmann et al. (2001) the cost of conversion of recycled material into new products is often less than the conversion cost using virgin materials. For example, steel mini-mills that melt scrap iron do not require the same level of capital investment (coke ovens, iron ore sintering facilities, blast furnaces) as required for the conventional steel mills, thereby greatly reducing capital and operating costs (Crandall, 1996). Similarly, paper mini-mills have lower capital and operating costs than conventional mills because the separation of cellulose fibers from wood has already been done (Denison and Ruston, 1997). As per Joy M. field et al. (2007) while producing aluminum, steel, paper, and glass a lot of adverse environmental consequences stem from the initial processing of the virgin materials. Consequently, environmental regulations and their associated costs are very high for manufacturers using virgin materials. On the other hand, the use of recycled materials significantly reduces all forms of pollution and therefore, has minimal environmental compliance issues besides substantial cost benefits (Kharbanda and Stallworthy, 1990).

E. Qualitative Analysis of Energy

The demand for energy is rapidly increasing. At the same time the conventional resources of energy are depleting very fast. The efficient use of energy for the industrial and other applications has assumed a great importance. This thought gave birth to the concept of “exergy” (G. Wall et al., 2011) which deals not only with the quantitative aspect of “energy” but also its “qualitative” aspect. This concept focuses on the ‘capability’ of ‘energy’ to perform tasks. This can be further explained by understanding the work potential of a particular type of energy. For example ‘frictional energy’ has very little ability to perform any work. On the other hand some forms of thermal energy have tremendous work potential. Consequently it can be said that different forms of energy possess different work potential. The importance of designing more energy efficient (exergetic aspect) machines and equipments have to be understood at length.

VII. PRODUCT LIFE CYCLE AND SUSTAINABILITY

Sustainable products are the products that are fully compatible with nature throughout their entire life-cycle. Various aspects and criteria should be considered while designing a product based on sustainability issues. The various parameters of sustainability for designing a sustainable product is shown in figure 1.1.

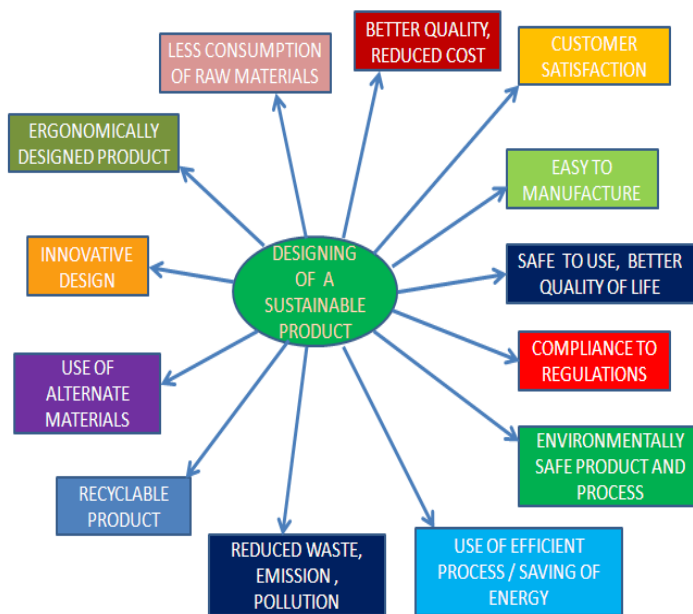


Figure 1.1: Parameters of sustainability

CONCLUSION:

Progress and developments are never static but are always dynamic in nature. The rapid developments in last few decades has highlighted the fact that the over exploitation of the natural resources resulted in destructive development by causing much damage to our eco system. It is therefore desirable that the concept of sustainability to be inbuilt in all the aspects of manufacturing including processes, tools, methodologies and techniques. The manufacturers are expected to use renewable energy, develop technologies that are more energy efficient and focus on the reduction and optimization of waste, emission and toxic substances while manufacturing. The development of sustainable manufacturing processes and practices will give rise to true sustainable development.

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Innovation for a greener manufacturing

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Abstract—Traditional manufacturing system which were in practice since ages does not take into account the damages caused to our environment. Manufacturers are engaged in relentless exploitation of natural resources for producing goods with the sole aim of earning profits. Such a system puts up intense pressure on scant resources available and leads to further environmental degradation. This paper highlights the role of greener manufacturing practices which emphasis the use of novel approaches for design, production and operation for a sustainable future. An integrated approach is required to analyze the impact of various manufacturing parameters with the aim of minimizing environmental damage. Manufacturers are going in for eco-innovations for transformation the production process and increasing green productivity of resources.

I. INTRODUCTION

Environmental responsibility has grown steadily as a corporate concern for the past decade. Increasing laws and regulations, coupled with the recognition that developing more friendly manufacturing operations is the need of the hour have put green manufacturing at or near the top of most companies' agenda. Green manufacturing has become a challenge for industries in the current trend of globalization and environmental awareness. The central objective of manufacturing is the combination of economic and ecological efficiency, which is achieved through cleaner production. The environmental and resource parameters are integrated in product development, process technology, and systems management to gravitate towards the optimization of resources and efficiency of operations. Environmental protection measures have to be linked to productivity and quality improvements to gain acceptability and to rationalize their implementation

Green manufacturing involves manufacturing processes in which the resources which have relatively lower environmental impacts than the existing ones are used. It eliminates or minimizes waste in the form of energy, emission, hazardous chemical and solid waste. Green manufacturing includes source reduction, recycling and green product design. Source reduction is broadly defined to include any actions reducing the waste initially generated.

Melnyk and Smith[1] defined green manufacturing as "a system that integrates product and process design issues with issues of manufacturing planning and control in such a manner as to identify, quantify, assess, and manage the flow of environmental waste with the goal of reducing and ultimately minimizing environmental impact while also trying to maximize resource efficiency". Green Manufacturing (GM) is the intersection of product development and manufacturing practices with environmental issues and concerns. The greater the overlap between these areas, the greater the extent to which manufacturing practices recognizes and embodies environmental issues, concerns, and practices. The manufacturing industry is focusing on innovations in the field of energy, process and products in their operations for reducing their negative impact on environment.

2 Motivation for adopting Green Manufacturing

The motivation for experimenting and adopting innovations in Manufacturing has varied across sectors. The main forces behind this are

- Increasing cost of energy
- Growing input costs
- Increase consumer awareness for Green products
- Introduction of new environmental and waste management laws
- Technological advances which open up new commercially viable business opportunities
- Non-replenish able nature of resources
- Stricter government regulatory pressures

The development of green manufacturing requires newer approaches for design, production and operation for energy savings and reduced environmental impact. Manufacturers are going in for eco-innovations for transformation of production process operations in following ways:

3.1 Employing Green energy

The conventional resources of energy are depleting very fast and the cost of energy is also increasing/ The efficient use of energy for the industrial and other applications has assumed a great importance

due to problems of emission green house gases also with thermal power plants .Employing Green energy includes

- All aspects of energy management, and the modeling & control of energy management systems
- Renewable energy, alternative energy, with real-time power monitoring, environmental monitoring,
- Asset management, asset utilization, and energy reduction / optimization,

The automobile and transport industry have taken steps to reduce emissions and other environmental impacts related with fossil fuel consumption. They have focused on increasing energy efficiency of vehicles and development of alternate fuels. Power industry has innovated with the use of carbon sinks for reducing green house gases .IT companies are setting up energy efficient data centers to reduce electricity consumption Manufactures today fallow a green supply chain practices ,so as to reduce their carbon imprints.

3.2 Green Process Design

Green process design is a process for assessing and evaluating the environmental, occupational health and resource consequences of a product through all phases of its life, i.e. extracting and processing raw materials, production, transportation and distribution, use, remanufacturing, recycling and final disposal (Alting L,1993) Green process design is an optimization problem by maximizing the added value and minimizing the resource consumption and waste dispersion activities at different stages of manufacturing. It emphasis the role reducing, replacing and recycling of resources, to mitigate the problems of rapid industrialization

LCA which involves a detailed study of the various environmental parameters at different stages of the product The variants of Life cycle analysis (LCA) for an eco-balanced process design approach are suggested by various researchers are give in table 1.

Table 1: Characteristics of various LCA approaches

S. NO	Green process design	Characteristics
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	approach	
1	Cradle-to -gate	Partial assessment - manufacturing to factory gate
2	Cradle -to - Cradle	Biometric approach to the design of system
	Gate-to -Gate	Looks at valve added in production chain
3	Well -to Wheel	Efficiency of fuels consumed
5	Life Cycle Energy Analysis	Total life cycle energy consumption is analyzed

The metal and mineral industry has in recent years significantly increased its environmental performance through a number of energy-saving modifications and the re-design of various production processes. These have often been driven by strong external pressures to reduce pollution and by increases in the prices and scarcity of raw materials. For example, the development of advanced high-strength steel vehicle designers and steel makers and enabled the production of stronger steel for the manufacturing of lighter and more energy-efficient automobiles Electronic industry is enhancing the recycling capabilities of components appliances Electronic industry is increasing using LCA approach to minimize the emission of harmful fumes..Companies are manufacturing products that are biodegradable and does not pose the problem of disposal associated with them. Several strategies in the areas of process planning, machine design, and machine operation are being deployed to develop green machine tools. Before exploring different solutions, a life-cycle energy analysis is first presented to guide subsequent investigation. The results of this analysis provide a range of the environmental impact of the use of machine tools in different types of manufacturing facilities.

3.3 Green Product Design

Researchers have analyzed different stages of a product's life and developed techniques and logistics to improve the design of the product from an environmental perspective. These techniques, all together, are referred as the design for environment (DFE) (Fiksel J 1996). This is based on the philosophy of integrating manufacturing and design operations for making products environmentally

benign. By the use different DFE principles the problems of environmental impact are addressed at the design stage only. Various researchers have advocated use of different strategies to achieve these goal which are listed below

S. No.	Characteristics	Impact on Environment	Researcher's
1	design for energy conservation	Reduced carbon emission	Hesselbash (1998) Henshaw J. W.(1994) Issacs J A 1996
2	design for minimizing the discharge of hazardous byproduct	Improves waste management	
3	design for disassembly	lower Ecological Impacts	
4	Design for recycling	Enhanced eco-efficiency	
5	Design for remanufacturing or part recovery	Increased Sustainability	

Manufacture today alter design technologies so as restrict the use of hazardous substances in electrical and electronic equipments .It contribute to the protection of human health and allows for environmentally sound recovery and disposal of waste electrical and electronic equipment Consumers goods manufactures fallow a star rating system to indicate the energy consumption of their appliances .HVDC lines are being designed which have lower transmission losses. Newer plastic product are being manufactured which allows for easier recycling. Automobiles manufactures are designing hybrid vehicles which will have environmental impact,

3.4 Integration Lean and Green Manufacturing practices

Many leading companies have implemented Lean Manufacturing Programs which yield increased efficiency, reduced costs, improved customer

response time, and more. Others have adopted “Green” Programs resulting in reduced energy consumption, waste generation, and hazardous materials usage. Gary G. Bergmiller, et. al. (2009) highlights that models for both Lean and Green manufacturing include management systems, waste identification, and implementation of waste reducing techniques (WRT) to achieve desired business results. Studying known Lean companies, it is confirmed that strength of management system correlates with WRT implementation which correlates with business results for both Lean and Green Programs. Geoff Miller et. al.(2010) recommended that integrated lean tools and sustainability concepts aid in the elimination of waste have helped the company meet ever increasing customer demands while preserving valuable resources for future generations.

3.5 Green Supply Chain Management

As per Handfield R (2005) Green supply chain management(GSCM) is designed to incorporate environmental considerations into decision making at each stage of an organization’s materials management and logistics functions until post-consumer disposal . Vachon S (2007) highlights the tangle linkages between green supply chain practices such as environmental collaboration with suppliers, environmental monitoring upon suppliers, environmental collaboration with customers, environmental monitoring by customers and the selection of environmental technologies . GSCM impact on relationship conditions existing between a customer and its suppliers were highlighted by Simpson D (2007).

Conclusion

The paper highlights various innovative approaches which are influencing the achievement of an environmentally friendly manufacturing. Green manufacturing advocates changes in the processes, products and practices Green manufacturing entails s all phases of product’s life cycle from design, production and distribution phases to the use of products by the end users and its disposal at the end of product’s life cycle. Green process design is an optimization problem of maximizing the added value and minimizing the resource consumption and waste dispersion activities at different stages of manufacturing. With the use different design for environment principles the problems of

environmental impact are addressed at the design stage and products are designed to be environmentally benign. Model for both Lean and Green manufacturing management systems highlights waste identification, and implementation of waste reducing techniques to achieve desired business results. Environmental considerations must be taken into account in decision making at every stage of an organization's materials management and logistics functions.

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Science in media: Media and message in a techno-savvy world

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Abstract—Science and technology have become so much a part of our world that instead of underlining reality and fostering rationalism, they have lead paradoxically to overwhelming of our world with images. Something more pervasive and intrusive has been shaped out of this interaction- this is Virtual Reality [1]. Reality has been undermined by virtual reality. In the present times, cyberspace could claim to be more populated than real, tangible world. It has also engendered a global international culture feeding on media: where media objects become cult objects and have fan following. This culture further engenders numerous cultures that may be localized variants of the global culture, hence ‘glocalization’[2]. The Medium is the Message’ – this statement from Marshall McLuhan is no exaggeration[3]. ‘Media, a product of technology, which in turn is application of science, has changed the way we perceive reality and our value – judgments. Medium is the message also means that the social media one uses would determine the social inclinations and status of one. For example, if you are on twitter, you are part of a clique that is famed to be witty and media-savvy. You are of the people who love the social networking site’s capacity to make your message public and indeed invite almost instant reactions. New Media has also led to blurring of the line between high culture and low culture; it has led to emergence of new kind of art like electronic art, digital art, telematic art and of course animation.

I. INTRODUCTION

The content of the media is anything from factual to fictional; from literary to scientific. Humans have always tried to transcend the limitations of media. Consider cubist paintings that try to convey multiple perspectives at the same time. Also, avant garde art and sculpture inspired by movement trying to convey fluidity in static media. In Da Vinci Code, there is a paragraph that informs about Leonardo da Vinci’s habit of mirror writing [4]. Dan Brown’s guess is that Da Vinci practiced this reversed writing to get rid of people peering over his shoulder, but the author lets the point remain moot. So media can reveal as well as conceal- reveal to those that know the code and conceal from those that do not share it. So medium is message in this way too, else it is nonsense. The unraveling of Genetic Code by humans-is it a divine indicator that nature is ready to share the code of life with humans and allow humans to interfere with evolution and

determine it; or is it an alarming turning –point telling us that we have transgressed the limits delving into mysteries not meant for us.

Myriad Media

When we think of telegrams , we think of urgencies and emergencies even before the actual content is revealed; when of telegrams, we think of important messages that have relevance across oceans-may be serving some political nexus that is trans-continental. When walkie-talkies are the objects then it is some war-time message. We of course believe that anyone with a walkie-talkie will be shouting ‘Tango-charlie’. Compare telephonic communication to the interaction that takes place on the internet. The message on telephone is certainly limited by the kind of channel. It relies on transmission of sound as opposed to visuals and sounds and written message combined made possible in contemporary media. It is not permanent unless recorded for future use. It is interpersonal and simultaneous copies are not generated for group, community or mass communication. Now, consider Twitter, the social networking site founded in March 2006 by Jack Dorsey wherein messages or Tweets have to be just 140 characters long. This demands Twitter community to use wit to express themselves in short, crisp language that also reads like news. According to Wikipedia, it has been described as the SMS of the internet[5]. ‘Necessity is the mother of invention’- this proverb rings true because it is human need to communicate on personal as well as public levels. It is interesting to observe that a new phenomenon has emerged in which ‘friend’-ship is redefined. In Indian context, friendship was associated with age. This attitude of veneration has been replaced by another one of informal access. Even, approaching another user whose ‘profile’ you like has become easier being facilitated by the portals tailor-made to enhance interaction. Such a portal is ‘facebook’.

Media, Message and Cyberculture

The World Wide Web, telecommunication, radio and television broadcasting and print technologies would not have been possible without the spirit of scientific innovation. These are media that have been developed using advances in technology. Impact of media on science and science on media is all pervasive- visible in societal changes. Enlightenment ideals of reason, thought and knowledge are not the heirloom of the elite or scholarly anymore; education has become democratized thanks to mass communication that makes knowledge accessible to all. Modern media has made

knowledge eclectic and egalitarian. Therefore, media allows for access to knowledge. On a microcosmic level it allows the message to be replicated for numerous recipients. Consider what message did Narendra Modi want to convey by making simultaneous appearance at three different places at the same time on November 20, 2012 in Gujarat? That he is a progressive and techno-savvy chief minister? His appearance in holographic projections has been condemned as a 'hi-tech 3D campaign extravaganza'[6]. But he also conveyed the message that he is a minister giving greater value to media publicity spending crores on it, while farmers in Vidarbha struggle with loans and failing crops. As an e-newspaper Firstpost reports 'Modi's speech was telecast on specially erected screens in Ahmedabad, Vadodara, Rajkot and Surat with the help of 3D holographic technology and satellite link-ups'. This was followed by Modi's undeterred 27 appearances throughout Gujarat making him invincible almost.

Proliferation of media makes for cheaper media which in turn makes the message sharable and common. Furthermore, sophisticated media gives greater clarity and density to the message. Besides this, the multiplicity of media supporting each other or multimedia correspondingly allow for greater detail and panorama of information related to any subject. For example, I could look for a word like 'gigantic'. Not only would I get to see the spelling, meaning and etymology of the word, but if I have audio software installed I could hear the pronunciation of the word. There may be still images as well as videos suggestive of the word which could be played if my computer's operating system supports the software for video-player. This is usual today and fully loaded systems are regular since PCs have become common.

In *Understanding Media: The Extensions of Man* (1964) Luhan asserts that media should be the focus of study in communication, rather than the message. By this, he emphasizes the importance of media as for him the media definitely alters the message. He also puns on the word message to ram home the point. He elaborates the point further with the help of deconstructing the structure of a movie. Where images are arranged in an order found best by the editor and not as they may have emerged in the chronological progression. Certain scenes are repeated and their very frequency makes them important. A montage of images may create a desired impression on the audience from creation of symbolic associations to the exact converse where every connection is undercut and in the end, the meaninglessness is highlighted as may be expected from surrealist or postmodern works. Similarly, if we analyze news content, we find that the presentations incorporate the message in a detached cerebral way that aims at evoking interest in the most weird of things and invite voyeurism as well as progressively desensitize the viewers as they are exposed to sensational news bytes often. To build upon and take from Luhan, we can infer the value of internet as a medium. The World Wide Web offers miraculous media that creates virtual spaces while paradoxically eliminating actual spaces and distances between the users. It allows skype, video chats, e-mails and groups that allow techno-savvy users to get connected. In fact, local

cliques are created from a host of far-off users who share the same ideology or outlook or interests. This brings in the concept of 'Internet Memes'[7]. Even their preference, of a particular portal or media makes them partake of a brotherhood-media brotherhood to be precise. Even, Skype when used to connect family members may be a comforting media but we have had instances where it was used for other purposes.

Technology is science made useful. Technology is tangible science- it can be touched, handled and used. Modern media are engendered in science; they emerge where technology is most spectacular and most handy at one and the same time. That also makes it most appealing. Media equipment, gadgets, gizmos and media softwares are all technological products. Technology, especially media, has become more affordable and accessible. Moreover, the farthest of regions presents a market opportunity to technological products and technomedia. So media is proliferating and the user is getting accustomed to this highly-technological media. The trouble is that in the endless flux of images propagated by contemporary media, it has become difficult to separate truth from reality and fact from fiction. Media makes science visible in its myriad colours and spectacular feats. Dry equations can move a genius like Einstein, for lesser mortals science has to be garbed as 'infotainment' [8] and 'edutainment' [9]. Science in society is science that caters to human convenience, but it is also science for a cause. The great inventions of science serve humanity and are guided by philanthropy and altruistic impulse. It is for humanity to make good use of them.

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