SOCH

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MASTNATH JOURNAL OF SCIENCE & TECHNOLOGY

A Quarterly Journal of Shri Baba Mastnath Engineering College
Asthal Bohar, Rohtak - 124 021

ABOUT THE COLLEGE :

Established in the year 1997, Sh Baba Mastnath Engg. College is deeply committed to contribute towards the development of Engg. & Technology education. Through a modern Technology & qualified faculty, education at this college is a continuous process towards the perfection. To be prestigious college of the region where excellence in visible in the field of wholesome development and empowerment through not only on education but also on imparting technological ethics.

ABOUT THE JOURNAL :

To facilitate sharing of various research and academic activities, we have ventured into publication of a Science & Technology Journal. It is quarterly publication of SBMNEC. The journal is intended to provide a forum for debate and deliberations of academicians industrialists and practitioners.

MANUSCRIPT SUBMISSION :

The Editorial Team invites manuscripts on all aspects of management and business environment. For style sheet, kindly refer to the last page of the journal. Manuscripts and all editorial correspondence should be addressed to :

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The Secret to living is Giving

One way to judge a person is by what they say. A better way is by what they do. The best way is by what they give. Blessed are those who can give without remembering and take without forgetting. The big problem is not the haves and have no - It's the Give Nots.

"Feel for others - in your wallet." An Indian proverb says, "Good people, like clouds, receive only to give away".

Text book of Acts says, " it is more blessed to give than to receive". Giving is always the thermometer of our love for others. Getters don't get happiness. Givers get it. Eleanor Reosevelt said, "When you cease to make a contribution, You begin to die".

Make all you can save all you can but give all you can. That's an excellent formula for a successful life. Giving is proof that you have conquered greed.

The law of harvest is to reap more than sow. It is true that people who give always receive. The motto of my institution is, " *विधेयम् जन सेवनम्*" and I feel that this Journal will go a long way in giving, disseminating and distributing the knowledge received from giants of the field. I offer my choicest blessings for the successful publication of the Journal.

Mahent Chand Nath Yogi
President
SHRI BABA MAST NATH GROUP OF INSTITUTES

Penning it Down

If you want to see if you can really swim, don't frustrate yourself with shallow water, Charles Schwab said, "When a man has put a limit on what he will do, he has put a limit on what he can do". Life is too short to think small.

I agree with Oscar Wilde when he said, "Moderation is a fatal thing. Nothing succeeds like excess".

Dr. J.A. Holmes said, " Never tell a young person that something cannot be done". God may have been waiting for centuries for somebody ignorant enough of the impossible to do that thing. If you devalue your dreams no one else will raise the price. You will find great leaders are rarely realistic by other people's standard.

Cavett Robert said, "Any man selects a goal in life which can be fully achieved has already defined his own limitation. Rather, Be a history maker and world shaker". Go where you have never gone before. When you climb the tallest tree, you capture the best fruit.

Develop an infinite capacity to ignore what others think cannot be done, Don't just grow where you are planted. Bloom where you are planted and bear fruit.

You only become a winner if you are willing to walk over the edge. Take the lid off. Go out on a limb------that's where the fruit is ! Spirella writes :

The is no thrill is easy sailing. When skies are clear and blue.
There is no joy in merely doing things which any man can do.
But there is some satisfaction that is mighty sweet to take.
When you reach a destination that you thought you would never make.

My best wishes for the first edition of the Journal of Engineering College.

Dr. Markanday Ahuja
Managing Director

Principal Speaks

It gives me immense pleasure in writing to you on this occasion of launch of Soch-Mastnath Journal of Science & Technology. I am confident that this Journal will go a long way in enhancing the interaction between the College and the Practitioners and professionals.

The Global Competition to which the world is exposed today is an outcome of globalisation & liberations of recent past. In the wake of the changed global environment, Indian industry finds itself faced with the challenge of Global Competitiveness. To cope with this changed environment India need a different breed of professionally trained technical professionals at the entry point which is evident from the recruitment pattern adopted by the Indian entrepreneurs during last years.

We at SBMNEC believe strongly in blazing forth a new and innovative trail. Standing on the threshold of a whole new millennium, our entire energies are focused on cultivating & developing a complete generation of dynamic & technical professionals.

I am behalf of the Management assure Mr. Rajbir Singh, the Chief Editor of the Journal full assistance in all respects in the improvement of the journal year by year so that this journal become a real asset of the college. I wish all success for the journal among the readers.

Dr. K.K. Sinha
Principal

Analysis of Economic - disparity

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Abstract

Last decade has witnessed astonishing advances in field of science and technology and hence tremendous increase in some economic parameters (GNP, GDP etc) have been achieved. Quite ironically, besides materialistic economic growth, it has, atlength produced ocean deep socio-economic disparity and a distressing state of poverty and mass-illiteracy, conflict and confusion, hatred and violence, war and tension galloping the developing nations mainly due to the neglect of human development programme. Recent UNDP report is a warning for countries of the developing nations including India,

This paper tries to analyse the recent report and proposes a new index namely socio-economic disparity index to determine the state of inequality for a country. The higher the index, the greater will be economic inequality and consequently a country with a very unequal distribution of income is unlikely to produce the same collection of goods and services compared to a country with more equal distribution. Hence it makes the developing nations difficult to survive in age of open market and globalisation.

Introduction

It has been practise to evaluate the success of an economy by measuring some economic indicators like Gross National Product, Gross Domestic Product, per capita income, Sensex and so on. Due mainly to impact of emerging technologies, it is well admitted fact that many countries have registered tremendous increase in Gross National Product which is quite important but high growth rate do not always guarantee the easing of urgent socio-economic based human problems but to the contrary, in many cases high growth rates have been accompanied by increasing unemployment, rising socio-economic disparities, worsening quality of life and over all detoriation in index of human development.

Infact, development is not an uni-directional activity. It is generally agreed that development relates to changes, to improvements particularly of a socio-economic nature, for all, rather than a handful of people, in all, rather than a few countries of world. In fact the happiness and progress of whole world community is the aim for which the Scientists and Technologist work ceaselessly, But is it not a shocking disclosure to the ardent supporters of modern technology that majority of scientific and industrial development is prodigiously enjoyed by just a meager percentage of urban population while the long cherished desire of even basic amenities still remain a dream to large population, living specially in rural areas of the third world? By now it has become increasingly evident that economic growth is a necessary but by no means a sufficient condition for social progress and that supplementary measures are needed if the problems of poverty, diseases, hunger and unemployment are to be effectively dealt

with. Obviously, there are sufficient reasons to call for changes in basic philosophy of economics to properly fulfill the requirements of the common masses as well, that is development of welfare concept. It has become increasingly evident by the report of United Nation Development Programme (UNDP) that national income of a country is not a complete indicator of all round well-being of masses, nor the economic development is synonyms of human development . In India on last one decades, many dazzling & astonishing achievements have taken place, the FDI has become enormous, sensex is tossing new heights, five star hotels have increased in numbers, Engineering college, Medical College, Management College in private sectors have increased by leaps and bounds, costly cars of foreign make, costly mobiles, hi-fi computers & internet have registered simply unbelievable statistics, but at the same time poverty has also assumed an alarming dimension side by side. Only as regards (Infant Morfality Rate) IMR , every one out of five children in India die at birth.

LATEST UNDP REPORT -AN OVERVIEW

In the latest report of UNDP, India has been ranked 127 with respect to index of human development, whereas even backward poor countries like Bangladesh, Vietnam and Uganda have been placed above it. The UNDP report is a serious challenge to India's so called claim of economic reform with human face.

Undoubtedly India's national income has increased but the per capita income has not shown significant positive trend, whereas China having much bigger population (nearly 1,30,4196000) has per capita income of 890 dollar per annum. The most conservative views of considering resources are dangerously limited and narrow as economist take in their preview of resources things like metals and minerals, oceans & hills, mines and rivers, the earth and planet the sun and moon, the stars and galaxies but commit the most vital mistake of excluding human resource which is most probably the most precious creation of nature and significant parameter for sustainable development. What is needed is proper planning & management of this vast treasures of human resources gifted to India just like China. As enunciated earlier, it is quite difficult to assign a universal definition to development but a big section of economist would agree that economic development without human face will finally be disastrous. UNDP has considered Infact Mortality Rate (IMR), average life expectancy of people, participation of children in primary & middle school, drop-out rates, provision of health facilities, per capita income, percentage of population BPL, gender discrimation etc as main basis for determining human development index. As per UNDP, India has been quite unsuccessful is discharging its main fundamental duties in fulfilling basic human needs and that is why the economic growth achieved could not be transformed into human development.It has resulted in jobless growth accentuating the socio economic disparities further. In the table given below data regarding some of top-ranking nations with respect to human development has been given in table 1.1

Sr.No.	Country	Rank	Specific features
1.	Narve	First	Difficult geographical conditions, Literacy rate-99%
2.	Canada	Fifth	Literacy rate -99%
3.	Ireland	Eight	Literacy rate 99%
4.	Sweden	Sixth	Literacy - 100%
5.	Lanka	Ninety Third	Very unstable political sceneries Literacy rate 91.6%
6.	China	Eighty Fifth	Literacy -84%,

Highest Population in World From above simple table, it is quite obvious that despite troublesome geographical and political scenario, the literacy rate are much above that of India and so also the higher human development index.

Actually the per capita income has been computed conventionally by dividing the National Income by population. And thus an average has been obtained which is highly confusing and misleading. In fact only 20 percent of people prodigiously enjoy the majority of economic development and the rest 75% population is deprived of even basic human needs. This has finally culminated in worsening the socio-economic structure of our country as it has at length produced jobless economic growth. The widening socio-economic disparities may be deep root of all these problems.

After impact of economic liberalization, the big percentage of national income has been owned by a handful of population whose standard of living bounced up characterized by fastly increasing number of costly five star hotels, costly cars, drinks, privately managed educational system, privately owned costly hospital the production of costly cars, air-conditioners. The facilities of air-travel increased enormously but public transport system which the middle & lower income group people were utilizing nearly collapsed. The increase in National Income resulted in breakdown of India's highest cultural heritage, social harmony which could be characterized by sizable increase in number of army of educated unemployed people who are victim of drug addiction, mental breakdown, abduction, rebellion and thus and overall deterioration in national character. Despite the recent encouraging rate of economic growth, India will find itself unable to reach the level of human development of developed country even by 2050-60 if this current model of development programme is continued.

If an analysis is attempted to sad plight of farmer, even more depressing situation would be depicted from the report of recent national sample survey conducted by ministry of statistics. It is evident that 27 percent of farmer have got even less than Rs. 400 pm for their livelihood and the lowest income strata of 4 percent farmers get even less than Rs 225 pm whereas other botton 8% have to satisfy on Rs 225 to less than Rs. 300 pm and 15 percent on

less than Rs. 380 pm. A peculiar data has emerged out of this survey that consumption expenditure of average former has declined by 9.3 per cent as compared to last national survey which puts a strong question mark on the justification for continuation of economic liberalization practiced currently, Infact the non-recognition of socio- economic disparity concept is the root cause of this short of unbalanced development.

Socio-economic disparity -an analysis

There have been attempt to depict economic inequality by various statisticians and economist from time to time. If a plot is made between population / No of household on vertical axis and income on horizontal axis, the frequency distribution may exhibit various shapes. A bell - shaped histogram or smooth curve with two equally shaped halves is indicative of a perfect symmetrical distribution. In this case the arithmetic mean median and mode will be equal as shown in figure. If this frequency distribution represents a particular country, it is most desirable and there is complete equality.

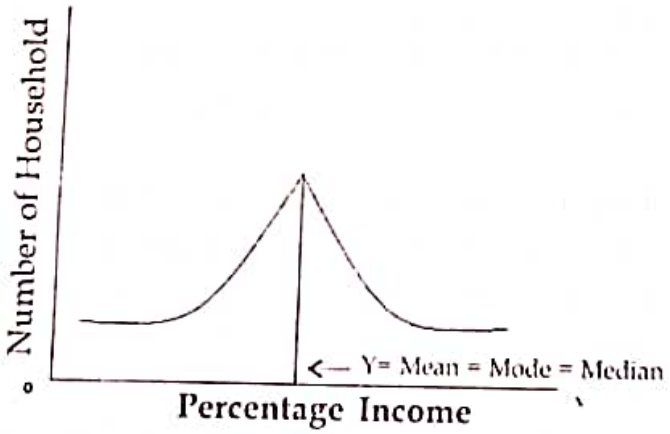


Fig. - 1.1

But it is only hypothetical case. The income distribution, for most of the countries, is quite uneven distribution which is not symmetrical about its mean value is obtained which is called skewed distribution. A distribution with short left leg and long right end is skewed to the right and a distribution with a long left and a short right end represents a left skewed distribution.

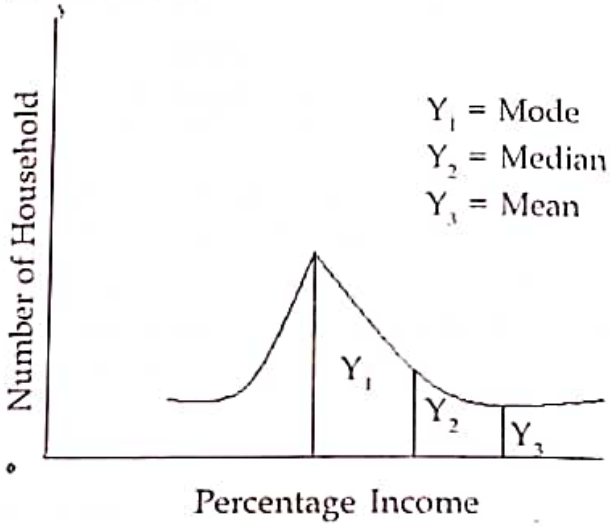
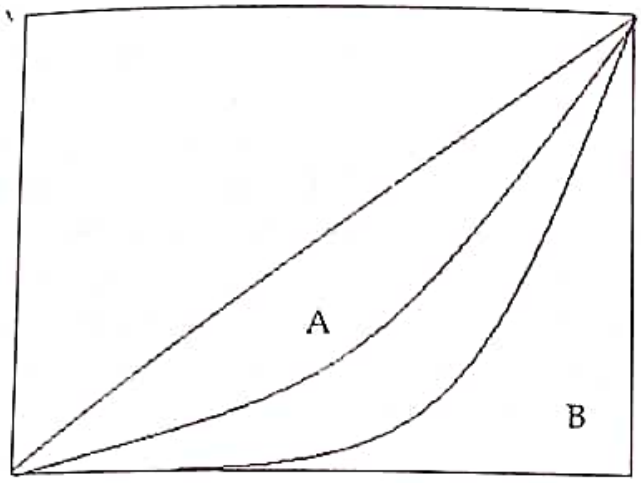


Fig. - 1.2

The degree of skewness can be computed by third moment of the samples about the mean. Another attempt by lorenz is quite impressive in presenting the uneven distribution between income and population.

Lorenz Curve depicts in a neater way the extent of equality and inequality among masses. In this diagram the vertical axis measures cumulative percentage of total income and on the horizontal axis cumulative percentage of total population is shown. Thus it depicts the socio-economic disparity easily. However the diagonal of the diagram making 450 angle defines a complete state of equality. If the Lorenz curve moves farther away from diagonal, the greater will be the degree of inequality. Naturally this increasing socio-

economic disparities have been eventually responsible for breakdown of world harmony. A society with a very unequal distribution of income is unlikely to produce the same collection of goods and services compared to a society with more equal distribution remarks Harbury.



Percentage Population

Fig.- 1.3

Curve A clearly shows economic inequality and the curve B which moves farther away from diagram, the inequality gap increases menacingly. Such disparities have resulted in a worst social disaster characterized by thousands suicides committed by people in Andhra Pradesh and other states. What a horrible impact of so called imported cyber technology ? It would not be out of place to mention that the literacy rate of cyberbad (on which people were so much boosting) is even less than many places in India including Patna. How surprising and sad disclosure it is ? Some people conferring on hi-fi lap-top, internet and arranging video-conferences, but on the other hand people committing suicide due to starvation - this is bound to create violence and unrest in the society. The socio-economic disparities will only be eliminated if we resort to welfare concept cautiously.

Another approach for inequality analysis has been proposed by Gini. However it is also related with lorenz's concept. It is mathematically computed by the area enclosed between the 45o diagonal line representing complete equality in income distribution of a nation and the actual income distribution depicted by Lorenz carve. The greater the area, the more will be inequality and vice-versa, It may be expressed mathematically as

$G = 1 + 1/n - 2/n^2Y \; [\, y_1 + 2y_2 + 3y_3 + \ldots + ny_n \,]$

Here Y_1, Y_2 - Yn are individual income in decreasing order, Y denotes the mean income and n is the number of ordinates. Gini Coefficient may vary from zero to one. But this coefficient is only a measure of relative size, of course it is very difficult to ascertain and calculate such measure.

Hence a newer measure involving three parameters have been proposed namely socio-economic disparity index or simply disparity index (μ) which may be defined as follows to represent degree of inequlity with some what better approximation. Here the highest income group Ymax in determined by taking average of 5 percentage people belonging to group comprising of people with uncover more than 100 Lakhs and above. Ymin represent the average income of 5 percent persone belonging to the lowest income group in the economy that is bottom 5 percent whose income lie at less than Rs 250 pm.

$$\mu = \frac{\text{Max}^{m} \text{ Income in economy} - \text{Min}^{m} \text{ Income in economy}}{\text{Average per capita income}}$$

$$= \frac{Y_{max} - Y_{min}}{Y}$$

This index will be higher for a country where the difference between income of an individual belonging to higher income group is enormously more than that individual of lower income group representing minimum income (Y min). If more individuals in economy belong to group above mean/mode value of income naturally . the average value will also increase. Thus if the data of income is diversely more closely in lower income group, the average will shown a lower value. Hence higher index value will be obtained which would be indicative of unsatisfactory and skew growth.

Suggestion for Minimizing Socio-economic disparity

Thus it become quite evident that socio-economic disparity is one of the greatest responsible factors which causes social-tension, drug addiction, abduction terrorism, hatred and disharmony, illiteracy, poverty deterioration in quality of life and various other evils that are accentuating the eating up of the basic fabric of humanity. Some of the steps to minimize inequality and to bring about all round prosperity are suggested in succeeding paragraphs.

1 Development of welfare technology

At present developing nations are crippled due to existence of various types of unemployment such as seasonal unemployment (due to seasonal pattern of demand) cyclic unemployment (due to drop out in business and industrial activity). Disguised unemployment, frictional unemployment and structural unemployment etc. Technology is one of the most important factors of production and adaptation of welfare technology may open new era of well - being of all. The judicious application of principles of modern science and technology in annexation with, environmental conservation and human understandings serve as the basic ideals of Welfare Technology. For the third world, in particular, the welfare technology has to be more labour oriented, less capital intensive and should promote utilisation of locally available materials and manpower so that socio-economic disparities are minimized and quality of life is upgraded. Thus the welfare technology has to identify the priorities and should pay proper regard to human welfare and environmental stability. Probably this would be one of the most ethical way to solve not only the problem of hunger, unemployment and illiteracy but also should tend to retard the rapid degeneration of human values. Today the third world, if not the whole, stands in the greatest need of welfare Technology.

The welfare technology is a big generator of employment. Here the importance of welfare technology is more pronounced and relevant in case of developing nations. In words of Gabriel Ardent in a paper, A plan for full employment in the developing nation "for a poor man the chance to work is the greatest of all the needs and even poorly paid and relatively unproductive work is better than idleness". Further he adds "Coverage must come before perfection and it is important that there should be enough work for all because that is the only way to eliminate antiproductive reflexes and create a new state of mind-that of a country where labour has become precious and must be put to best possible use and dignity". The welfare technology unlike the sophisticated technology, believes in dynamic approach by providing work / employment

opportunities to as much persons as possible even at the cost of initial lower output efficiency. Eventually the persons will consider themselves as integral part of the nation and would gain self confidence that their labour and time have some importance. It will create a new enthusiasm and uproot their age-old tattered mental structure and hence the efficiency and overall social environment is bound to enhance substantially. Thus the society will be saved from total collapse due to frustration and demoralization as can witness the demoralized army of unemployed educated young people crumbling under severe mental depression and leading a life that is slur in the name of development. In fact it has been rightly said that it is more desirable that everybody produce something than a few people should each produce a great deal.

Honestly speaking, the productivity of an unemployed man is not only nil but highly negative and contributes to devaluation in human behaviour. It eventually culminates into outburst of deep-rooted frustration accumulated in the minds of youth who, in turn show unruly and violent reaction. What is the meaning of physical happiness to be provided by technology to us when it takes away the pleasure of soul ? Hence that technology is appropriate and in the interest of the human-society which has the intrinsic capacity to create as large number of work-places and job-opportunities as possible because right to work is very much interlinked with the concept of "right to live". At a place Gandhiji has remarked, " A factory employs a few hundreds and renders thousands unemployed. I may produce tons of oil from an oil-mill but I also drive thousands oilmen out of employment".

Actually creation of large number of work places and job-opportunits for the development of society and individual, ecological harmony with surroundings and elimination of socio-economic disparities for enrichment of quality of life should guide the basis for development of technology of future. Although some steps have been taken to provides employment opportunities like encouragement & incentive to entrepreneurs, Women empowerment programme, food for work programme, TRYSEM project, JRY, PMRY etc but they have proved to be inadequate and ineffective.

2 **Changes in income -** tax structure :-The formulation of linear laws of income - tax are not in keeping with the socio-economic status of people belonging to various income group. Instead a highly progressive direct tax policy should be formulated. Here the higher income-group may have to pay taxes up 90%. Although one may argue that there is high probability that higher income group people will resort to tax-evasion and avoidance. Accordingly rules and regulation must be made strict enough to punish the persons found guilty of tax-evasion.

3 **Negative taxation -** According to Prof. Friedman a guaranteed annual income is probably the best operational way to changes market determined income distribution. It is a tax transfer to people from Government which can be considered as subsistence allowance and subsidy paid to economically weaker section of society. The critical threshold income (CTI) should be carefully determined with the help of outstanding experts in economics, sociology and statistics etc. and should be flexible to be adjusted as per feedback from

masses. The persons living below that critical threshold income should be benefited with negative tax.

4 **Education & Population control :** Due to lack of proper education, people, especially, of weaker economic group do not pay much attention towards population control. They also indulge is wasteful expenditures such as smoking frequently, drinking unhygienic liquor which further deteriorate their financial condition as well physical health. By organizing the labour force and providing them proper education can eradicate their poverty and thereby disparity can be lessened.

Concluding Remarks : Here it may be mentioned that technology which is capable of creating as many work - places as possible needed with minimum cost involvement using less capital intensive machines etc and giving more emphasis on effective employment of human resources, utilizing the available local resources can be capable of removing the inequality in the third word. Moreover, the ceiling of highest individual income and wealth, price-freezing and some fundamental reform in taxation policy may also help in minimizing inequality. Instead of the existing nearly linear taxation, it should impose higher rate of taxes to people above certain income level. Negative taxation can uplift the sad plight of lowest income group and would abridge the income gap.

Naturally, Therefore, a concept with altogether different socio-economic outlook so as to primarily aim at welfare maximization of the people of the country must come up . Here the vision is broad enough as the aim is not only of profit maximization of a firm but of welfare maximization of people so that antisocial reflexes characterized by abduction, crime, frequent strikes, tension and terrorism can be put under full control. It has direct bearing on the problem of unemployment which is the greatest curse of modern age and devises technological packages for creation of as many work places as possible and thus enhancement in employment opportunities and getting rid of inhuman and inelegant working condition prevailing in slums of big cities like Delhi, Mumbai and Kolkata etc. In case of developing nations of third world the main reasons behind the socio-economic crisis have been blind imitation of western style of technology (which were rather forced on them also in absence of suitable alternative approach) and non recognition of own natural and human resources as gifted by nature which could have found best expression in development of welfare technology. No one can ignore the use of sophisticated technology in technological advancement but what is even more important is overall human welfare and naturally providing employment to all can not be rated a second grade technological mission by any means. Lincon has rightly remarked" it is good to be important but it is more important to be good". And so more important is human welfare and jobs to all than blind use of sophisticated technology. By this way we can aim at economic development with less socio-economic disparity with human face.

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" E - Governance in India "

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Abstract

Governments are moving towards ushering in an age of electronic governance. The initial motivation usually comes from the need to improve the efficiency of the processes in the government & for improving the quality of the life of the citizens. The strategic objective of E-governance is to support and simplify governance for all parties : government, citizens & businesses. E-governance electronic means support and stimulate good governance.

The E-governance strategic differ from country to country, state to state & region to region as should reflect the needs and aspiration of those countries, states & regions. E-governance is a powerful tool helps in planning, scheduling and accomplishing a project. This paper is an attempt to study that how E-governance is used by the different states in various activities to improve an overall efficiency.

Introduction :

The Indian government is using IT to facilitate governance. The IT industry is doing its bit to help as public-private partnerships become the order of the day.

The last couple of years have seen e-governance drop roots in India. IT enables the delivery of government services as it caters to a large base of people across different segments and geographical locations. The effective use of IT services in government administration can greatly enhance existing efficiencies, drive down communication costs, and increase transparency in the functioning of various departments. It also gives citizens easy access to tangible benefits, be it through simple applications such as online form filling, bill sourcing and payments, or complex applications like distance education and telemedicine.

"Almost every state has an IT place in place with the aim of evolving itself from being an IT-aware to an IT enabled government. State governments are fast recognizing the benefits of an IT- enabled working environment."

As of now, E-governance projects are being run only in certain departments. This approach will gradually be extended to all departments eventually, leveraging the power of IT to streamline administrative functions and increase transparency.

"IT has a vital role to play in all transactions that the government undertakes. It helps the government cut red-tapism, avoid corruption, and reach citizens directly." Such initiative will

help citizens learn about the various policies, processes and help-lines that the government offers. The governments of Singapore, Canada and Switzerland have implemented such portals, and set the benchmarks in this regard. With the help of IT, the government can process citizen to government transactions such as the filing of tax returns, death and birth registration, land records, etc.

A strong technology infrastructure can help central and state governments deliver a comprehensive set of services to citizens. Microsoft is working with several state governments to help evolve a long-term technology blueprint for IT infrastructure. It is working with various departments of the central government, and has undertaken several projects and initiatives with state governments as well.

As far as E-governance projects are concerned, the government is gradually changing its role from an 'implementer' to a 'facilitator and regulator.' IT will encourage private sector participation in E-governance projects, so more projects in E-governance based upon the public private participation (PPP) model should come about in the near future."

Leading by examples (E-governance in India)

Agriculture, power and education are fields where the government makes use of IT to provide services to citizens. The revenue collection department is in the process of using information technology for applications such as income tax. Some notable examples:

"A Kolkata-based hospital leverages e-governance for tropical medicine. The hospital employs tele-medicine to assist doctors in rural areas as they analyze and treat panchayat residents. This method does away with patients having to travel all the way to kolkata for treatment. Patients feel better being examined tin their own village. Using tele-medicine, the hospital is able to dispense its expertise to far-flung districts. The patient goes for an examination to the local doctor in the panchayat. This doctor is in contact via a voice & data connection with a doctor at the hospital for tropical medicine. Thus, the panchayat resident gets the benefit of being traded by both a local doctor and a hospital specialist.

"The Karnataka government's 'Bhoorni' project has led' to the computerization of the centuries-old system of handwritten rural land records. Through it, the revenue department has done away with the corruption-ridden system that involved bribing village accountants to procure land record; records of right, tenancy and cultivation certificates (RTCs). The project is expected to benefit seventy Lakh villagers in 30,000 villages. A farmer can walk into the nearest taluk office and ask for a computer printout of his land record certificate for Rs 15. he can also check details of land records on a touch-screen kiosk by inserting a two-rupee coin. These kiosks, installed at the taluk office, will provide the Public with a convenient interface to the land records center.

- In Gujarat there are web sites where citizens log on the get access to the concerned government department on

issues such as land, water and taxes.

- In Hyderabad, through E-Seva, citizens can view and pay bills for water, electricity and telephones, besides municipal taxes; They can also avail of birth / death registration certificates, passport applications, permits / licenses, transport department services, reservations, Internet and B2C services, among other things.

- E-Choupal, ITC's unique web-based initiative, offers farmers the information, products and services they need to enhance productivity, improve farm-gate price realization, and cut transaction costs. Farmers can access the latest local and global information on weather, scientific farming practices, as well as market prices at the village itself through this web portal-all in Hindi.

- E-Choupal also facilitates the supply of high quality farm inputs as well as the purchase of commodities at the farm.

- Given the literacy and infrastructure constraints at the village level, this model is designed to provide physical service support through a choupal sanchalak - himself a lead farmer-who acts as the interface between the system and the farmers. The contents of this site in their entirety are made available only to the registered sanchalaks.

International status of E-governance

There are three main domains of E-governance:

1. **Improving government processes** :E-administration such initiatives deal particularly with improving the internal workings of the public sector. They include:

- Cutting process costs
- Managing Process performance

For example :- Creating a National ID System in Egypt

In Egypt, the information and Decision Support center has created a comprehensive national database with 85 million birth records, 12 million marriage records and 2 million divorce records. This has provided the basis for a national ID number and, hence, a secure and accurate national ID card. Automation of previously-manual processes has saved considerable sums of money. The information base and ID numbers have also been an essential building block in the creation of other public sector planning and service delivery applications.

2. **Connecting Citizens : E-Citizens and E-Services**

Such initiatives deal particularly with the relationship between government and citizens. They include

- Talking to citizens
- Listening to citizens
- Improving public Services

For example :- Greater Openness of Local Government in South Korea, Supporting Free and Fair Elections in South Africa

Government initiatives:

The National E-governance plan (2003-07) reflects the strategic intent of the central government in the right perspective. Many projects are earmarked under this plan, and it is trying to address the digital divide.

From a political perspective, after watching the performance of some IT- savvy states in the recent elections, the system has woken up to the need to focus more on rural development. "The political systems are keener to use IT to disseminate information faster to farmers, disburse loans, improve education and the health systems in villages, etc. There is a clear-cut incentive to do it as 60 percent of the vote-bank still lives in rural India."

E-governance has to be supported by the will and resources of those who are in governance, be it at the central or state level. The central government has analyzed and appreciated the concept by creating a separate E-governance department headed by a secretary to trigger-governance in India. The World Bank, ADB And UN have been approached, and in response they are generously funding e-governance projects.

In future, education, agriculture, state wide area networks (SWANs) and Community Information Centre projects will be rolled out backed by a strong public private participation model (PPP) to achieve long-term sustainability.

Projects with PPP models in these segments can revolutionize the governance experience. In the next couple of years the industry is expected to grow by 22-25 percent.

Getting better all the time :

Most vendors foresee strong government initiatives to make the most of. IT and the future for E-governance looks bright. Besides deployment and training on e-governance application, Cisco is working with various state governments. The company, along with the United Nations Development Program (UNDP) and National Institute of Smart Government (NSIG) was hosted India's first South Asia Public Sector ICT Summit, a two-day conference, on January 24 and 25th 2005 in Hyderabad. The theme of the summit is 'New Models for E-Government in South Asia and the World,' and is targeted at senior government and policy makers from countries in South Asia, including India.

This was the first such summit of its kind being organized in India. Last year in July, UNDP and Cisco came together to organize a similar event in China.

"The government benefits from reduced duplication of work. In addition, the processes of data collection, analysis and audit are simplified, and become less tedious. E-governance holds advantages for the business community too, playing the role of a catalyst and a channel for E-business, a fact evidenced by developments in the US and Singapore. But perhaps the single-largest benefit of E-governance is its potential to give birth to an entire web-based economy."

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An investigation into selection of die - material for forging application

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Abstract

In forging, the selections of die materials are very important in the production of various components. No single die material combines all the physical properties like wear resistance, toughness, hardness & resistance to softening at elevated temperature. Therefore, the selection of the most suitable combination of die material is necessary.

Hot work die steels are commonly used for hot forging dies subjected to temperature ranging from 315 to 650o C. These materials contain Cr, W & in some cases, V or Mo or both. Due to the high forging loads and tool stresses, tooling for cold forging must be fabricated from tool materials that are harder than those used in hot forging. Die steel grade used for cold forging die are M2, D2,O1 & S1 etc.

INTRODUCTION

In Forging, most dies are subjected to extremely high loads that are applied rapidly. They must withstand these loads a great no of times without breaking and without undergoing excessive wear or deformation. In many applications, die steels must provide this capability under conditions that develop high temp in the die. No single die material combines maximum wear resistance, toughness & resistance to softening at elevated temperature. Consequently, selection of the proper material for a given application often requires a trade off to achieve the optimum combination of properties (1)

In forging, the selections of die materials are very important in the production of various components. A recent study of the cost of forged items produced that the total cost of the forged product could be roughly as follows.[2]

Material - 53%	Over head - 32%
Die Cost - 8%	Labour - 7%

DFRA estimate, in 8% of die cost, 50% of die cost involved in die material cost. The die must be made by modern manufacturing method which are based on die sinking using copy milling or most recently ECM machine, from appropriate die materials in order to provide sufficient quantities of product to justify the expense required to make the dies.

Selection of the most suitable combination of die material & hardness for die blocks or die inserts is influenced by several factors.

i) Shape, size & weight of forging.

ii) Composition of metal being forged.
iii) Temperature at which the metal is to be forged.
iv) No. of forgings to be made.
v) Type of forging equipment (hammer or press).
vi) Cost of the die material.
vii) Sequence of machining the die impressions (before or after hardening)
viii) Forging tolerances, including those specified for draft angles
ix) Established plant practice, previous experience with similar application & auxiliary equipments

As the various properties desired frequently incompatible to one another, therefore, compromises are necessary in the selection of die materials & hardness.

REQUIREMENT OF A DIE STEEL[3]

There are three requirements for a die steel tool. It has to be readily machinable, and be capable of resisting the stresses imposed in service without failure. Thirdly and perhaps most importantly, it has to produce the required number of components without losing shape and at the lowest operating cost.

When translating these requirements to material properties, die materials can be selected by relating one or a combination of the following physical property characteristics to the prime requirements for the particular hot work application :

i) Wear resistance
ii) Hardenability
iii) Hot hardness
iv) Toughness
v) Dimensional stability, and
vi) Thermal fatigue resistance

DIE LIFE AND DIE FAILURE[4]

Proper selection of the die material and of the die manufacturing technique determines to a large extent, the useful life of forging dies. Die life is defined as the no. of forging is produced from the same die before it needs re-sinking.

Dies may have to be repaved when die failure occurs and Die failure is caused by many reasons. Some of the factors, which are caused to die failure, are :

i) Abrasive action
ii) Thermal fatigue (Heat checking)
iii) Mechanical fatigue
iv) Excessive temperature
v) Metallurgical aspects
vi) Use of lubricants
vii) Design considerations

FACTORS IN THE SELECTION OF DIE MATERIAL[5]

Properties of materials the determine their selection as die material for forging are:

i) Ability to harden uniformly
ii) Wear resistance (ability to resist the abrasive action of hot metal during forging).
iii) Toughness
iv) Resistance to thermal fatigue & heat checking.
v) Resistance to mechanical fatigue.

One of the important factors to consider in the die materials selection is the properties of the

alloying elements present in forging dies. The table below gives a qualitative look on those elements.

Effect of alloying elements on physical characteristics of die steels[3]

Physical Properties	Alloying elements in order of decreasing effect
Wear Resistance	V ,W, Mo,Cr,Mn
Hardenability	Mn, Mo, Cr, Si, Ni, V
Hot hardness	W, Mo, Co, V,Cr, Mn
Toughness	V,W, Mo, Mn, Cr
Dimensional Stability	Mo, Cr, Mn
Thermal Fatigue	Cr, Si, Mo

DIES AND DIE MATERIALS FOR HOT FORGING[5]

Die materials used for hot forging include hot work tool steels (AISI H series). The AISI hot work tool steels can be loosely grouped according to composition is shown in table 2. Die materials for hot forging should have good hardenability as well as resistance to war, plastic deformation, thermal fatigue & heat checking and mechanical fatigue. Die design is also important in ensuring adequate die life; poor design can result in premature wear or breakage.

Die Materials :

Hot work die steels are commonly used for hot - forging dies subjected to temperatures ranging from 315 to 650 C (600 to 1200F). These materials contain Cr, w and in some cases, V or Mo or both. These alloying elements induce deep hardening characteristics & resistance to abrasion & softening. These steels usually are hardened by quenching in air or molten salt baths. The Cr base steels contain about 5% Cr. High Mo content gives materials resistance to softening, V increases resistance to abrasion and softening. W improves toughness & hot hardness. Tungsten containing steels, however, are not resistance to thermal shock & cannot be cooled intermittently with water. The tungsten-base hot work die steels contain 9 to 18% W, 2 to 12% Cr, & sometimes small amounts of V. The high tungsten contents provides resistance to softening at high temperature while maintaining adequate toughness, but it also makes water - cooling of these steels impossible. Low-alloy proprietary steels are also used frequently as die materials for hot forging. Steels with ASM designations 6G, 6F2, & 6F3 have good toughness & shock resistance with good resistance to abrasion and heat checking. These steels are tempered at lower temperature (usually 450 to 5000 C or 840 to 930o F), therefore, they are more suited for applications that do not result in high die surface temperature for example, die holders for hot forging or hammer die blocks.

6G is a Cr - Mo steel, while 6F steels are Ni-Cr-Mo compositions. The difference between 6F2 &6F3 is in the amount of these principal alloying elements as shown in table. (1)

Table1 : Classification & Comparison of Principal types of Tool Steels

	Compoisition %							
	C	Mn	Si or Ni	Cr	V	W	Mo	Co
Low Alloy tool Steel								
6G	0.55	0.80	0.25 Si	1.0	0.10		0.45	
6F2	0.55	0.75	0.25 Si	1.0	0.10opt		0.30	
			1.00 Ni					
6F3	0.55	0.60	0.85 Si	1.0	0.10opt		0.75	
			1.80 Ni					
6F4	0.20	0.70	0.25 Si				3.25	
			3.00 Ni					
6F5	0.55	1.00	1.00 Si	0.50	0.10		0.50	
			2.70 Ni					
6F6	0.50		1.50 Si	1.50			0.20	
6F7	0.40	0.35	4.25 Ni	1.50			0.75	
6H1	0.55			4.00	0.85		0.45	
6H2	0.55	0.40	1.10 Si	5.00	1.00		1.50	
Chromium Hot Work Tool Steel								
H10	0.40			3.25	0.40		2.50	
H11	0.35			5.00	0.40		1.50	
H12	0.35			5.00	0.40	1.50	1.50	
H13(a)	0.35			5.00	1.00		1.50	
H14	0.40			5.00		5.00		
H19	0.40			4.25	2.00	4.25		4.25
Tungsten hot-work Tool Steels								
H21	0.35			3.50		9.50		
H22	0.35			2.00		11.00		
H23	0.30			12.00		12.00		
H24	0.45			3.00		15.00		
H25	0.25			4.00		15.00		
H26	0.50			4.00	1.00	18.00		
Molybdenum hot-work tool Steels								

DIE MATERIAL FOR ISOTHERMAL AND HOT-DIE FORGING[5]

In the isothermal forging process, the dies are maintained at the same temperature as the forging stock. This eliminates the die chill completely and maintains the stack at a constant temperature throughout the forging cycle.

The hot die forging process is characterized by die temperature higher than those in conventional forging, but lower than those in isothermal forging. Typical die temperature in hot die forging is 110 to 2250 C (200 to 400o F) lower than the temperature of the stock. Conventional die steels do not have adequate strength or resistance to creep and oxidation at near -net shape temperature. Hot die/ isothermal forging dies must maintain precision while resisting the excessive high temperature included stresses that are caused by tight, complex geometries. Therefore expensive nickel base alloys such as Alloy 100, B-1900, MAR-M-247, Astorlogy, Alloy 718, and NX - 188, as well as Molybdenum alloys such as titanium Zirconium modified molybdenum or TZM must be used for these applications. Table 2 gives the composition of die materials for isothermal and hot die forging.

Table2 : Compositions of die materials for isothermal & hot die forging

Alloy	Composition %								
	C	Co	Cr	Fc	Mo	Ni	Si	Ti	Others
Nickel Base Alloy									
Alloy 100	0.18	15.0	9.5		3.0	rem		5.0	5.5 Al,0.95 V.0.06Zr, 0.01B
B 1900	0.10	10.0	8.0		6.0	rem		1.0	6.0 Al. 4.0 Ta.0.10Zr. 0.015 B
Astrology	0.05	17.0	15.0		5.0	rem		3.5	4.0 Al.0.06 Zr
Alloy 718	0.05		18.0	19.0	3.0	rem		0.4max	
Alloy 713 C	0.05		12.0		4.5	rem		0.6	6.0 Al, 2.0 Nb, 0.1 Zr 0.01 B
NX 188	0.04				18.0	rem			
MAR-M-247	0.15	10.0	8.25	0.5	0.7			11.0	5.5 Al, 3.0 Ta, 1.5 HF, 0.05Zr, 0.015 B
Molybdenum Alloy									
TZM	0.15				rem			0.5	0.08 Zr

DIE MATERIALS FOR COLD FORGING

Because of the generally higher flow stresses of work piece materials at cold forging and extrusion forging must be fabricated form tool materials that are harder than those used in hot forging. These materials frequently must have good resistance to wear and fatigue strength. In cold forging the tooling usually consists of a punch, a die pressed into a shrink sink, and at ejector. A back plate is normally provided behind the punch to distribute the high punch pressure into the rest of the tooling assembly.

Due to the high forging loads and tool stresses, cold forging is one of the most demanding metal forming applications. Therefore, the success of the cold forging process depends upon both the selected tool materials and the die design. Emphasis is but on binding materials with a combination of high strength and toughness to withstand the high forging pressure typical of cold forgings. Tungsten carbide inserts are used in numerous application of this sort.

These various components of cold forging tooling are subdivided to different levels of stresses. The back pressure plates. Which must have high compressive strength, are made from steel hardened up to 62 HRC and selection of the punch material depends on the type of deformation. In forward extrusion the punch must have high compressive strength, whereas in backward extrusion the punch must also have very good wear resistance. Since in this process, a considerable amount of metal flow occurs along the punch surface. The dies are subject to high cycling pressure as well as abrasion. Therefore die materials must have high fatigue strength and good wear resistance to wear. In cold extrusion, the inserts are presented with one or two shrink rings so that they can withstand the high stresses present in the die cavity. Die steel grade used for cold forging die M2,D2,O1 & S1, as given in table (3).

Table3 : Typical Compositions of Steel used in Cold forging for die and punch.

	Composition %									
	C	Mn	Si	Cr	Ni	Mo	W	V		Others
Steel (AISI-SAE)										
O1	0.9	1.0		0.50						
A2	1.0			5.0		1.0				
D2	1.50			12.0		1.0				
SI	0.5			1.5			2.5			
M2	0.85			4.0		5.0	6.0	2.0		

DIE MATERIAL FOR HERF (HIGH ENERGY RATE FORGING)[5]

It is also called high velocity forging. Prehardened tool steels such as 6F2 and 6F3 are used when forging stresses are low and production quantities are small. For larger quantities and severe forging requirements, tool steels such as H11 or H13 are used for the critical die components.

In high production dies, 6F2, and 6F3 steels and alloy steels such as 4140 & 4340 are used for back up blocks, shrink rings, & retainers. A modified H13 tool steel containing 1.5% Ni is recommended for die inserts and punches for long production runs, close tolerances forgings and hot work applications in which exceptional toughness and resistance to abrasion and heat cracking are importanty. Hubbed die inserts are commonly made of H11 tool steel, But 4140 steel is sometimes used when production requirements are small or the operation is not severe. Almost any tool steel that will withstand hot working can be used for hubbed die blocks or inserts, although die made of prehardened tool steel would soften during hot-hobbling operation.

MANUFACTURING OF DIES[2]

In manufacturing of dies, die maker must start with the die drawing and select one of the various die manufacturing techniques that are available, i.e. manual machining copy milling or turning, numerical control (CNC) machining, electro-discharged machining (EDM), Electro-Chemical machining (ECM), hobbling and casting, selection of the preferable die manufacturing technique depends on die cavity. The die making process includes: Selection of materials for the die, die preparation, taking into consideration the forging machine that will produce that particular forging, preparing a design, machining the dies, benching the dies, and taking a cost of the dies. EDM is used when minimum draft angles and very narrow rise are required and it has the ability to produce dies accurately.

Now a day, EDM is used for die sinking because of many advantages with reasonable cost

CONCLUSION

The various factors, which needed to be considered when selecting a die-steel Die steel material represent a small proportion of the total production cost Selective application of a die-steel which will meet the physical requirement of the particular application can lead to the extended die-life and a significant reduction in the total production cost per tonne of forging produced. The prime consderation for selecting any hot work die-steel depends on the process used. All these processes require that the die block be capable of resisting the stress imposed in service without fracture. Physical properties such as wear resistance, hardenability, hot hardness, toughness, dimensional stability and thermal fatigue resistance. Hot work die steels suitable for the drop forging and extrusion industries. Selection is based on the ability of these steels to meet the physical requirement of the closed, die-forging process and also the method of manufacturing method dies.

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Flexural behaviour of srfc beams with mtps flyash

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Abstract

In the present study the flexural behaviour of steel reinforced fibrous concrete with partial flyash utilisation was undertaken. Primatic speciments of SRFC with mild steel fibres of aspect ration 40,60,80 and volume fraction of 1 percent, 2 percent & 3 percent were prepared in laboratory and were loaded to using symmetrical twopoint loading till failure.

Enhancement of ultimate moments were interpreted and effects of Aspect ration & volume fraction was observed.

Keywords :- MTPS flyash, SRFC beams, flexural rigidity, fibre reinforcement.

Introduction

With the ashtonishing pace of industrial and scientific development, terrible population explosion, unemployment and underemployment in rural sector encouraging mass exodus of rural population towards urban area, the demand for housing & construction activities have registered sharp growth. Most of nations of third world are seriously facing the acute shortage of dwelling houses. Hence it is urgently needed to design and build cost effective eco-friendly dwelling houses for specially economically downtrodden people in there contries including ours.

Instead of mild steel bars, utilisation of fibres of various materials in different aspect ratio and volume fraction (like steel, sisal, glass, carbon etc) fibres have been investigated and it has been found that due to its crack arresting mechanism the strength parameter, toughness, ductility and rotational capacities of hinges in post elastic range of FRC substantially increases. Actually the mechanism of FRC is complex due to randomness of orientations and other characteristics of fibres, but essentially fibres act as crack warrantors restrickting the development and propagation of cracks and transforming an inherently brittle material with a very low tensile strength into a composite material with improved ductivity, high impact stength and distinctive post cracking behaviour prior to ultimate collapse.

factors that affect the post-cracking strength of FRC may be summed up as follows :-

1. Material properties of fibre to be utilised.
2. The volume fraction V1 of the fibre.
3. The fibre aspect ration AR = 1/d.
4. Postcracking is characterised by pull out of fibres at a dominant single major crack.

If besides Normal tensile reinforcement designed as per balanced section computer by ultimate load analysis, fibre reinforcement of mild steel is also provided in addition, the

section is called steel Reinforced Fibrous Concrete (SRFC). In the present study behaviour of SRFC beams with MTPS flyash as partical cemetn replacement of 10% (as it is indicated elsewhere that up to 10% MTPS flyash replacement may be rcommended safely without reduction in strength and obtaining economy as well) have been studied using varying aspect ratios & Volume fraction.

SCOPE OF THE RESEARCH PROGRAMME

In this programme MTPS flyash collected from upper stages of ESP (4th to 7th in this case) have been used as 10% partial replacement of cement in the concrete mix. The reinforcement is the usual tensile reinforcement provided as per IS codes and mild steel fibers obtained from Bharat Wagon & Engg. in, the varying volume fraction of 1%,2%,3% and varying aspect ration of 40, 60 and 80 have been investigated.

Flexural behaviour of Reinforced steel fibrous concrete :-

In order to derive expression of ultimate moment of RSFC, some simplifying assumption have been made as suggested.

1. The compressive stern is idealised by a rectangular block as suggested by cohitney.
2. The tensile contribution of fibres is represented by a stress block having force equal to that required to develop the dynamic bond stress of the fibres that are effective in the tensile portion of the beam.
3. A bond efficiency factor of 1.0 has been used for steel fibres. Swarmy proposed the following equation for dering flexural formula.

Considering Equilibrium $\Sigma F_x = 0$

Total force of compression = Total force of tension

$$(0.85\, 0_c b) \times (0.85 K_1 d) = \frac{\sigma + bV_f B}{K_2 d} \int_0^{k_2 d} \gamma dy + A_s f_y \quad \text{--1}$$

The ultimate moment of Resistance of SRFC beam can now be written as

$$M_u = 0.4150\sigma_c K_1^2 bd^2 + \frac{\beta\sigma_{ir} K_2^2 bd^2}{3} + A_s f_y d(1 - K_1) \quad \text{--2}$$

where β = orientation factor of fibre

σ = stress in fibre at fracture

f_y = yield strong Reinforcing Steel.

$\frac{K_2}{K_1} = \alpha$ = Constant.

and other letter have their usual significance.

Experiment programme

All the materials to be used such as cement, fine aggregate, coarse aggregate, MTPS flyash & m.s. fibres were tested for their properties and and strickt quality control was applied by eliminating varying properties as per IS codes 4031-1968-IS456-1978 and so.

For obtaining the effect of Aspect ratio and volume fraction of fibres, on the flexural strength of following series were casted.

AR = 40 series Beam, having V_f = 10%,2%,3%
AR = 60, series Beam having V_f = 1%, 2%.3%
AR = 80, Series Beam having V_f = 1%, 2%, 3%

For each AR series and particular V_f, 3 prismatic members of dimension 900mm x 150mm x 150mm with mild steel bass in tension zone were casted. After curing, the specimenns were tested for 28 days ultimate flexural strength using two point loading system. The results were fabulated.

A Reference beam of the same size but without fibres was also casted and tested to help established the effect of fibres on SRFC moment carrying capacity. The beams were tested by UTM under flexure.

RESULT

Table - 1

VOLUME FRACTION	ASPECT RATIO	MU KG.M	INCREASE OF MU KG.M	SUCESSIVE INCREASE OF MU (KG.M)%
Nil		282.0		
1%	40	310.0	28.0	9.93
1%	60	315.0	5.0	1.61
1%	80	321.6	6.6	2.09

Table - 2

VOLUME FRACTION	ASPECT RATIO	MU KG.M	INCREASE OF MU KG.M	SUCESSIVE INCREASE OF MU (KG.M)%
Nil		282.0		
2%	40	341.6	59.6	21.13
2%	60	350.0	8.4	2.46
2%	80	350.6	0.0	0.00

Table - 3

VOLUME FRACTION	ASPECT RATIO	MU KG.M	INCREASE OF MU KG.M	SUCCESSIVE INCREASE OF MU (KG.M)%
Nil		282.0		
3%	40	360.0	78.0	27.66
3%	60	363.5	3.5	0.97
3%	80	365.0	1.5	0.41

Table - 4

ASPECT RATIO	VOLUME FRACTION	MU KG.M	INCREASE OF MU KG.M	SUCCESSIVE INCREASE OF MU (KG.M)%
Nil		282.0		
40	1%	301.0	28.0	9.93
40	2%	341.6	31.6	10.19
40	3%	360.0	18.4	3.39

Table - 5

ASPECT RATIO	VOLUME FRACTION	MU KG.M	INCREASE OF MU KG.M	SUCCESSIVE INCREASE OF MU (KG.M)%
Nil		282.0		
60	1%	315.0	33.0	11.70
60	2%	350.0	35.0	11.11
60	3%	363.5	13.5	3.86

Table - 6

ASPECT RATIO	VOLUME FRACTION	MU KG.M	INCREASE OF MU KG.M	SUCCESSIVE INCREASE OF MU (KG.M)%
Nil		282.0		
80	1%	321.6	39.6	14.04
80	2%	350.0	28.4	8.83
80	3%	365.0	15.0	4.29

Table - 7

COMPARISON OF TEST MOMENT AND CALCULATED MOMENT OF TEST PROGRAMME

BEAM DESCRIPTION	VOLUME FRACTION %	TEST MOMENT (WU1/6) KG.M (M1)	CALCULATED MOMENT KG.M. (M2)	M1/M2
1. 3 beams	1.0	310.0	310.0	1.00
400mm*100m*100mm	2.0	341.6	312.8	1.090
v.f = 40	3.0	360.0	322.4	1.120
2. 3 beams	1.0	315.0	310.0	1.010
400mm*100mm*100mm	2.0	350.0	312.8	1.120
V.F. = 60	3.0	363.5	322.4	1.130
3. 3 breams	1.0	321.6	310.0	1.030
400mm*100mm*100mm	2.0	350.0	312.8	1.120
V.F. = 80	3.0	365.0	322.8	1.130

Table -8

BEAM DESCRIPTION	VOLUME FRACTION %	TEST MOMENT (WU1/6) KG.M (M1)	CALCULATED MOMENT KG.M. (M2)	M1/M2
1. 3 beams	40	310.0	310.0	1.000
400mm*100m*100mm	60	315.0	312.8	1.007
v.f = 1%	80	321.6	322.4	1.000
2. 3 beams	40	341.6	310.0	1.102
400mm*100mm*100mm	60	350.0	312.8	1.119
V.F. = 2%	80	350.0	322.4	1.085
3. 3 breams	40	360.0	310.0	1.161
400mm*100mm*100mm	60	363.5	321.8	1.162
V.F. = 3%	80	365.0	322.4	1.132

DISCUSSION OF THE RESULT

In order to evaluate reliability of experimental result, simple, statistical measures were computer to adjudge the consistency. For this mean, standard deviation & coefficient of variation upto 5% is indicative of good quality control.

The ultimate moment of SRFC have been found to increase substantially by 29.4% (maxm) and 6.4% (min) over R.C. beams.

For aspect ratio remaining at 40, the MU increased by 9.93%, 10.19% and 5.30% for volume fraction of 1%, 2% and 3% respectively.

Similarly for aspect ration of 60, the MU increase was 11.70% for 1% V_f 11.10% to Vf=2% and 3.86% Vf= 3%.

Similar trends were available for L/d rates of 40 & Vf =1%,2% & 3%

Similarly for V_f =1% , the MU increased by 9.93% for AR=40, 1.61% for A_R =60 and 2.09 for AR=80.

Similarly for Vf =2% , the MU increased in ultimate moment was 21.13% for AR=40, 2.46% for AR =60 and nil for AR=60.

Similar Trends were available for Vf=3%. Where increase will MU was 27.66% for AR=60, 0.97% for AR=60 and 0.41 & AR=80.

The study of fibres having Vf=3% was not possible because the MU result shows converent tendency and secondly addition of further steel fibres was found physically difficult to put fibres in position in the concrete mix.

To explain the behaviour of increase in ultimate moment, possibly the fracture mechanics of concrete may be consdered. Investigation shows that very fine cracks exist at the coarse aggregate-cement morfar interface of hardened concrete even before application of load due to tension-compression field. The cracks tends to increase in length, width and number. But at the same time due to presence of fibre reinsforcement in mass of cement concrete may interface and retard the process of microcracking & thus crack progation is retarded. This is why higher ultimate strengths have been recorded in SRFC over the RC beam without fibres.

CONCLUSIONS

1. The inclusion of steel fibres in Reinforced concrete beams has been shows to increase the ultimate moment capacity of the composite. The maximum increase in ultimate moment was of the order of 29%.

2. The increase in volume fraction has pronounced effect on increase in the ultimate moment of the steel fibrous concrete.

3. The effect of increase of aspect ratio has small effect on the ultimate moment capacity of the beam.

4. The inclusion of steel fibres in Reinforced concrete structures increases the flexural rigidity, thereby decreasing the defection.

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EVERSE ENGINEERING : A CAD TOOL FOR ENGINEERS

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Abstract

"Reverse Engineering" can be seen as the inverse approach to usual CAD - based construction process in engineering Creating freeform surfaces is a challenging task even with advanced geometric modeling systems. Laser range scanners offer a promising alternative for model acquisition the 3D scanning of existing objects or clay maquettes. The problem of converting the dense point sets produced by laser scanners into useful geometric models is referred to as surface reconstruction. This broad definition is based on the systems approach to design and encompasses a number of potential methodologies whereby an existing product is analyzed, prior to, or during, the development of new product. The accurate physical replication of freeform curves and sculptured surfaces is required for a variety of important industrial, consumer and medical applications. Often, the only available representation of a desired form or shape is a previously manufactured product or a naturally existing entity. The shape modeling, accurate reproduction and optimization of these forms is the subject of the topic.

Keywords : CMM, curve, surface, optimization, Bezier, Bspline

Introduction

reverse engineering techniques can be used to aid in the manufacture of spare parts when original parts inventories are exhausted. For mechanical parts this process involves sensing the geometry of an existing part, creating a geometric model of the part from the sensed data, and then passing this model to an appropriate CAD/CAM system for manufacturing.

Reverse engineering is the general process of analyzing a technology specifically to ascertain how it was designed or how it operates. This kind of inquiry engages individuals in a constructive learning process about the operation of systems and products. Reverse engineering as a method is not confined to any particular purpose, but is often an important part of the scientific method and Technological development. The process of taking something apart and revealing the way in which it works is often an effective way to learn how to build a technology or make improvements to it. Through reverse engineering a researcher gathers the technical data necessary for the documentation of the operation of a technology or component of a system. In "Black box" reverse engineering, systems are observed without examining internal structure, while in "White box" reverse engineering the inner workings of the system are inspected. Through theses methods, researchers are able to examine the strength of systems and identify their weaknesses in terms of performance, security, and interoperability.

The reverse engineering process allows researchers to understand both how a program

works and also what aspects of the program contribute to its not working. Independent manufacturers can participate in a competitive market that rewards the improvements made on dominant products.

A common misperception regarding reverse engineering is that it is used for the sake of stealing or copying someone else's work. Reverse engineering is not only used to figure out how something works, but also the ways in which it does not work. Some examples of the different uses of reverse engineering include:

- Understanding how a product works more comprehensively than by merely observing it.
- Investigating and correcting errors and limitations in existing program.
- Studying the design principles of a product as part of an education in engineering.
- Making products and systems compatible so they can work together or share data.
- Evaluating one's own product to understand its limitations.

Applications of Reverse Engineering

The applications of reverse engineering are so many but the important among them are listed below:

Mechanical Engineering : Old products for which there are no prints: Products designed before CAD/CAM existed are typical examples . Product technical data are needed for the purpose of maintenance, of maintenance, upgrading, or ISO 9000 documentation. Another example is where molds and / or dies were originally out source due to lack of internal manufacturing capability in CNC machining or EDM processes, their is a need to duplicate the existing molds and / or dies for the purpose of replacement due to wear or other damage.
Design reuse : To design a new product, the manufacturer incorporates some old CAD data, not in the form of solid models, into a new design. Reverse engineering is used in order to take advantage of information on existing parts or part elements, including cost, geometry, calculations, assembly steps, and CNC codes to create a new part in minimal time and cost.

Ergonomic : ergonomic and esthetic design of engineered parts. Handles and paddles in automobiles, commercial and military airplanes are typical examples where ergonomics has a significant impact on the operator/s performance.

The applications in mechanical engineering can often be in the construction of car and air craft bodies, ship hulls, aeroplane wings, shoe insoles, telephone sets, turbine blades, and other house hold appliances such as fans, vases, tea posts and toys. In these fields of application, the designers often formalize their ideas by first.

Constructing a wooden or clay model and then using advanced digitizing equipment and geometric modeling software to create a CAD model for further design or production.
Medical Applications : A reverse engineering approach is applied in applications where the complex and highly unique human surface, must be created in order to obtain an exact, fit for a joint or surgical implant design. implants of human body parts where reverse

engineering is practiced the same way as in mechanical engineering, but with design ideas usually coming form computer tomography (CT), E- ray, and sketches provided by surgeons.

Benchmarking: Most companies in competing industries carryout benchmark comparisons of competitor's products, reverse engineering allows the engineers to input the facsimile of the competitor's product for carrying out in depth analysis. For centuries, reverse engineering has been practiced by companies with products competing in the same market. By reverse engineering competitor's products, one expects to understand the manufacturing knowledge. Reverse engineering is practiced by all the military powers on whatever equipment of their antagonists that they can get their hands on.

Computer Science: Video and movie production experts use 3D digitizers to capture organic objects, such as human body and animal parts with smooth flowing surfaces, to create shapes for TV commercials and special effects. Computer sciences for feature recognition and in age processing.

There are several application areas of reverse engineering. It is often necessary to produce a copy of a part, when no original drawings or documentation are available [1]. Applications can also be found in the CIM environment, bio mechanical engineering, electrical engineering and civil engineering.

Problem Statement: The flowchart of a reverse engineering system has been illustrated in fig. 1 The objective here is to develop a physical prototype starting from an existing manufactured component. The activities can be divided into following stage.

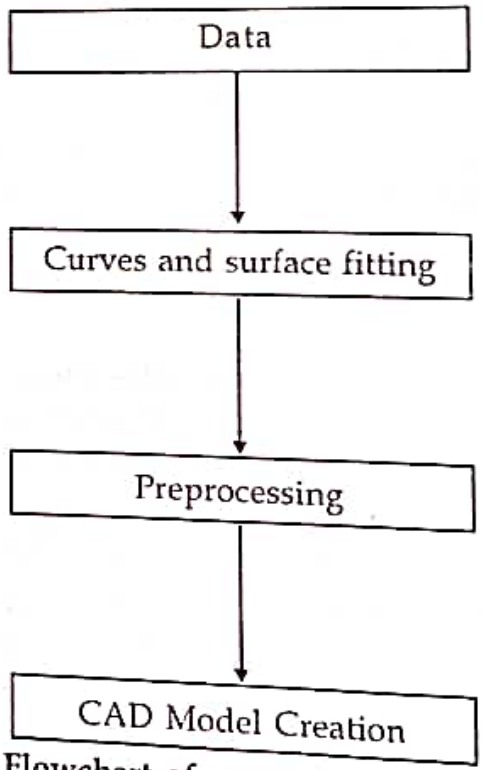

Figure : 1 Flowchart of reverse engineering process

It involves scanning the existing component with the help of laser scanner or coordinate measuring machine (CMM), etc. The above problem has been formulated as constrained nonlinear optimization problem with the explicit error expression as the objective function and Least Square Optimization is used as optimization technique. The solution is essential the true location of the prototype surface with respect to the design surface and the magnitude of the form error. The design surface generated in previous stage is used to generate either the NC codes or the stl files depending on the prototyping machine. Lather is used in case of a rapid prototyping machine.

The final stage of the reverse engineering process is the introduction of a new product into the market place. These new products are often innovations of the original product with competitive designs, features, or capabilities. These products may also be adaptations of the original product for use with other integrated systems, such as different platforms of computer operating system.

Mathematical Formulation of Curve Fitting

Inverse Design

a) B-Spline Curve :

The previous section discussed the generation of a B-spline curve from its defining polygon that generates a B-spline curve through a set of data points is consider. The problem is shown schematically in figure below. If a data point lies on the curve, then it satisfies main equation of B-spline curve, writing the main equation for each J data point's yields.

$$R_1(u_1)=N_1,k(u_1)P_1+N_2,k(u_1)p_2+ \ldots\ldots\ldots+Ni,k(u1)\ Pi$$

$$R_2\ (u_2) = N_1,k(u_2)P_1 + N_2,k\ (u_2)P_2+ \ldots\ldots\ldots+N_{i,k}(u_2)P_i$$

$$R_3\ (u_3) = N_{1,k}(u_3)P_1 + N_{2,k}\ (u_3)P_2+ \ldots\ldots\ldots+N_{i,k}(u_3)P_i$$

.....

.....

$$R_j\ (u_j) = N_1,k(u_j)P_1 + N_2,k\ (u_j)P_2+ \ldots\ldots\ldots+Ni,k(uj)Pi$$

Where $2 \le K \le n + 1 = J$. This set of equations is more compactly written in matrix form as

$$[R] = [C]\ [P] \qquad (1.2)$$

Where [C] matrix is

$$[C]=\begin{pmatrix} N_{1,k}(u_1)\ldots\ldots\ldots\ldots\ldots\ldots N_{i,k}(u_1) \\ \ldots\ldots\ldots\ldots \quad \ldots\ldots\ldots\ldots \\ \vdots \qquad\qquad \vdots \\ \vdots \quad \vdots \quad \vdots \\ N_1,k(u_1)\ldots\ldots\ldots\ldots\ldots\ldots N_i,k(u_1) \end{pmatrix} \qquad (1.3)$$

if, then the matrix [C] is a square matrix and the defining polygon is obtained directly by matrix invrsion. i.e.

$$[P] = [C]^1\ [R] \qquad 2 \ge k \le n+1 = J \qquad (1.4)$$

In this case resulting B-spline curve passes through each and every data point, i.e., a curve fit is obtained. Although the continuity of the resulting curve is everywhere, Ck-2, it may not be "smooth" or "fair".

A fairer curve is obtained by specifying fewer defining polygon points than data i.e., $2 \le k \le n+1 = J$. Here, [C] is no longer square, the problem is over-specified and can be solved only in some mean sense. Recalling that matrix times its transpose is always square, the defining polygon vertices for a B-spline curve that fairs or smoothes the data is given by

$$[R] = [C]\,[P]$$

Now multiplying by [C]T on both sides

$$[C]T\,[R] = [C]T\,[P] \qquad (1.5)$$

$$[P] = [\,[C]T\,[C]]\text{-}1\;[C]T\,[R] \qquad (1.6)$$

Both of these techniques assume that the matrix [C] is known. Provided that the order the B-spline basis, the number of defining polygon vertices n=1 and the parameter values are known matrix [C] can be obtained.

To find out parameterization is not a simple task if the fit has to be an accurate one. One useful parameterization model is based on the chord length approximation.

$u1 = 0$

$$\frac{u_l}{u_{max}} = \frac{\sum_{d=2}^{l} |P_d - P_{d-1}|}{\sum_{d=2}^{J} |P_d - P_{d-1}|} \quad l \ge 2 \qquad (1.7)$$

$d=2$

Here J is the total number of data. The maximum parameter value Umax is generally taken as the maximum value of the knot vector. The curve fitting obtained by this method is not perfect in order to get perfect fitting it must be optimized by any of optimization technique

b) **B-spline Surface:**

Section 2.2.2 (b) discusses the generation of B-spline surfaces from a known defining popygon net. Inverse problem is also importance; i.e., given a known set of data points on the surface, determine the best polygon net, which interpolates that dat. The quation of general B-spline surface is

$$S(u,v) = \sum_{i=0}^{m+1} \sum_{j=0}^{n+1} P_{i,j} n_{i,k}(u)_2 M_{j,1}(v) \qquad (1.8)$$

Here s(u,v) are the known surface data points: the ni,k(u) and Mj,1(V) basis functions can be determined for a known order and a known number of defining polygon net vertices in each parameter direction provided that the parameter values u,v are known at the surface data points. Writing out equations for a single surface data point yields.

$$s_{l,r}(u_l,v_l) = N_{1,k}(u_l)[m_{1,1}(v_l)\ P_{1,1} + M_{2,1}(v_l)\ P_{1,2} \ldots\ldots + M_{m+1}(v_l)\ P_{1,m+1}] +$$

$$N_{n+1,k}(u_l)[M_{1,1}(v_l)\ P_{n+1,1} + M_{2,1}(v_l)\ P_{n+1,2} + \ldots\ldots + M_{m+1}(v_l)\ P_{n\ 1,m+1}] \qquad (1.9)$$

Where for an rxs topologically rectangular set of data $2 = k = n = r$ and $2 = k = m = s$, writing an equation of this form for each data point yields a system of simultaneous equations. In matrix form the result is

$$[S] = [C][P] \qquad (1.10)$$

Where Ci,j =Ni,k(u) MJ,i. For an rxs topologically rectangular surface point data, [D] is an r*sx3 matrix containing the 3D co-ordinates of the surface point data. [C] is an

r*sxn*m matrix of the B-spline basis functions, and [P] is an n*mx3 matrix of the 3D co-ordinates of the required polygon net points. If [C] is square, the defining polygon net is obtained directly by inversion.

$$[P] = [C]^{-1}[S] \quad (1.11)$$

In this case the resulting surface passes through each data point. Although the resulting surface will be everywhere Ck-2, C1-2 continuous, it may not fair. In general, fewer the polygons point the fairer the surface.

If [C] is not square the problem is over-specified and solution can only be found by mean sense.

$$[P] = [[C]^T[C]]^{-1}[C]^T[S] \quad (1.12)$$

The surface fit obtained by equation (1.12) is not in original location so in order to get in the original location it must be optimized in order to get smooth surfaces.

Least Square Based B-spline Curve and Surface Fitting

Least Square based method for curves fitting. The input is a set of measured data points, each specified by x, y,,z value. The objective is to interpolate the curves through it such that fitting error will be minimum. To evaluate the effectiveness of the method, a series of data points from a mathematically known curve are used as input. The problem has been formulated as an unconstrained nonlinear optimization problem with simple bonds. A novel initialization scheme has been presented for the set of parameter values and average knot vector scheme has been implemented for knot vector generation for B- spline curve.

Least -square fitting follows the parameter optimization procedure in the sequence of steps for reverse engineering. However, as the formulation of the error expression for optimization requires the mathematical background of least -square fitting.

Objective Function Formulation

Let Ri be the measured data point, supplied by the user and Ric be the points on the interpolated B-spline curve evaluated at the points corresponding to the parameter ui.

Then

$$[R]c = [C][[C]^T[C]]^{-1}[C]^T[R] \quad (1.13)$$

Error in x,y and z co-ordinates can be stated as

$$\begin{aligned} x &= [Rxc - Rx] \\ y &= [Ryc - Ry] \\ z &= [Rzc - Rz] \end{aligned} \quad (1.14)$$

Euclidean error expression at a particular point will be

$$e_i = \sqrt{\delta x^2 + \delta y^2 + \delta z^2} \quad (1.15)$$

Total error expression will be

$$etotal = \sum_{i=1}^{r*s} e_i \quad (1.16)$$

The average error expression will be

$$eaverage = \sqrt{\sum_{i=1}^{r*s} \left\{ \frac{e_i^2}{s} \right\}} \quad (1.17)$$

Optimization problem is formulated as minimization average error where the design is parameter values ui and the variable bounded between 0 and 1. The etotal is the objective function for the non linear least-square minimization problem with bonds are imposed on the parameter values and constraints are imposed at the boundary points of the region of interest. The average error minimize by the Levenberg-Marquadt mathod as shown in the figure below.

Conclusions : Least square based curves and surface fitting, have been implemented in the work. Suitable example has been provided to illustrate the effectiveness of the approach. The goal of optimization process is not only to achieve an optimal solution but an also to find an optimal process to achieve the goal. The results obtained are encouraging and indicate a stable convergence pattern for the fitting problem.

The work addresses only one activities of reverse engineering, i.e. fitting of curve and surfaces methodologies for two activities such as scanning and post processing (NC code generation or STL file creation) can be developed in order to realize and integrated reverse engineering system scanning procedure can be automated by programing the co-ordinate measuring machine. The surface obtained after fitting can be used for NC generation if the prototyping process is computer numerically controlled (CNC) . Some slicing software can also be developed which will convert the surface definition to STL , file, to be used input of rapid prototyping machine.

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Low cost Digitally controlled liquid level Indicator cum pump controller

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Abstract :
The work described in this topic deals with IC. Transistors based schemes to indicate the liquid level and controls the operation of motor pumps. The scheme offer compactness and flexibility as compare to old schemes, which was costly as well as bulky. With the advent of transistor & IC thee is growing trend to use them for level measurement of liquids. Level measurement is an important aspect in the controls of mining and many industrial processes. Liquid level indicators are widely used to measure the level of liquid in the tanks, reservoirs, vessels, open channel streams and variety of other similar cases in industries. In general. Mechanical type liquid level indicators are used and to maintain the required level of liquid, the pump is switched on and off manually, where as given scheme does automatically. The given scheme have been successfully developed and tested in the lab.

Introduction :-

At present the instruments used for liquid level measurement in reservoirs, tanks, mines & industries are not very accurate and convenient for the operator. To check the level of liquid a person has to go to sit.

Using the proposed scheme one can get the liquid level indication at the control room itself. As per requirement pumps can be switched on or off depending upon desired liquid level.

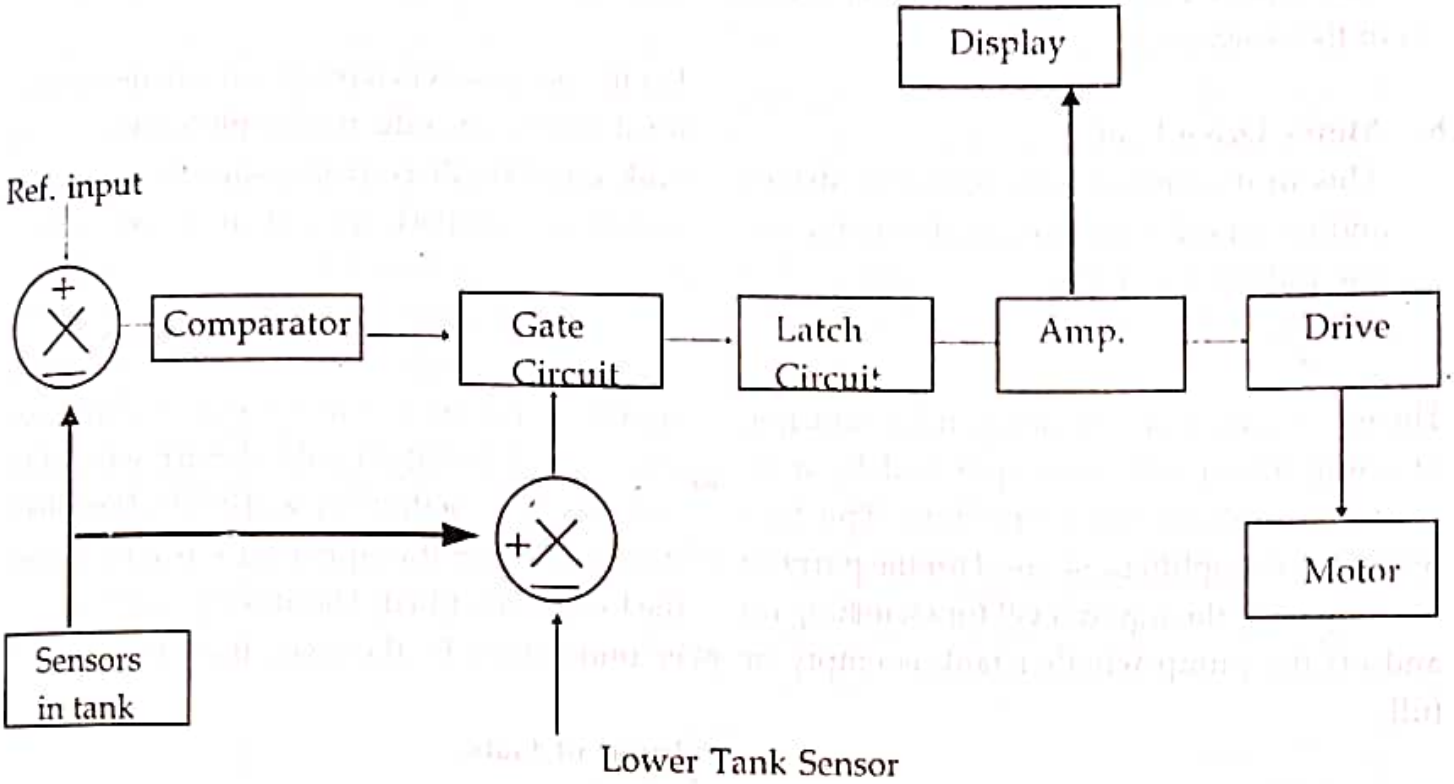
The main object of the present work is to develop an liquid level indicator cum pump controller using digital method. It indicate liquid level in digital form on display panel or by a indicator. According to the required level of liquid, pump can be controlled by the IC and transistors. For the indication of liquid level and controlling the pump comparators and latch circuit are used. The comparator gets input from the sensor of tanks, reservoir etc. which senses the level of liquid by using probes and shows level on the panel using LED or by digital display.

The distinguishing feature of the given scheme is automatic controls and the principle of feedback.

The main circuit of liquid level indicator cum pump controller using digital method consists of different sections. The different sections are:-

1. Power supply
2. Sensors
3. Comparator Circuit
4. Latch Circuit
5. Gate Circuit
6. Amplifier Circuit
7. Display Unit
8. Motor Drive Unit

The above all the sections are shown below in block diagram format :-



The above all the sections are described briefly here : -

1. **Power Supply:-**
   This unit supplies power to different sections for proper operation.

2. **Sensors:-**
   The sensor senses the level of liquids in the reservoirs, tanks, in mines and in different places where the level of liquids are to be monitored.

3. **Comparator:-**
   This section of the scheme plays very important role because upon the basis of the output of comparator the motor of the pump can be switched on or off. Also this section compares the indication of the level.

4. **Latch Circuit :-**
   This section avoid the null operations of the motor of the pump, it operate the motor when tank is empaty and avoid run of the motor when tank is full/partially filled.

5. **Gate Circuit :-**
   This unit is not necessary if the lower tank is not present. This unit gives output only when lover tank contains liquid and upper tank is empty.

6. **Amplifier Circuit :-**
   This unit is important because the output of the comparator, latch circuit and gate circuit is not sufficient to on the off the relay/ starter of the pump and also not sufficient for display purpose. So to operate the pump and display the amplifier is required.

7. **Display Unit :-**
This unit display the level of liquid present in the reservoirs, tanks etc.

8. **Motor Drive Unit:-**
This unit combines two subunits drives and motors. Drives operate the motor of the pumps and liquid can be pumped to the required tank at the desired level.

The whole circuit are working on the principle of comparison which is operated by a IC contains operational amplifiers. The two operational amplifiers are used for the purpose of comparing the liquid level for switching on and off the pump whether tank is empty or full,

Remaining operational amplifier are used for the purpose of indicating / displaying the intermediate level of liquid whether the tank is partially filled or filled or empty.

We can understand the operation of the system by the means of digital manner . The truth table below showed which gives clear fig. of the on and off status of motor form the level of liquid from the tank sensor.

	U	L	M
(1)	0	0	1
(2)	0	1	1
(3)	1	1	0
(4)	0	1	0

In above U stand for the upper sensor, L stands for lower sensor & M stands for motor status, where as 1/0 are as usual true/false or on/off.

In the above truth table for (2) and (4) state there is a contradiction because for same state once output is on and once output is off. For this in scheme the Latch circuit is used.

For the purpose when proposed scheme is used for domestic or industrial application a lower tank must be there from where the liquid/water is pumped. So one more sensor is necessary at the lower tank. If liquid is in lower tank then only motor should start otherwise it remains off. To make such decision one gate circuit is designed. The output of that Gate circuit will be ON/Enabled only when the both the input of the Gate will be ON/Enabled. It means when the upper tank is empty and the lower tank filled. The above procedure can be understand by the given truth table.

Input of Gate.

A	B	Gate O/P
0	0	0
0	1	0
1	0	0
1	1	1

Here A sands for sensor output of upper tank and B stands for sensor output of lower tank. In final stage display panel is used to monitor the level of liquid. It can be done by using LCD & a simple LED. If LCD is used it becomes costlier and if it is LED then it is very cheap.

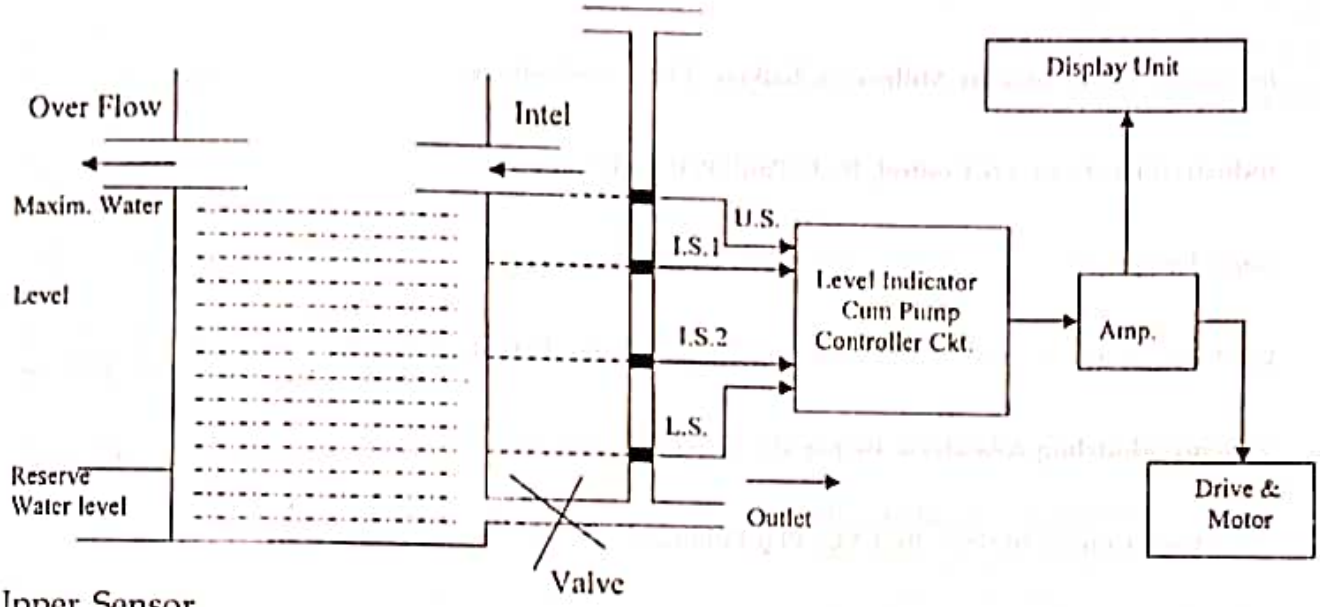
To operate the pump in final stage Amplifier is required became the signals from the scheme is very low voltage. To operate high rated motors it requires molerately high voltage/power. So one power amplifier is needed. From the power amplifier the output of amplifier is given to the starter of the motor.

The above schem worked successfully while testing in the Lab. For testing purpose one small size motor of 12V as well as one relay has been taken.

The above scheme is very cheap compare to all the electronic type and mechanical type level indicator cum pump controller. Its cost is around 1000/- per set.

For the sensing of liquid in tank, no special sensor in required only instead of G.I. pipe PVC pipe can be used in place of venting pipe.

The whole scheme is shown below..



U.S.- Upper Sensor
L.S.- Lower Sensor
I.S. - Intermediate Sensor

Working : -

When ever tank is filled or partially filled the upper sensor as well as intermediate sensor shows the level of liquid corresponding to the liquid level in the tank. When ever tank is empty i.e. if the liquid level touches the lower senses of the tank, the sensor gives a signal and sensed by the proposed scheme and switches on the motor of the pump. Again when the tank is filled and touches the upper sensor again the sensor fed a signal to proposed scheme and motor is switched off automatically.

Conclusion :-

The given scheme is very cheap compare to the other level indicator cum pump controller available in the market. The proposed scheme is very compact so it can be installed/mounted at any place. The given scheme is based on transistor & IC (semiconductor devices), it consume very low power.

Same scheme can be used to control many pumps at a time. Only on addition of some hardware. It can be used in industry also to control the liquid level as well as to control the operations of pumps.

In general the given scheme is an ideal and optimized scheme for level indicator cum pump controller.

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Abstract

The paper highlights the state of Management education in India, historical perspective, development and structure of management education in India. It also deals with the concept of distance education and distance management education in particular. The new era distance education methodology using the tools of Information Technology is the concept of the future. The paper highlights the problems of traditional management education that form the reasons for the development of online management education. The paper also highlights the strategic issues that occur in online education adoption by the universities.

Introduction

India and the Indians have undergone a paradigm shift. From an agro based economy it has emerged as a service oriented one. (www.indiaeducation.info/bizschool) The services sector has been growing at a tremendous pace in the Indian economy, and management education is no exception. Although India was late and slow in modernization of industry in general in the past, it is now a front-runner in the emerging knowledge based new economy. Education of all types has witnessed a growth and management education in India, in particular, has grown phenomenally. Information technology revolution is the major contributor in the phenomenal development in the area of education.

Information technology has contributed substantially in the dissipation of the knowledge globally. Internet has made it easy to access information about courses from anywhere in the world. (Ramanna, 2003) Several new ways of communicating to the students are now available besides the traditional lectures that make location irrelevant. Faculty and students can communicate to each other through email, chat sessions, discussion group and video conferencing. Lecture notes, video presentations, power point presentations,

cases, assignments and examinations can be made available through the Internet, CDs and videos. Even assessments can be done through the Internet making it possible for students from most parts of the world to do a management degree from the west.

Online education in the area of management could not remain untouched. Management education could no longer be contained in the fortresses of 'brick-and-kiln' universities and B-school institutions. Knowledge by its very nature is all-pervading that has to flow to the realms where it is required the most. In all its natural form, a highly professional management qualification found a medium of Internet, assisted by the technological advancements, to spread faster all across the globe.

Growth & Development Of Management Education In India

Education has been around for as long as man has been though its structure and perception has varied over centuries and civilizations. Management education emerged as a discipline in the past 100 years or so. In 1881, Wharton School of Finance and Commerce came into existence at the University of Pennsylvania, USA. Universities of Chicago and California followed this in 1898. Thereafter, the growth was rapid i.e. 40 Business Schools by 1915 and 118 by 1925 (Chowdhury, Subir, 1999). However these were largely an extension of the studies in commerce and finance. The first separate management education programme started at MIT in 1931. The second was at Harvard, dating back to 1943.

To start with, US business schools focused on descriptive industry studies, but by the 1920's, attention was focused on functional areas like accounting and retailing. In 1959, US business schools promptly shifted from vocational orientation (e.g. retailing and accounting) to managerial (e.g. Financial Management and Marketing Management) and scientific focus approach (e.g. Operational Research and Market Research).

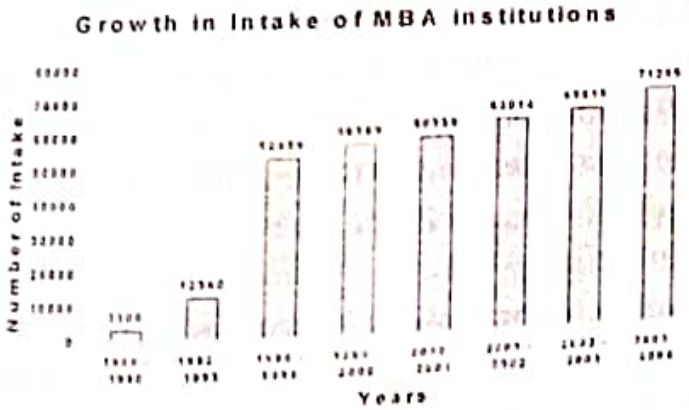
As traced by Subir Chowdhary (1999), in India, management education is a post-independence phenomenon started in the fifties, but gaining momentum only in the nineties, following economic liberalization.

At the time of independence, Indian economy was developing and hence we required bureaucratic management skills. However fifty years after independence, the Indian economy has become more mature, and hence, we require entrepreneurial management skills. Our management schools have failed to meet this challenge. Therefore, there is a need to revamp our management education.

In 1950, the Department of Commerce of the Andhra University started the first M.B.A. programme in India. Indian Institute of Social Welfare and Business Management, Calcutta is the first management institute setup in this country in 1953 by the visionary Chief Minister of West Bengal, Dr. Bidhan Chandra Roy. The Institute initially offered Diploma in Social (Labour Welfare) to be followed by part-time Postgraduate Diploma in Business Management from 1954, awarded by Calcutta University. In the same year, besides Calcutta University other universities that initiated the M.B.A. programmes were Bombay University, Delhi University and the Madras University. In 1963, Indian Institutes of Management,

Ahmedabad was set up in collaboration with the Harvard Business School.

In 1952, the All India Council of Technical Education established an All India Board of Technical Studies in Management for the purpose of examining the possibility of starting management courses in universities and other educational institutions. Also on the recommendations of this Board the Administrative Staff College of India, Hyderabad was established in 1956 as a joint and cooperative enterprise of Government of India and Private Industries & Commerce. In 1958, All India Management Association (AIMA), New Delhi was formed to propagate and establish professional management education in India. In 1993, AICTE was born under the aegis of Ministry of HRD, Government of India, New Delhi. The 1950s and 1960s witnessed the growth of commerce education and 1970 and 1980s witnessed the growth of management education in India as shown in Exhibit 1 & 2. There has been a tremendous growth of management institutes in our society. Every year about 74,000 students pass out of management schools. Keeping in mind the demand, the supply is very meagre.



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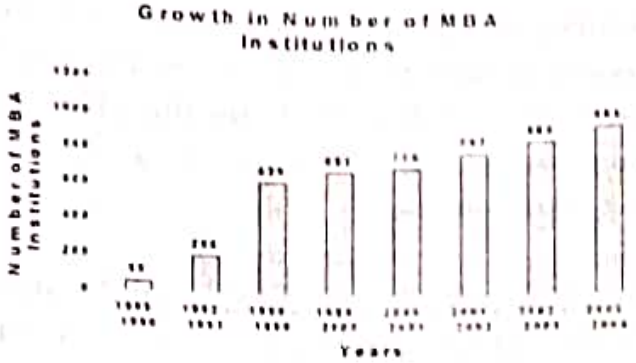
Source: M.K. Sridhar, Reader, Canara Bank School of Management Studies, Bangalore University, on website of Development of Management education in India, (2004).



(Exhibit 2)

Source: M.K. Sridhar, Reader, Canara Bank School of Management Studies, Bangalore University, on website of Development of Management education in India, (2004).

Structure Of Management Education

The various categories of institutions in which management courses are being offered at the postgraduate level in India (Powar, 1994) currently are:

- Institutions of national importance
- University departments
- Colleges affiliated to universities
- Non-university institutions (autonomous)
- Unaffiliated institutions
- Distance/correspondence-based university departments & institutions

Concept Of Distance Management Education

Distance education, it its present form originated in the Western countries universities. The first Open University was started in Britain in Milton Keynes, in 1969, which came out to be a great success. According to Prof. Borje Holmberg(1977), "Distance education includes various forms of study at all levels which are not under the

continuous and immediate supervision of tutors present with their students in lecture rooms or on the same premises, but which, nevertheless, benefit from the planning, guidance and tuition of a tutorial organization."

According to Barker, Frisbie, and Patrick (1989), distance education refers to "The simultaneous telecommunicated delivery of instruction from a host site or classroom to distant sites, coupled with live audio and/or video interaction between teacher and student(s)-not to correspondence study".

Online Education by this definition is also a form of distance education. Hence, online education also enjoys the same characteristics as that of distance education. Keegan (1982) described these characteristics as follows:

a) The involvement of an educational institution or organization (which distinguishes distance education from private study):
b) The use of media to unite teacher and learner;
c) The provision of a means of two way communication;
d) Learning on an individual rather on group basis;
e) From perspective of the institution, the possibility of the economics of scale that go with an industrial form of production (e.g. printing, broadcasting, etc.).

In short, distance education is a system of education in which there is no Physical interaction between the teacher and the taught, but they are linked through different media such as print, radio, T.V., internet, etc. Before Internet access became widely available, Distance Education used phone lines, cable TV, videotapes, or postal mail for instructors to deliver asynchronous instruction to distance learning students enrolled in virtual classes. During the past few years Distance Education using Internet has become widely accepted in higher education institutions. (www.sunilhazari.com)

Online education can be defined as an approach to teaching and learning that utilizes Internet technologies to communicate and collaborate in an educational context. This includes technology that supplements traditional classroom training with web-based components and learning environments where the educational process is experienced. (www.blackboard.com)

Online management education can be defined as "formally and systematically organized teaching and learning activities, of the management courses, in which the instructor and the learner(s) are geographically separated, using ICT (Information and Communication Technology) to facilitate their interaction and collaboration". Open University, UK, was the pioneering institute in this field (Pathak, 2003). University of Pennsylvania was the first to start online program in the area of management. Many other universities in USA and Europe have thereafter followed suit. (Education Times Report: July 25, 2005).

Online Management Education in India

The gradual development and growth of distance education all over the world also had its impact in India. In July 1962, the University of Delhi made an important landmark decision by starting correspondence courses. The

success of the experience of Delhi University gave the impetus to other universities and by 1985 there were 31 universities offering various courses through correspondence. Also in 1985, the Govt. of India decided to set up the Indira Gandhi National Open University (IGNOU), which has established a formidable position in imparting education to the needy and the unreachable. Thereafter, 9 other State Open Universities were set up and are in operation. Notable among these are in the states of Maharashtra, Punjab, Rajasthan, Madhya Pradesh, Kerala and Andhra Pradesh (Kaur, 1996). Today we have a cumulative strength of 13,53,054 students enrolled in IGNOU and 9 State Open Universities.

In the early seventies, the medium of distance education was put to use in the field of management studies in our country. Pioneer in this work was Punjabi University, Patiala, where distance education was employed in management studies in 1972 (Kaur, 1996). Initially there was a fear regarding the applicability of distance education in the field of management. However, the experiment of Punjabi University turning out to be success prompted other Universities to follow suit. There are many institutions imparting distance education in management in India. Some well reckoned names worth mentioning are: IGNOU, New Delhi; AIMA, New Delhi; Madurai-Kamraj University, Tamil Nadu; Dr. B.R.Ambedkar Open University, Hyderabad; University of Bombay, Mumbai; Mohanlal Sukhadia University, Udaipur; etc. These institutions offer either MBA or Post Graduate Diploma programmes in various areas of Management through correspondence.

Online Management Education in India first started with a programme offered by Brilliant School of Management, an extension of Madras based Brilliant Tutorials, a private institution (Human Capital, Feb. 2002). It was started, largely, with an aim to train working executives to acquire formal management knowledge while they were working. Some other private players have tried their hand on it, however, universities have yet to formally adopted this online method of imparting management education. In fact, in this initial stage there has been collaboration with the university and the private institutes to offer such a course online - degree of the university and delivery by the institutes. Institute of Management Technology, Ghaziabad with Vidyasagar University is one such example, and another is Punjab Technical University with Lovely Institute, Jallandhar.

Problems Of Traditional Management Education

- One time, one place learning (inequality of supply) : In regular education, students have to attend a particular college/ institute and study as per time bound academic sessions. The learners have to place their schedule around learning and therefore the segment includes mostly students who don't have regular engagements and can attend regular classes. (Gupta, 2003).

- Local target audience and reach : The regular programmes have a local target audience because generally a college in a particular area will attract local students from that area only owing to limited reach.

- Text based courseware: Some universities

suggest books from various authors as part of the courseware and some get the content developed in the form of condensed text based notes, which is not self-explanatory. This leads to poor retention levels and dissatisfaction among the students and they merely mug up the courseware for passing the exams.

- Shortages of faculty and salaries : Getting competent faculty is a serious problem and it restricts delivery of quality education. Make shift arrangement of filling vacancies through visiting/part-time staff does not get the commitment to quality education. Also, due to high cost of living, salary package continues to rise creating a big burden on any educational institute (Gupta, 2003).

- Infrastructure : Present system requires large investment on purchase of land, construction of technical and administrative accommodation, procuring equipment for laboratories and procurement and storage of books for library adding to the burden of the institutes (Gupta, 2003).

- Minimal use of latest technologies : Majority of the regular colleges in India still follow the traditional blackboard-chalk method of imparting education. They are also reluctant to adopt new technologies in spite of government support and access (Ramanna, 2003).

- Limited interactivity : The chief advantage of the regular education is that student can interact and ask questions to the faculty. However, many students still feel shy to ask questions in a classroom as most of them hesitate in front of the faculty owing to varying knowledge levels.
- No facility to review a lecture: The lectures given by a faculty in a classroom cannot be archived and are lost as soon as the faculty walks out of the classroom. The students have no option but to memorize the concepts discussed- if possible!

- No interaction with university : The student does not have any interaction with the university. Hence, the university is unable to get proper feedback from the students regarding the various academic, administrative and technical problems the students may be facing. (Pathak, 2003)

- Access to information is not so easy : University processes are cumbersome and are generally not easily accessible. Students have to contact the college or university by post, telephone or personally visit the campus to find proper information.

- Manually driven : Most of the processes right from registration to certification are manually driven. This makes the system more error prone. There are often delays for reevaluation with repeated representations for examination results. (Gupta, 2003)

Reasons Behind Development Of Online Management Education

Online management education is one of the ways of imparting effective education to the aspiring people, residing anywhere in the world, to pursue and advance their learning process via Internet, without messing up their

professional responsibilities and duties with education by presenting a variety of solutions and subjects beyond the scope of traditional education. Online learning helps to increase the educational experiences irrespective of age and geographical diversity. The different arguments, which can be given in favour of the development of the online management education, are as below:

- It enables education anywhere, anytime and to anyone : The world-wide-web empowers the University to deliver training and critical information to its widespread student base no matter where and what time zone the users are in. They can just access it whenever they feel like, from home or from office. Always on - class starts when you want.

- Facilitates self paced and continued life-long learning : It gives the learner the flexibility to go through the programme content at the time that is most convenient to him and thereby achieve an appropriate balance of work, family, community and educational commitments. Online distance education has made lifelong learning more accessible for all people. 'Lifelong learning has been perceived as both a social ideal, involving personal growth and active citizenship, and an economic necessity in a knowledge economy... (that) requires people to undertake continual retraining and the acquisition of new skills in response to technological and structural economic changes,' (Flew, 2002: 164).

- Better access : Online courses improve accessibility for students (Abrioux, 2001; Barltlett, 1999) because they can accommodate a wide range of geographically dispersed and non-traditional students. Determining the best time to schedule a class and lure the student into the "brick and mortar" classroom is one of the major drawbacks of traditional training programs. E -Learning provides access to training for students when and where they need it. 24 x 7 access for students, learners and customers alike, from any location on any PC, PDA, smart phone or handheld device via a standard Web browser. (Ref: www. acseduonline.com/trainingcourses.aspx).

- Cost savings : A much-touted benefit of online learning is cost savings. Lot of amount can be saved in travel and downtime alone by using e -Learning. Training materials can be updated for a fraction of the cost of revising materials distributed by other means. Payback can be seen clearly over the near and long term. (Candy et al., 1994 in Volery and Lord, 2000).

- **Reduced implementation costs**

Installation on a single server and single database supports hundreds of students and hundreds of courses throughout your enterprise and can include students external to your business, without additional configuration required on students PCs.

- **Reduced ongoing maintenance costs**

Our initialisation process defines your exact needs, alleviating the requirement for extended development

- **Reduced integration costs into the future**

CoreLEARN can be integrated seamlessly

with any database or open source ERP application.

- **Learner focused and measurable :** Technology can personalize content and anticipate learner's future information learning needs. It also can match content with each individual's learning style, experience and skills, i.e. look and feel customization is possible. All screens can be fully customized by editing the templates, protecting and building upon your initial investment as the business requirements of the e-learning system change. Powerful Learning features make the implementation, hosting, tracking, testing, auditing and administration of online courses a flawless process. E-learning provides secure and reliable systems for recording and capturing what an individual knows and is able to do.

- **Better learning outcomes :** Alexander and McKenzie (1998) (in Alexander, S. (2001) state that the major 'benefits of online distance educ tion are an improved quality of learning; an improved productivity of learning; an improved access to learning; and an improved student attitude to learning'. Faster Response Time - time sensitive training can be delivered faster than through traditional classroom methods. By using communication technology to deliver training to multiple sites at the same time, e-learning becomes a competitive advantage.

- **Better use of "experts" :** An expert presenter or trainer can be used more cost effectively with e-learning than through traditional classrooms. Programs that require the presence of an expert can send the expert's message to multiple sites simultaneously - saving time and money. And the message is consistent for every delivery of the course.

Strategic Issues In Online Adoption By Universities

The online education has provided universities with a powerful new tool for knowledge delivery - a tool that is likely to transform teaching and learning practices irrevocably in the future. (Bates, 2000) In order to achieve promoting effective learning, gaining market share, and demonstrating leadership in the quality, a university must focus its efforts on strategically building its capacity, managing quality and planning its online presence. (Deden & Herrington, 2002) The various issues that universities need to take into consideration for online education may be stated as follows:

Economics : There are views that online education reduces the expense of delivering learning are false. So far, in most institutions, online education is a "special project" that requires extra funding - it is not (yet) a cost saver. Online courses require expensive technical infrastructure (Farell, 2000); the universities may provide sufficient support for setting up the technology but the users connecting from home may have slower modem connections or other constraints that may limit the effectiveness of the course delivery.

Cost-effectiveness essentially means that, given the amount of money and time expended to teach a concept, course, unit, whatever...are

the learning outcomes achieved, to what extent, and with how much of an investment. What is harder to determine is the monetary value of the convenience and access issues that are a by-product of the delivery system. What is it worth and how can an organization gauge the net value? (www.elearnspace_everything.edu/elearning)

- **Pedagogical quality :** The online education has provided many ways in which students can communicate with others in real time environment, which had previously missing from distance education courses. (www.aacsb.edu/publications/metf)

  Mioduser, Nachmias, Oren & Lahav (1999) reviewed 500 websites and evaluated aspects of the design and implementation. Their report revealed that it is insufficient to equip universities with appropriate technology to enable online learning without pedagogical advantages. Courses must be designed with the emphasis not only on content but on learning processes.

  There is pressure to replace more teacher-centred courses with student-centred approaches [Black, Sileo & Prater (2000); Housego & Freeman (2000)], and to emphasise more authentic learning settings [Brown, Collins & Duguid (1989); Barab, Squire, & Dueber (2000); Cronin (1993); Herrinton & Oliver (2000); Lebow & Wager (1994)], and problem-based learning tasks [Reeves & Laffy (1999); Roschelle & Behrend (1995); Savery & Duffy (1996)].

  In adopting these approaches, the nature of the learning moves away from abstracted knowledge-based learning to learning that supports both authentic contexts and the completion of tasks that reflect the genuine practices of the professional (Herrington & Oliver, 2000).

- **Student demand :** Online education 'offers the potential to provide learning to new audiences - educate under-served populations,' (Candy et al., 1994 in Volery and Lord, 2000). Many students study online via distance education because it is simply too far to travel to their nearest education institution campus. Significant increases are also observed in enrolments for overseas fee paying students (Kemp, 2000). This increase is an indication of the trend towards lifelong learning through ongoing postgraduate study, which is seen by professional associations as a necessary requirement for maintaining community standing.

  Online management education targets mass community of learner Online management education is suited for busy people who wish to increase their knowledge and skills without giving up jobs, leaving home, or losing income.. This ranges from students to top executives, professionals, students, housewife's etc, without any age bar. Students of online distance education need to be more motivated in order to keep on track and this will lead to a better level of education for all involved.

- Branding and marketing : Deden & Herrington (2002), observed that we do not yet know how the graduates of online

programs will perform on the job, as compared to the graduates of the classroom programs. Some early innovators - the universities, which have had a head start in going online, have definite advantages. Brand recognition is one of them. University of Phoenix and Jones University offered only few credits online and the student could complete an MBA started elsewhere. Thus the start was of a minimal nature, but they are looked upon as sector leaders such that they set benchmarks for competitive features and quality. For traditional universities, the creation of online courses and units to date has represented a significant investment in both technology and intellectual property. This investment has been made in the expectation of improving student access to education; however, the university sector has not yet developed powerful strategies for marketing online courses.

New corporates, vertically integrated companies, especially owning significant intellectual property are creating a highly competitive online learning marketplace. Competition from these new commercial ventures with value certification (e.g. Microsoft, Cisco, NIIT, etc.) as opposed to a university degree is seen to have the advantage of worldwide brand recognition. (Deden & Herrington, 2002)

- **Maintaining competitiveness in two over-headed business at the same time :** Colleges and universities that have resolved the e-learning/classroom debate face another concern: how to integrate e-learning into the existing curriculum without cannibalizing existing classroom offerings.(www.elearnspace_everything.edu/elearning/ElearningvsClassrooms, 2002)

Traditional universities have high overhead: physical infrastructures and must at least maintain these at a competitive level while trying to be competitive online as well. Right now, the performance results of graduates of online or mixed mode programs have not yet been established. The reputations of existing institutions still rest on the graduates of their on-campus programs and on their research. They cannot afford to abandon, or even loosen their grip on their traditional strengths. This divided attention doesn't help in building expertise in the online delivery and even the focus gets lost. (Deden & Herrington, 2002).

- **Institutional inertia :** Universities have notoriously slow response times, ponderous decision making processes, and great resistance to change. It takes tremendous push by powerful players and tremendous capital investment to change the practices of academic staff. The rapid pace of technological change requires tremendous focus, funding, and flexibility.

- **Systemic issues :** Limited consideration is sometimes given to issues in the student's life that may be impacting a desire to take an online course (or even the idea that students ought to have the choice). The focus is sometimes about organizational need, not student need. The perception seems to exist that successful online courses negatively impact regular on-campus classroom courses...so the de-linking is seen as essential. These are huge systemic issues

that must be addressed. (www.elearnspace_everything.edu/elearn , 2000).

- **Emerging changes in academic work styles and motivators :** Despite the inherent advantages provided by online education, the administrators can encounter obstacles in promoting pedagogical effectiveness. Low expertise of faculty in design and delivery of course materials for online environments. It is difficult for faculty to develop instructional activities, because most do not have formal training in curriculum and lesson planning. (O'Quinn & Corry, 2002)

  Poley (1998) also discusses the need for all educators to be learner centered throughout their lifetime. Whiting (1987) reported that online management educators must be more than just "talking heads." The literature suggests that educational institutions and their faculties must develop and more effectively use teaching skills in order to remain scientifically and technically up-to-date in contemporary society. To be successful in online management education it is apparent that faculty and staff need to be properly trained in the delivery of either interactive television or web-based courses.

- **Customizing the management education :** Concerning online management education, Cheney (2002) writes, "the quality of human interaction is more critical than the technology as a predictor of success [Kelsey (2000); White and Weight (2000) p. 4]. In many ways, the distance education environment more easily facilitates strong student-faculty interaction than traditional education, in that the "role of the professor shifts from that of authority to the role of course manager" [Roberson (2002), p. 2; Scagnoli (2001), p. 21]. The functions these course managers perform include "facilitator, teacher, organizer, grader, mentor, role model, counselor, coach, supervisor, problem solver, and liaison" (Riffee, 2003, p. 1). Since distance education instructors are relieved of much of the "responsibility of 'covering the content,' they [are] able to engage in 'customized coaching'" (Offir, 2003, p. 67). From an administrative standpoint, such interactive approaches require more investment in human rather than technological resources (Allen, 2001).

CONCLUSION

Online education is seen as the future methodology of delivery for management education. Various studies concluded that students found online discussions beneficial and useful to them. Many students felt that online discussions have benefited their learning skills and have improved their learning quality. The students enjoyed the flexibility of online discussions. The market of online education in the initial years will be limited. In this period it will be better for the universities to use resources to the minimum, so collaborations are the right alternatives. As the market for online courses matures and revenues increase steps could be taken to gradually move towards attaining independence in design, development and delivery of the online courses. It is essential to develop the core competency in that area.

As a conclusion it may be stated, that due to

better perception of learning outcome, increased enjoyment and motivation from online management education the online method justifies as a viable delivery process for management education, which may be adopted by Indian universities while taking care of strategic issues.

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Implementation of TCP westwood algorithm for congestion control with faster recovery

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Abstract

TCP Westwood is a protocol, which increases the performance of TCP window congestion control by using as feedback, the end-to-end measurement of the bandwidth available along a TCP connection. The available bandwidth is estimated at the TCP source by measuring the return rate of acknowledgments. The estimated bandwidth is then used to properly set the congestion window and the slow start threshold after a congestion episode that is after a timeout or 3 duplicate acknowledgments. The rationale of this strategy is simple: TCP Westwood sets a slow start threshold and a congestion window which is consistent with the network capacity measured at the time congestion is experienced. In particular, TCP Westwood introduces a mechanism of faster recovery to avoid overly conservative reduction of the congestion window after a congestion episode by taking into account the end-to-end estimation of available bandwidth. The advantage of the proposed mechanism is that the TCP sender recovers faster after losses especially over connections with large round trip times, or running over wireless links where sporadic losses are due to unreliable links rather than congestion. The previous models require only slight modifications at the sender side and are backward compatible. In this paper we implement the already known TCP westwood algorithm in NS.

TCP/IP and the Transport Layer

TCP/IP is a set of rules that defines how two computers address each other and send data to each other. This set of rules is called a protocol. Multiple protocols that are grouped together form a protocol suite and work together as a protocol stack. TCP/IP is a strong, fast, scalable, and efficient suite of protocols. This protocol stack is the de facto protocol of the Internet.

Features of TCP/IP

- Support from Vendors

As stated earlier, TCP/IP receives support from many hardware and software vendors. This means that the TCP/IP suite is not tied to the development efforts of a single company. Instead, the choice to use TCP/IP on a network can be based on the purpose of the network and not on the hardware or software that has been purchased.

- Interoperability

One of the major reasons why the TCP/IP suite has gained popularity and acceptance so universally is that it can be installed and used on virtually every platform. For example, using TCP/IP, a Unix host can communicate and transfer data to a DOS host or a Windows host.

- Flexibility

TCP/IP is an extremely flexible protocol suite. Examples of TCP/IP's flexibility include the latitude an administrator has in assigning and reassigning addresses. An administrator an automatically or manually assign an IP address to a host, and a TCP/IP host can convert easy-to-remember names, such as www.sybex.com, to a TCP/IP address.

- **Routability**

A limitation of many protocols is their difficulty in moving data from one segment of the network to another. TCP/IP is exceptionally well adapted to the process of routing data from one segment of the network to another, or from a host on a network in one part of the world to a host on a network in another part of the world.

Design Goals of TCP/IP

TCP/IP has evolved to its current state. The protocols within the TCP/IP suite have been tested, modified, and improved over time. The original TCP/IP protocol suite had several design goals that intended to make it a viable protocol for the large, evolving inter-network.
Some of these goals included:

- **Hardware independence**

A protocol suite that could be used on a Mac, PC, mainframe, or any other computer.

- **Software independence**

A protocol suite that could be used by different software vendors and applications. This would enable a host on one site to communicate with a host on another site, without having the same software configuration.

- **Failure recovery and the ability to handle high error rates**

A protocol suite that featured automatic recovery from any dropped or lost data. This protocol must be able to recover from an outage of any host on any part of the network and at any point in a data transfer.

- **Efficient protocol with low overhead**

A protocol suite that had a minimal amount of "extra" data moving with the data being transferred. This extra data called overhead, functions as packaging for the data being transferred and enables the data transmission. Overhead is similar to an envelope used to send a letter, or a box used to send a bigger item - having too much overhead is as efficient as using a large crate to send someone a necklace.

- **Ability to add new networks to the inter-network without service disruption**

A protocol suite that enabled new, independent networks to join this network of networks without bringing down the larger inter-network.

- **Routable Data**

A protocol suite on which data could make its way through an inter-network of computers to any possible destination. For this to be possible, a single and meaningful addressing scheme must be used so that every computer that is moving the data can compute the best path for every piece of data as it moves through the network.

The Algorithm

a) Introduction to the Algorithm

The Transmission Control Protocol (TCP) is designed to offer an end-to-end connection-oriented packet switching service using IP over heterogeneous networks. It was originally designed to provide reliable data delivery over conventional (wired) networks for a limited range of transmission rates and propagation delays. One of TCP strengths lies in its congestion control mechanism proposed in the cornerstone work by Van Jacobson [1]. Nowadays, data transfers over communication paths with ever-larger bandwidth/delay products, quality of service (QoS) requirements for interactive traffic and communication over wireless links, are shifting the domain for which TCP was originally engineered. As a consequence, active research is in progress to extend the domain of TCP operability [2], [3], [4], [5], [6]. The congestion control algorithm used in the TCP/IP protocol is a sliding window mechanism that uses packet loss to detect congestion. In particular, the end-systems probe the network state by gradually increasing the window of packets that are outstanding in the network until the network becomes congested and drops packets. Initially, the increase is exponential during the Slow Start phase. This phase is intended to quickly grab the available bandwidth. When the window size reaches a slow start threshold (ssthresh), the increase becomes linear, thus allowing for a gentler probing of the available capacity. Clearly, it is desirable to set the threshold to a value that approximates the connection's "fair share". The optimal value for the slow start threshold is the one that corresponds to the segments in flight in a pipe when TCP rate equal to the available bandwidth [8], i.e. when its transmission window is equal to the available bandwidth-delay product. When a loss is detected either through duplicate acknowledgements, or through coarse timeout expiration, the connection backs off by shrinking its congestion window. If the loss is indicated by duplicate ACKs, TCP Reno attempts to perform a "fast recovery" by retransmitting the lost segments and halving the congestion window. If the loss is followed by coarse timeout expiration, the congestion window is reset to 1. In either case, after the congestion window is reset, the connection needs several round-trip times before the window-based probing is restored to near capacity. This problem is exacerbated when random or sporadic losses occur. Random losses are here defined as losses not caused by congestion at the bottleneck link. They are common in the presence of wireless channels. In this case, a burst of lost segments is erroneously interpreted by a TCP source as an indication of congestion, and dealt with by shrinking the sender's window. Such action, clearly, does not alleviate the random loss condition and it merely results in reduced throughput. The larger the bandwidth-delay product, the larger the degradation caused by such action. A similar situation occurs in presence of bursty sources that may be responsible for small, sporadic losses due to a flurry of UDP packets shortly congesting intermediate routers. Although a smaller transmission window can help lowering the congestion in the short run, it will affect the source's ability to regain speed in the long run. Random or sporadic losses (or a combination of the two) cannot be efficiently handled by conventional TCP algorithms that use packet drop (rather than bandwidth availability)

information to set their congestion window.

b) End-To-End Bandwidth Measurement

A basic assumption of TCP design is that the network is a "black box". As a consequence, a TCP source cannot receive any explicit congestion feedback from the network and has to rely only on implicit feedback such as timeouts, duplicate acknowledgments and round trip measurements. It is thus said that TCP must perform an "end-to-end" control. In this work, a new implicit feedback is to be used for congestion avoidance, while the source performs an end-to-end estimate of the bandwidth available along a TCP connection by measuring the rate of returning acknowledgments. For such an estimate to be meaningful, the source must be able to infer the amount of data delivered to the receiver over time. The TCP protocol provides for the receiver to notify the sender of the reception of a segment by means of an acknowledgement (ACK), carrying an indication as to what segment was received. When an ACK is received by the source, it conveys the information that an amount of data corresponding to a specific transmitted packet was delivered to the destination. If the transmission process is not affected by losses, simply averaging the delivered data count over time yields a fair estimation of the bandwidth currently used by the source.

When duplicate ACKs (DUPACKs), indicating an out-of-sequence reception, reach the source, they should also count toward the bandwidth estimate, and a new estimate should be computed right after their reception. However, the source is in no position to tell for sure which segment triggered the DUPACK transmission, and it is thus unable to update the data count by the size of that segment. An average of the segment size sent thus far in the ongoing connection should therefore be used, allowing for corrections when the next cumulative ACK is received. For the sake of simplicity, though, the algorithm will assume all TCP segments as having the same size. Following this assumption, the algorithm will further assume that sequence numbers are incremented by one per segment sent, although the actual TCP implementation keeps track of the number of bytes instead: the two notations are interchangeable if segments have all the same size. It is important to notice that, immediately after a congestion episode, followed either by a timeout or n duplicate ACKs, the bandwidth used by the connection is exactly equal to the maximum bandwidth available to that connection. This is confirmed by the fact that packets have been dropped, a clear indication that buffers are at (or near) saturation. Before a congestion episode, the used bandwidth is less or equal to the available bandwidth because the TCP source is still probing the network capacity. The bandwidth estimation is performed, as described by the following pseudo code:

```
if (ACK is received)
sample_BWE[k] = (acked*pkt_size*8)/(now - lastacktime);
BWE[k] = (19/21)*BWE[k-1] + (1/21)*(sample_BWE[k]+ sample_BWE[k-1]);

Endif
```

where acked indicates the number of segments acknowledged by the latest ACK, pkt size indicates the segment size in bytes, now indicates the current time, lastacktime the time the previous ACK was received, k and (k-1) indicate the current and the previous value of the variable, and BWE is the low-pass filtered

measurement of the available bandwidth. The estimated bandwidth is eventually translated into the appropriate windows size as cwin = BWE * RTTmin, where RTTmin is the smallest round-trip time routinely computed by the TCP source (and used to set the coarse timeout). It is clear that the bandwidth available along a TCP connection can be evaluated at the receiver side using the same filtering procedure. Then, this feedback could be delivered back to the source via ACKs by setting the AdvertisedWindow field equal to min (AdvertisedWindow, RTTmin*BWE)). On the one hand, this choice has the major advantage of robust bandwidth estimation with respect to losses of ACKs along the returning path. Indeed, losses of ACKs, i.e., along asymmetric TCP connections, could negatively affect the bandwidth estimation at the source. On the other hand, it would require modifications of the TCP receiver, whereas the choice of placing the bandwidth estimation at the sender favors a sender-side-only implementation of the new protocol.

c) On The Effects of Delayed and Cumulative Acks on BWE

As previously stated, DUPACKs should count toward the bandwidth estimation, since their arrival indicates a successfully received segment, albeit in the wrong order. As a consequence, a cumulative ACK should only count as one segment's worth of data since duplicate ACKs ought to have already been taken into account. However, the matter is further complicated by the issue of delayed ACKs. The standard TCP implementation provides for an ACK being sent back once every other segment received, or if a 200-ms timeout expires after the reception of a single segment [9].

The two important aspects of the bandwidth estimation process:

- The source must keep track of the number of DUPACKs it has received before new data is acknowledged.
- The source should be able to detect delayed ACKs and act accordingly

The approach we have chosen to take care of these two issues is detailed by the AckedCount procedure, detailed below, showing the set of actions to be undertaken upon the reception of an ACK, for a correct determination of acked. The key variable is accounted for, which keeps track of the received DUPACKs. When an ACK is received, the number of segments it acknowledges is first determined (cumul ack). If cumul ack is equal to 0, then the received ACK is clearly a DUPACK and counts as 1 segment towards the BWE; the DUPACK count is also updated. If cumulative ack is larger than 1, the received ACK is either a delayed ACK or a cumulative ACK following a retransmission event; in that case, the number of ACKed segments is to be checked against the segments already accounted for (accounted for). If the received ACK acknowledges fewer or the same number of segments than expected, it means that the "missing" segments were already accounted for when DUPACKs were received, and they should not be counted twice.
If the received ACK acknowledges more segments than expected, it means that although part of them were already accounted for by way of DUPACKs, the rest are cumulatively acknowledged by the current

ACK; therefore, the current ACK should only count as the cumulatively acknowledged segments. It should be noted that the last condition correctly estimates the delayed ACKs (cumul_ack = 2 and accounted_for = 0).

```
PROCEDURE AckedCount

cumul_ack = current_ack_seqno - last_ack_seqno;
if (cumul_ack = 0)
accounted_for=accounted_for+1;
cumul_ack=1;
endif
if (cumul_ack > 1)
if (accounted_for >= cumul_ack)
accounted_for=accounted_for-cumul_ack;
cumul_ack=1;
else if (accounted_for < cumul_ack)
cumul_ack=cumul_ack-accounted_for;
accounted_for=0;
Endif
Endif
Endif
last_ack_seqno =current_ack_seqno;
Acked=cumul_ack;
Return (acked);

END PROCEDURE
```

d) TCP Westwood : Algorithm Guidelines

The bandwidth estimation can be used by the congestion control algorithm executed at the sender side of a TCP connection in order to accomplish a faster recovery after a congestion event. First, we outline the algorithm in the most general form. Then, we describe the specific form we have implemented. As will be explained, the congestion window dynamics during slow start and congestion avoidance are unchanged, that is they increase exponentially and linearly, respectively, as in current TCP Reno. The general idea is to use the estimated bandwidth BWE to set the congestion window (cwin) and the slow start threshold (ssthresh) after a congestion episode. Recall that the basic role played by cwin and ssthresh in TCP congestion control is that cwin is increased and decreased to track the available bandwidth-delay product that should be represented by ssthresh. Overall, TCPWestwood performance improves if some form of fair sharing is implemented in the network, although this aspect will be discussed in a different work. We start by describing the general algorithm behavior after n duplicate ACKs and after coarse timeout expiration.

Algorithm after n duplicate ACKS

```
if (n DUPACKs are received)

if (cwin>ssthresh) /* congestion avoid. */

        ssthresh = f1(BWE*RTTmin);
        cwin = ssthresh;

endif
        if (cwin<ssthresh) /*slow start */
                ssthresh= f2(BWE*RTTmin)
                        If (cwin > ssthresh)
                                cwin = ssthresh
                        endif
                endif
endif
```

The rationale of the algorithm is simple. During the congestion avoidance phase we are probing for extra available bandwidth. Therefore, when n DUPACKS are received, it means that we have hit the network capacity (or that, in the case of wireless links, one of more segments were dropped due to sporadic losses). Thus,

the slow start threshold is set equal to the available pipe size, which is BWE * RTTmin, the congestion window is set equal to the ssthresh and the congestion avoidance phase is entered again to gently probe for new available bandwidth. Function f1 introduces one degree of freedom that can be used to tune the algorithm. In this paper we have chosen an identity function for f1, i.e. f1(.) = (.). During the slow start phase we are still probing for the available bandwidth. Therefore the BWE we obtain after n duplicate ACKs is used to set the slow start threshold. After ssthresh has been set, the congestion window is set equal to the slow start threshold only if cwin>ssthresh. In other words, during slow start, cwin still features an exponential increase as in the current implementation of TCP Reno. Function f2 introduces one more degree of freedom that we can use to tune the algorithm.

Algorithm after coarse timeout expiration

```
if (coarse timeout expires)
    if (cwin>ssthresh) /* congestion avoid. */
        ssthresh = f3(BWE*RTTmin);
            if (ssthresh < 2)
                ssthresh = 2;
                cwin = 1;
    else
        cwin = f4(BWE*RTTmin);

    endif
endif

if (cwin<ssthresh) /* slow start */
        ssthresh = f5(BWE*RTTmin)
            if (ssthresh < 2) ssthresh = 2;
                cwin = 1;
            else
                cwin = f6 (BWE*RTTmin)
            endif
    endif
endif
```

The rationale of the algorithm is again simple. After a timeout the cwin and the ssthresh are set according to one of the functions f i, i=3, 6 depending on the phase the algorithm is in when a timeout is experienced.

THE NETWORK SIMULATOR

NS is an event driven network simulator developed at UC Berkeley that simulates variety of IP networks. Ns began as a variant of the REAL network simulator in 1989 and have evolved substantially over the past few years. The simulator is written in C++; it uses OTcl as a command and configuration interface. It is focused on modeling network protocols like:

- wired, wireless, satellite
- TCP, UDP, multicast, unicast
- Web, telnet, ftp
- Ad hoc routing; sensor networks
- Infrastructure: stats, tracing, error models etc.

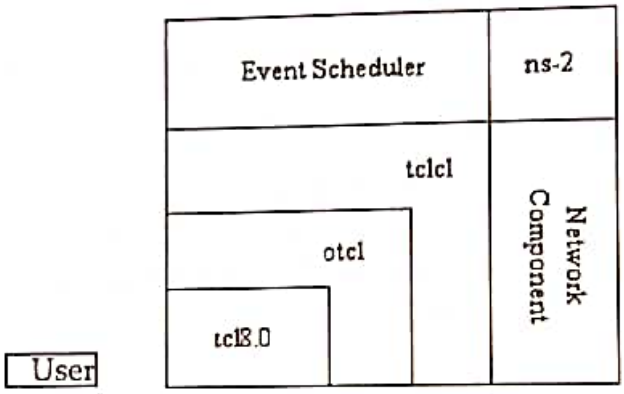
NS is used for:

- Evaluate performance of existing network protocols.
- Prototyping and evaluation of new protocols.
- Large-scale simulations not possible in real experiments.

AN OVERVIEW OF NS2

Architectural View of NS:

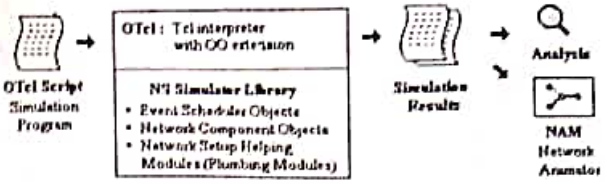
- In the figure below a general user (not an NS developer) can be thought of standing at the left bottom corner, designing and running simulations in Tcl using the simulator objects in the OTcl library. The event schedulers and most of the network components are implemented in C++ and available to OTcl through an OTcl linkage that is implemented using tclcl. The whole thing together makes NS, which is a OO extended Tcl interpreter with network simulator libraries.



Architectural View of NS

Simplified User's View of NS:

- In a simplified user's view, NS is Object-oriented Tcl (OTcl) script interpreter that has a simulation event scheduler and network component object libraries, and network setup (plumbing) module libraries (actually, plumbing modules are implemented as member functions of the base simulator object).



User's View of NS

Building NS2:

There are two ways to build NS2

- From all the pieces available at URL: http://www.isi.edu/nsnam/ns/ns-build.html

- ns-allinone

In NS from pieces, we have to separately install the various components (all the components are available as pieces on above mentioned site). On this report, we'll be concerned about building NS from all-in-one package.

NS-allinone is a package which contains required components and some optional components used in running NS. The package contains an "install" script to automatically configure, compile and install these components. After downloading, we have to run the install script.

Current ns-allinone-2.27 contains following components:

- Tcl release 8.4.5 (required component)
- Tk release 8.4.5 (required component)
- Otcl release 1.10 (required component)
- TclCL release 1.15 (required component)
- Ns release 2.27 (required component)
- Nam release 1.10 (optional component)
- Xgraph version 12.1 (optional component)
- CWeb version 3.4g (optional component)
- SGB version 1.0 (optional component,

builds sgblib for all UNIX type platforms)

- Gt-itm gt-itm and sgb2ns 1.1 (optional component)
- Zlib version 1.1.4 (optional, but required should Nam be used)

SOURCE CODE

File-Name: tcp-westwood.cc

```
//Note: naming convention: fr for fractions

#include <stdio.h>
#include <stdlib.h>
#include <sys/types.h>
#include <math.h>

#include "ip.h"
#include "tcp.h"
#include "flags.h"


static class WestwoodTcpClass : public
TclClass {
public:
    WestwoodTcpClass() : TclClass("Agent/
TCP/Westwood") {}
    TclObject* create(int, const char*const*)
    return (new WestwoodTcpAgent());
    class_westwood;


  WestwoodTcpAgent::WestwoodTcpAgent()
  : RenoTcpAgent()

   // Read defaults variables from ns-
  defaults.tcl
    bind("current_bwe_", &current_bwe_);
    bind("last_bwe_sample_",
    &last_bwe_sample_);

bind("unaccounted", &unaccounted);
    bind("fr_a_", &fr_a_);
    bind("min_rtt_estimate",
&min_rtt_estimate);
}

void WestwoodTcpAgent::dupack_action()
{
    if (ssthresh > cwnd)
    {
    /* 3 dupacks were received while in
slowstart */
        fr_a_ = fr_a_ + 0.25;

        if (fr_a_ > 4)
        {
            fr_a_ = 4;
    }
    }
    else
    {
        /* 3 dupacks were received while
in congestion avoidance */
        fr_a_ = 1;
    }

    ssthresh = (int)((current_bwe_/size_/8)
* min_rtt_estimate)/fr_a_;

    // ssthresh should not be < 2 as then
cwin would be less than 1
    if (ssthresh < 2)
    {
        ssthresh = 2;
    }

    /* reset cwin to ssthresh if larger*/

  if (cwnd > ssthresh)
    {
    cwnd = ssthresh;
  }
```

```
    output(last_ack_ + 1,
TCP_REASON_DUPACK);    // resend
missing packet
    return;
}

void WestwoodTcpAgent::timeout(int tno)
{
    /* retransmit timer */
    if (tno == TCP_TIMER_RTX)
    {

        if (cwin<ssthresh) /* slow start */
        {
            fr_a_ = fr_a_ + 1;

            if (fr_a_ > 4)
            {
                fr_a_ = 4;
            }
        }

        if (cwin>ssthresh) /* congestion
avoid. */
        {
            fr_a_=1;
        }

        ssthresh = (int)((current_bwe_/
size_/8) * min_rtt_estimate)/fr_a_;

        if (ssthresh > 2)
        {
            ssthresh = 2;
            cwin = 1;
        }

last_cwndaction_ =
cwndACTION_TIMEOUT;
output(last_ack_ + 1,
TCP_REASON_TIMEOUT);
    }
}

void WestwoodTcpAgent::recv(Packet *pkt,
Handler*)
{
    hdr_tcp *tcph = hdr_tcp::access(pkt);

    double time_now =
Scheduler::instance().clock();

    // last_ack_ indicates the ack no. of the
ack received before the current one

    // START BWE COMPUTATION
    // cumulative ACKs acking more than
2 packets count for 1 packet since DUPACKs
have already been accounted for

    int cumul_ack = tcph->seqno_ -
last_ack_;

    if (cumul_ack > 1)
    {
        /* check if current ACK ACKs
fewer or same number of segments than
expected: if so, the missing ones were
            already accounted for by
DUPACKs, and current ACK only counts as
1
        */
            if (unaccounted >=
cumul_ack)
            {
                unaccounted = unaccounted
- cumul_ack + 1;
                cumul_ack = 1;
            }
            else
```

```
        {
/* check if current ACK ACKs more segments
than expected: if so, part of them were already
accounted for by

 DUPACKs; the rest are cumulatively ACKed
by present ACK. Make present ACK count as
the unacknowledged ACKs
                in excess
              */

              if     (unaccounted     <
cumul_ack)
              {
                    cumul_ack          =
cumul_ack - unaccounted;
                    unaccounted=0;
              }
        }
    }

    double rtt_estimate = time_now -
lastackrx_


    if          ((rtt_estimate          <
min_rtt_estimate)&&(rtt_estimate > 0))
    {
        min_rtt_estimate = rtt_estimate;
    }

    nackpack_ += cumul_ack;

    int acked_size = size_ * 8 * cumul_ack;

    double ack_interv = time_now -
lastackrx_;

    double sample_bwe;
    sample_bwe = acked_size/ack_interv;
    current_bwe_ = ( current_bwe_ * (19/
21) ) + ( (1/21) * (sample_bwe +
last_bwe_sample_) );
        last_bwe_sample_ = sample_bwe;
    last_ack_ = time_now;

}


/* Process a packet that acks previously
unacknowleged data */

void WestwoodTcpAgent::newack(Packet*
pkt)
{
    hdr_tcp *tcph = hdr_tcp::access(pkt);
    myseqno_ = tcph->seqno_;

    //call parent newack
    RenoTcpAgent::newack(pkt);
}

File-name: tcp-westwood.h

#include "tcp.h"
/* TCP Westwood */
class WestwoodTcpAgent : public virtual
RenoTcpAgent
{

public:

    WestwoodTcpAgent();
    virtual void recv(Packet *pkt, Handler*);
    virtual void dupack_action();
    virtual void timeout (int tno);

protected:

double lastackno_;   /* Last ACK number */
```

```
        double lastackrx_;
/* Time last ACK was received */

        double current_bwe_;            /   *
Current Bandwidth estimation */
      double last_bwe_sample_;
/* Last sample used to compute BWE */
      int unaccounted;                  /   *
unaccounted ACKs already received */
      double a;                         /   *
bandwidth reduction factor */
      double min_rtt_estimate;
/* smaller recorded RTT estimate */
};
```

Simulation script : West_Test.tcl

```
set buffer 0
set psize 1400

set lrate 0.0

if {$argc > 1} {
   set buffer [lindex $argv 1]
   set lrate  [lindex $argv 2]
} else {
   puts "usage: ns xxx.tcl <protocol> <buffer>
<error rate>"
   puts " "
   puts "<buffer> is the buffer size, use 0 for
automatic size setting"
  puts "<error rate> is the link error rate (0.001
= 0.1%). Use 0 for no errors"

   exit 1
}

set ns [new Simulator]

$ns color 1 Blue
$ns color 2 Red

set tr_f       [open out.tr w]
set nam_f      [open out.nam w]
set record_f   [open out.data w]

$ns trace-all $tr_f
$ns namtrace-all $nam_f

### Finish proc
proc finish {} {
    global ns tr_f record_f nam_f
    $ns flush-trace
    close $tr_f
    close $record_f
    close $nam_f

     exec awk { { print $1, $2 } } out.data >
temp.cwnd
     #exec awk { { print $1, $3 } } out.data >
temp.sst
     exec awk { { print $1, $4 } } out.data >
temp.bwe

    exec nam out.nam &
    exec xgraph temp.bwe -m -x time -y bps -
geometry 600x200 &
   exec xgraph temp.cwnd temp.sst -m -x time
-y cwnd_ -geometry 600x200 &

     exit 0
}


# This is our network:
#
#
#  100Mb,1ms     5Mb,35 ms      100Mb,1ms
#  n0 -------- n1 ------------ n2 --------- n3
# TCP Source       30 buffer              TCP-
```

```
Sink
set n0 [$ns node]
set n1 [$ns node]
set n2 [$ns node]
set n3 [$ns node]

$ns duplex-link $n0 $n1 100Mb 1ms
DropTail
$ns duplex-link $n2 $n3 100Mb 1ms
DropTail

$ns duplex-link $n1 $n2 5Mb 35ms
DropTail

# Here we are setting the queue size for the n1
n2 link. If 0 was entered in the 2nd argument
then we are calculating maximum queue size
here

set buffer_calc [expr 5*1000000 * 35*2/1000
/ 8 / $psize]
if {$buffer == 0} {
   set buffer $buffer_calc
}
puts "The entered Buffer: $buffer - The
Calculated Buffer: $buffer_calc"

$ns queue-limit $n1 $n2 [expr $buffer *1]

$ns duplex-link-op $n1 $n2 queuePos 0.5

# Add bottleneck link errors
set lossy_link 0
if {$lrate > 0} {
      set lossy_link 1
}

if { $lossy_link == 1} {
      set loss_module [new ErrorModel]
      $loss_module unit pkt
      $loss_module set rate_ $lrate
      $loss_module ranvar [new
RandomVariable/Uniform]
      $loss_module drop-target [new Agent/
Null]
      $ns lossmodel $loss_module $n1 $n2
}
set tcp [new Agent/TCP/Westwood]
$tcp set window_ 100
$tcp set maxcwnd_ 2000
$tcp set packetSize_ $psize
$ns attach-agent $n0 $tcp

set sink [new Agent/TCPSink/DelAck]
$ns attach-agent $n3 $sink

$ns connect $tcp $sink

set ftp [new Application/FTP]
$ftp attach-agent $tcp

proc record {} {
   global ns tcp sink record_f proto
   set now [$ns now]

   set time 0.15

   set cwin    [$tcp set cwnd_]
   set ssthresh [$tcp set ssthresh_]

   if { (1) } {
      set bwe  [$tcp set current_bwe_]
   } else {
      set bwe  0
   }
      puts $record_f "$now [expr $cwin*1]
$ssthresh $bwe"

   $ns at [expr $now+$time] "record "
}
```

$ns at 0.0 "record"
$ns at 0.0 "$ftp start"

$ns at 40.0 "finish"

$ns run

Implementation of Algorithm

" The source files "tcp-westwood.cc" and "tcp-westwood.h" should be put under .\Cygwin\home\ User\ns-allinone-2.27\ns-2.27\tcp directory

" The Makefile.in should be edited so that it compiles and links the new module (i.e. add tcp-westwood.o anywhere in the OBJ_CC variable, for example near the other TCP related modules like tcp-reno.o).

" The variables for which default values are required should be added to ns-default.tcl

```
# Added for TCP Westwood
Agent/TCP/Westwood set current_bwe_ 0
Agent/TCP/Westwood set last_bwe_sample_
0

Agent/TCP/Westwood set unaccounted_ 0
Agent/TCP/Westwood set fr_a_ 1
Agent/TCP/Westwood set min_rtt_estimate
10000

Agent/TCP/Westwood set lastackno_ 0
Agent/TCP/Westwood set lastackrx_ 0
```

RESULTS OBTAINED

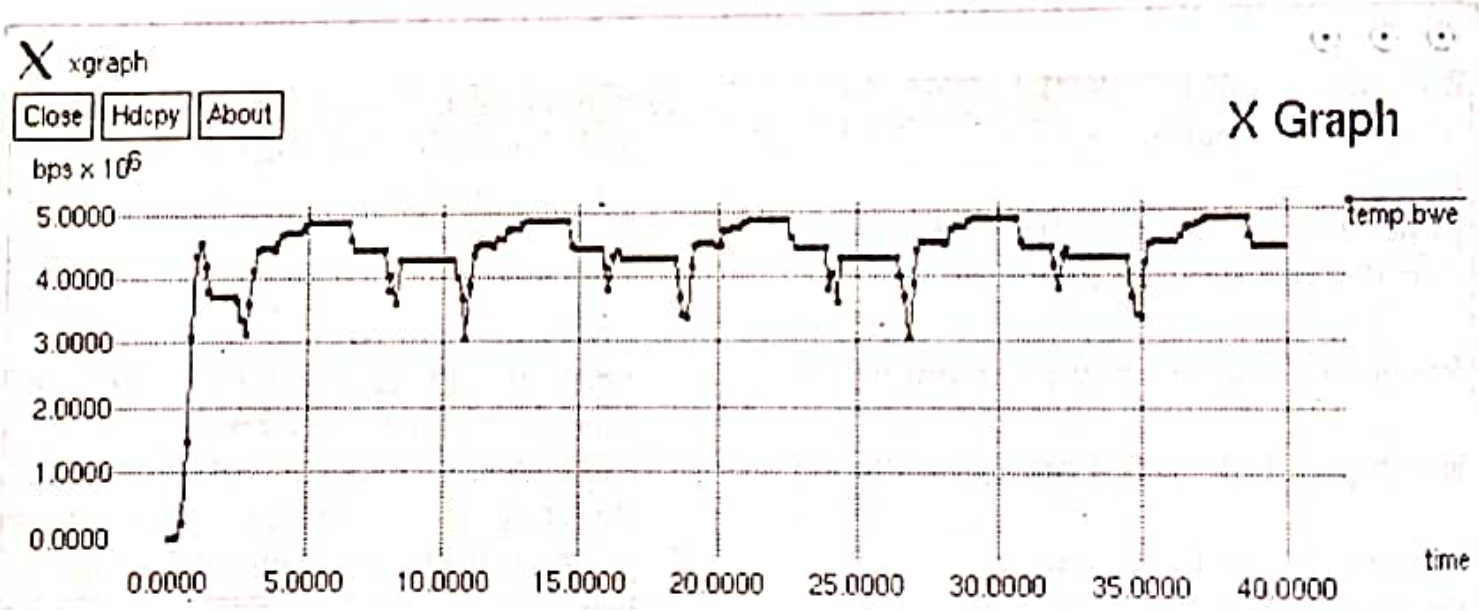


Fig: The graph of the bandwidth estimate v\s time

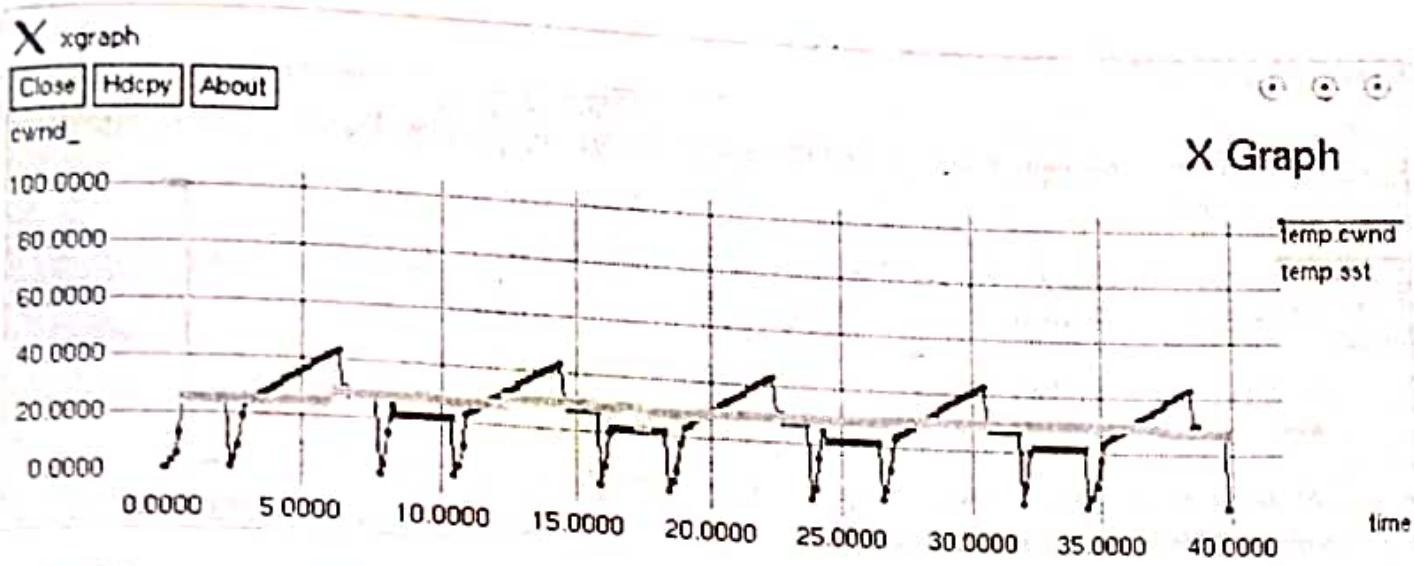


Fig: The graph of the congestion window (red) and slow start thresh(green) v\s time

Conclusion

TCP: WESTWOOD is a congestion control algorithm in which during congestion the sender tries to best match the actual band-width of the congestion. This improved TCP congestion control algorithm has been studied and implemented. In the process of implementing it, NS was studied. This sort of implementation of congestion control algorithms, find a wide range of applicability in the Wireless Networks. The graph's showing the variation of Estimated Band-width, Congestion Window size and Slow-start Threshold with regard to time have been plotted and studied

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The Control of Piezoelectric Smart Beam using Finite Element Method.

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Abstract

This work deals with smart structure vibration attenuation of flexible beam by using PZT bonded actuators. Equation of motion of Euler-Bernoulli beam incorporating the damping is obtained using the concept of equivalent force and moment. Finite element approximation of governing equation is obtained by variational formulation by Reiylegh -Ritz method. State space model of the smart beam was obtained through finite element analysis. For vibration control of large number of flexural modes by only few actuators using time-sharing control strategy called Modified Independent Modal Space Control in which vibration amplitude is suppresses by minimizing the modal energy as well as control effort. Numerical example of a cantilever beam is presented for illustration. The results obtained emphasizes importance of method in designing active control system for elastic beam in particular and large space structure in genera.l

Smart Structure :

It has been prolonged human zest to develop system that has functionality similar to the human muscular and nervous system with intelligence enough to take decisions for them self. In the recent years significant attention was attracted to develop such system and smart structure is one such development in this direction. By definition, a structure with self-detection, self-diagnostic, self-corrective and with self-controlled functionality may be called a smart structure (intelligent structure, adaptive structure and structronics as they are referred to, in different literatures).

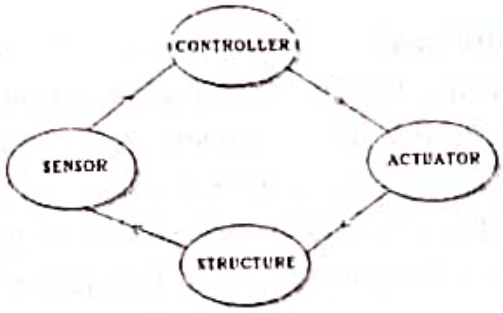
The ability of smart structure to allow soft ware adjustment to modify and tune not only the structure behavior (static as well as dynamic) but also enables the implementation of a number of control strategies make it a perfect choice for a number of applications, a few among them are, vibration suppression of aircraft structures; noise control of helicopter rotors; health monitoring of bridges; shape control of large space trusses; aeroelastic control of aircraft lifting components; and seismic control of buildings.

COMPONENTS OF SMART STRUCTURE:

A smart structure consists of following three basic components.

a) Sensor
b) Actuator
c) Controller

The three basic components and their interrelation is shown in figure 1



In this work a smart beam like one shown in figure 2 has been analyzed for their dynamic and static behavior. The beam is controlled by PZT bonded actuator also shown in figure 2 .the choice of the PZT is because of its simple integration into the structure; a readily obtainable commercial supply of piezopolymers and piezoceramics; and familiarity in using these materials gained from previous applications in transducers.

Figure: A typical smart beam with PZT actuator

4 Finite Element Method:

4.1 GOVERNING EQUATION OF MOTION

Response of an Euler-Bernoulli beam is governed by the partial differential equation

$$m(x)\frac{\partial^2 w(x,t)}{\partial t^2} + c\frac{\partial w(x,t)}{\partial t} + kw(x,t) = \bar{p}(x,t)) \qquad 4.1$$

Where k is the differential operator defining stiffness of the beam is given by

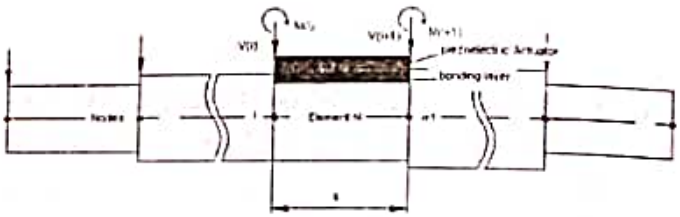
$$k = \frac{\partial^2}{\partial x^2}\left(EI\frac{\partial^2}{\partial x^2}\right) \qquad 4.2$$

$\bar{p}$ is distributed force per unit length , m(x) mass per unit length is damping constant. Flexural rigidity for composite section can be obtained using equation for composite beam element it can be shown Baz et al (1987) [13] that it has flexural rigidity EiIi given by

$$E_iI_i = E_1I_1 + E_2I_2 + E_3I_3$$

Where I1 I2 and I3 are area moment of inertia of the film, the bonding layer and the beam about the neutral axis respectivel

Discretization of the beam domain is done by dividing the beam into line elements, each elementhaving 2 end nodes, with a degree of freedom 2 for each node as shown in figure 3.1.



5 Control of Structure :

For designing a control system there are varieties of modeling techniques. Three more common among them are Transfer function model, Matrix fraction model, and State variable model.

Transfer function models were used in classical control techniques, which can be viewed as evolving principally before 1960. With theses techniques the relationship between input, and output signals was considered all-important. Design of control system was carried out based upon system transfer function using a variety of principally graphical techniques like Nyquist, Bode and Root-Locus method.

These are conceptually simple and computationally inexpensive. Classical control techniques have several drawbacks chief among these are that it is, generally, applicable to SISO (single input single output), linear time

invariant system. Secondly it is not able to provide a control law, which is optimal in any prescribed sense.

Control theory since 1960 has been largely developed on concept of the state rather then concept of frequency response or transfer function. Control theory derived using this concept is termed as state space /modern control theory. Modern control theory is capable of providing state space control laws for MIMO (Multiple Input Multiple Output) system, linear non-linear time invariant and time dependent .

STATE SPACE PLANT MODELS FOR FEEDBACK CONTROL:

Modern control theory is based upon a model of the system, which is constructed from a set of differential equations, which can be combined into a first order matrix differential equation. The matrix notation greatly simplifies the mathematical representation of the system, and provides a form of problem expression, which is readily amenable to computers solution.

Mathematical model of continuous, dynamic system usually have the form of differential equations. The type of differential equation depends upon the system parameters used to develop the model. If the system components can be lumped in such a way that the parameters are not explicitly dependent upon spatial coordinates the governing differential equation will be ordinary differential equation for example finite element models of the system. However, if the system components cannot be lumped, then the parameters are explicitly dependent upon spatial coordinate and the governing differential equations will be partial differential equation. The description of structure such as beams and plates typically fall into this category.

The input output response of both distributed and lumped parameter system is dependent upon time. That is not to say that the coefficient which define the governing differential equation necessarily vary with time. If they are constant, the system is referred to as time invariant if these coefficients vary with time, then the system is referred to as time-varying.

CONCLUSION:

NATURAL FREQUENCY

For the PZT based smart beam The following data are considered for numerical calculations and validation

Table :

Physical properties and dimensions of beam with PZT bonded actuator [12]

Material properties	PZT	Adhesive layer	Host beam
Young's Modulus N/m2	7×10^{10}	3×10^{9}	7×10^{10}
Density Kg/m3	7800	890	7800
Thickness m	0.001	0.0001	0.001
Length m	0.02	0.02	0.2

The above data may represent properties of a piezoceramic and epoxy resin and dimensions of the beam. Normal modes and undamped natural frequencies of the beam can be obtained by solving the eigenvalue problem associated with beam, equation (5.9)

$$K\Psi = \Lambda M\Psi$$

Where K and M are global system matrices that is obtained by assemblage of elemental matrices and imposing the necessary boundary conditions. Using MATLAB's generalized eigenvalue problem solver subroutine "EIG" the normal mode shapes of first twenty orders and corresponding eigenvalues are presented here.

Table 2 :
Natural frequencies and comparison with exact solution Liyong et al (2003) [12]

Mode order	ω (rad/s) Ref [12]	ω (rad/s) with bond Inertia considered	ω (rad/s) bond Inertia not considered
1	90.252	90.7581	90.7576
2	560.264	563.9124	563.9123
3	1553.061	1564.6509	1564.6529
4	3005.712	3031.8868	3031.9070
5	4891.526	4942.5223	4942.6371
6	7164.347	7254.8761	7255.3298
7	9782.125	9924.7142	9926.0220
8	12758.115	12945.6346	12948.3349
9	_____	16382.5689	16386.6535
10	_____	20319.3150	20324.3146
11	_____	24793.4155	24798.9377
12	_____	29802.5031	29808.3927

Results presented here have been calculated at 300 elements, convergence was checked by mesh refinement. The difference between natural frequencies of [12] and present analysis increases on going towards higher order modes. This could be due to the fact that, as the natural frequencies is increasing, considerable amount of coupling between axial and transverse mode is reported in [12] as, they have considered the axial displacement

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Blue Tooth Technology

(A Wireless communication Approach)

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Abstract

The Bluetooth technology is a boon of the present era. It's a part of wireless communication as well as mobile communication.

Bluetooth use low power and generally do not require a license for spectrum use. Bluetooth is a device which is widely used in communication to transmit and to receive the information.

This paper is an attempt to study about Bluetooth, its architecture and the various techniques to improve the quality of service.

INTRODUCTION

BLUETOOTH :

Bluetooth is a wireless LAN technology designed to connect devices of different functions such as telephones, notebooks, computers (desktop and laptop), cameras, printers, coffee makers, and so on. A Bluetooth LAN is an ad hoc network, which means that the network called piconet. A Bluetooth LAN can even be connected to the Internet if one of the gadgets has this capability. A Bluetooth LAN by nature cannot be large. If there are many gadgets that try to connect, there is chaos.

Bluetooth technology has several applications. Peripheral devices of a computer can communicate with the computer through this technology (wireless mouse or keypad). Monitoring devices can communicate with sensor devices in a small health care centre. Home security devices can use this technology to connect different sensors to the main security controller. Conference attendees can synchronize their palmtop computers at a conference.

Bluetooth was originally started as a project by the Ericsson Company. It is named for Harald Blaatand, the king of Denmark (940-981) who united Denmark and Norway. Blaatand translates to Bluetooth in English. Today, Bluetooth technology is the implementation of a protocol defined by the IEEE 802.15 standard. The standard defines a wireless personal- area network (PAN) operable in an area the size of a room or a hall.

Archicture

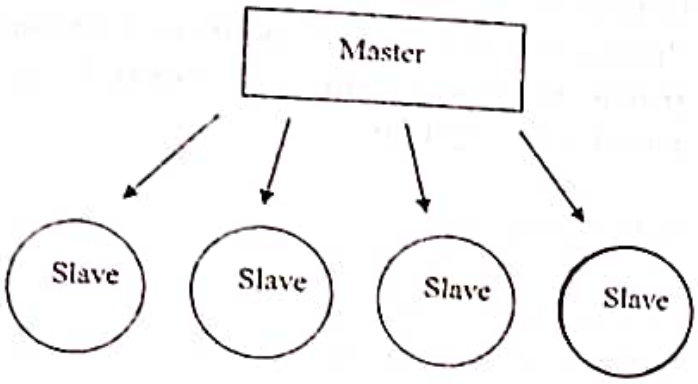
Bluetooth defines two types of networks: piconets and scatternet.

Piconets

A Bluetooth network is called a picinet, or a small net. A piconet can have up to eight stations, one of which is called the master; the rest are called slaves. All the slave stations synchronize their clocks and hopping sequence

with the master slave. Note that a piconet can have only one master station. The communication between the master and the slave can be one - to - one or one - to - many. Figure 1 shows a piconet.

Figure 1 piconet

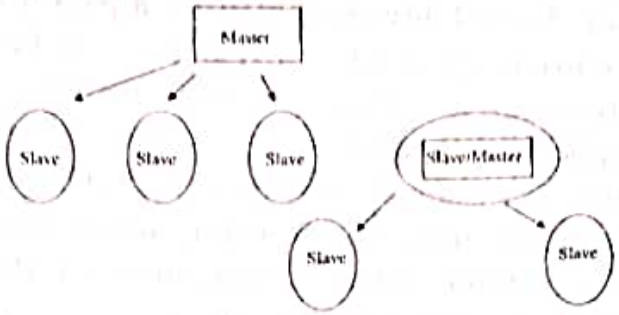


Although a piconet can have a maximum of seven slaves, an additional eight slaves can be in the parked state. A slave in a parked state is synchronized with the master, but cannot take part in communicate until it is moved from the parked state. Because only eight stations can be active in a piconet, activating a station from the parked state means that an active station must go to the parked state.

Scatternet

Piconets can be combined to form what is called a scatternet. A slave station in one piconet can become the master in another piconet. This station can receive messages from the master in the first piconet (as a slave) and, acting as a master, deliver it to slaves in the second piconet. A station can be a member of two piconets. Figure 15.16 illustrates a scatternet.

Figure 2 Scatternet



Bluetooth Devices

A Bluetooth device has a built- in short- range radio transmitter. The current data rate is 1 Mbps with a 2.4-GHz bandwidth. This means that there is a possibility of interference between the IEEE 802.1 1b wireless LANs and Bluetooth LANs.

Quality of Service

Quality of service (QoS) is an internetworking issue that has been discussed more than defined. We can informally define quality of service as some thing a flow seeks to attain.

Flow Characteristics

Traditionally, four types of characteristics are attributed to a flow: reliability, delay, jitter, and bandwidth, as shown in figure 3

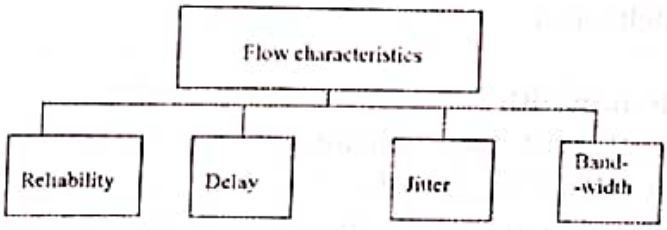


Figure : 3 Flow characteristics

Reliability

Reliability is a characteristic that a flow needs.

Lack if reliability means losing a packet or acknowledgement, which entails retransmission. However, the sensitivity of application program to reliability is not the same. For example, it is more important that electronic mail, file transfer, and Internet access have reliable transmission than telephony or audio conferencing.

Delay

Source-to-destination delay is another flow characteristic. Again application can tolerate delay in different degrees. In this case, telephony, audio conferencing, video conferencing, and remote log-in need minimum delay, while delay in file transfer or email is less important.

Jitter

Jitter is the variation in delay for packers belonging to the same flow. Real time audio and video cannot tolerate high jitter. For example, a real- time video broadcast is useless is there is a 2-ms delay for the first and second packets and a 60-ms delay for the third and fourth. On the other hand, it does not matter if packets carrying information in a file have different delays. The transport layer at the destination waits until all packets arrive before delivery to the application layer.

Bandwidth

Different applications need different bandwidths. In video conferencing we need to send millions of bits per second to refresh a color screen while the total number of bits in an email may not reach even a million.

Flow Classes

Based on the flow characteristics, we can classify flows into groups, with each group having similar levels of characteristics. This categorization is not formal or universal; some protocols such as ATM have defined classes, as we will see later.

TECHNIQUES TO IMPROVE QoS

We discuss some techniques that can be used to improve the quality of service. We briefly discuss four common methods: - scheduling, traffic shaping, admission control, and resource reservation.

Scheduling

Packets from different flows arrive at a switch or router for processing. A good scheduling technique treats the different flows in a fair and appropriate manner. Several scheduling techniques are designed to improve the quality of service. We discuss three of them here: FIFO queuing, priority queuing, and weighted fair queuing.

FIFO Queuing

In first- in, first-out (FIFO) queuing, packets wait in a buffer (queue) until the node (router or switch) is ready to process them. If the average arrival rate is higher than the average processing rate, the queue will fill up and new packets will be discarded. A FIFO queue is familiar to those who have had to wait for a bus at a bus stop. Figure 4 shows a conceptual view of a FIFO queue.

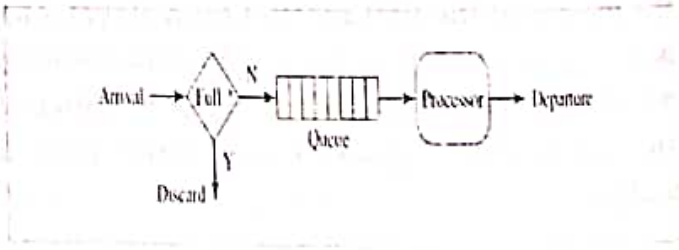


Figure : 4 FIFO queue

Priority Queuing

In priority queuing, packets are first assigned to a priority class. Each priority class has its own queue. The packets in the highest -priority queue are processed first. Packets in the lowest priority queue are processed last. Note that the system does not stop serving a queue until it is empty. Figure 5 shows priority queuing with two priority levels (for simplicity)

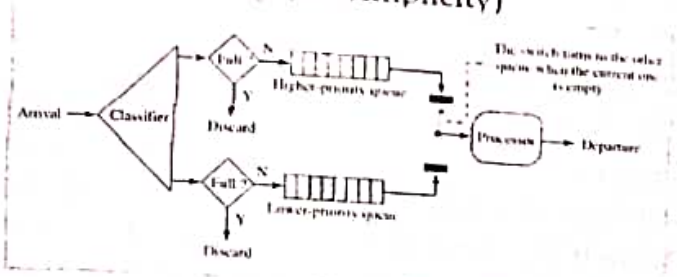


Figure : 5 Priority queuing

A priority queue can provide better QoS than the FIFO queue because higher priority traffic, such as multimedia, can reach the destination with less delay. However, there is a potential drawback. If there is a continuous flow in a high-priority queue, the packets in the lower-priority queues will never have a chance to be processed. This is a condition called starvation.

Weighted Fair Queuing

A better scheduling method is weighted fair queuing. In this technique, the packets are still assigned to different classed and admitted to different queues. The queues, however, are weighted based on the priority of the queues; higher priority means a higher weight. The system processes packets in each queue in a round-robin fashion with the number of packets selected from each queue based on the corresponding weight. For example, if the weights are 3, 2, and 1, there packets are processed from the first queue, two from the second queue, and one from the third queue. If the system does not impose priority on the classes, all weights can be equal. In this way, we have fair queuing with priority. Figure 6shows the techniques with three classes.

Figure 6 Weighted fair queuing

Traffic Shaping

Traffic shaping is a mechanism to control the amount and the rate of the traffic sent to the network. Two techniques can shape traffic: - leaky bucket and token bucket.

Leaky Bucket

If a bucket has a small hole at the bottom, the water leaks from the bucket at a constant rate as long as there is water in the bucket. The rate at which the water leaks does not depend on the rate at which the water is input to the bucket unless the bucket is empty. The input rate can very, but the output rate remains constant. Similarly, in networking, a technique called leaky bucket can smooth out bursty traffic. Bursty chunks are stored in the bucket and sent it at an average rate. Figure 7 shows a leaky bucket and its effects.

In the figure, we assume that the network has committed a bandwidth of 3 Mbps for a host. The use of the leaky bucket shapes the input traffic to make it confirm to this commitment. In the figure the host sends a burst of data at a rate of 12 Mbps for 2s, for a total of 24 megabits

of data. The host is silent for 5s and then sends data at a rate of 2 Mbps for 3 s, for a total of 6 megabits of data. In all, the host has sent 30 megabits of data in 10 s. the leaky bucket smooths the traffic by sending out data at a rate of 3 Mbps during the same 10 s. without the leaky bucket, the beginning burst may have hurt the network by consuming more bandwidth than is set aside for this host. We can also see that the leaky bucket may prevent congestion. As an analogy, consider the freeway during rush hour. If, instead, commuters could stagger their working hors, congestion on our freeways could be avoided.

A simple leaky bucket implementation is sown in figure 7. A FIFO queue holds the packets. If the traffic consists of fixed size packets (e.g. cells in ATM networks) the process removes a fixed number of packets from the queue at each tick of the clock. If the traffic consists of variable length packets, the fixed output rate must be based in the number of bytes or bits.

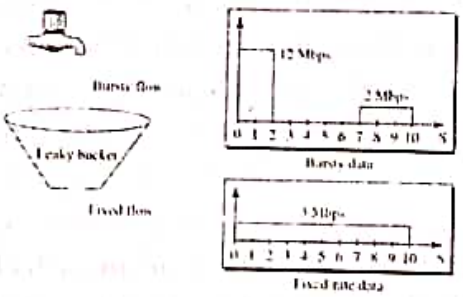


Figure 7 Leaky Bucket

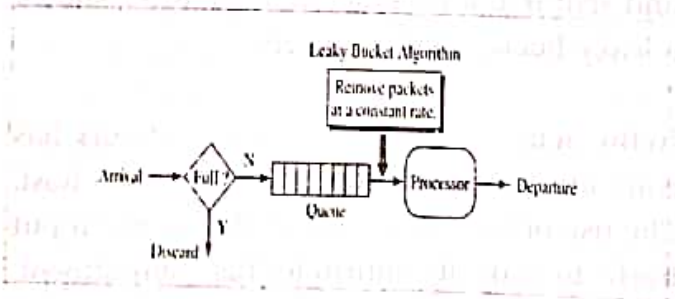


Figure 8 Leaky bucket implementation

The following is an algorithm for variable length packets:

1. Initialize a counter to n at the tick of the clock.
2. If n is greater than the size of the packet, send the packet and decrement the counter by the packet size. Repeat this step until n is smaller tan the packet size.
3. Reset the counter and go to step 1.

Token Bucket

The leaky bucket is very restrictive. It does not credit an idle host. For example, if a host is not sending for a while, its bucket becomes empty. Now if the host has bursty data, the leaky bucket allows only an average rate. The time when the host was idle is not taken into account. On the other hand, the token bucket algorithm allows idle hosts to accumulate credit for the future in the form of tokens. For each tick of the clock, the system sends n tokens to the bucket. The system removes one token for every cell (or byte) of data sent. For example, if n is 100 and the host is idle for 100 ticks, the bucket collects 10,000 cells; or the host takes 1000ticks with 10 cells per tick. In other words. The host can send bursty data as long as the bucket is not empty. Figure 9 shows the idea.

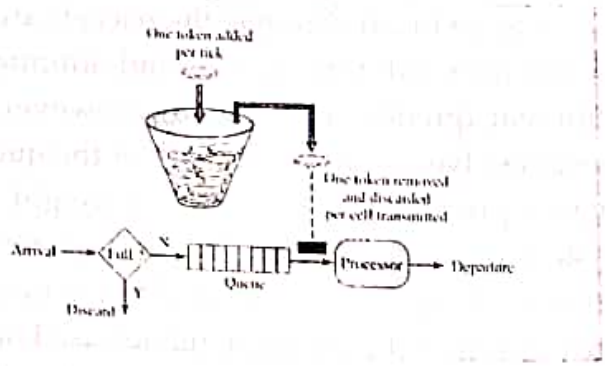


Figure 9 Token Bucket

The token bucket can easily be implemented with a counter. The token is initialized to zero. Each time a token is added, the counter is incremented by I. Each time a unit of data is sent, the counter is decremented by I. when the counter is zero, and the host can not send data.

The token bucket allows bursty traffic at a regulated maximum rate.

Combining token bucket and leaky bucket

The two techniques can be combined to credit an idle host and at the same time regulate the traffic. The leaky bucket is applied after the token bucket, the rate of the leaky bucket needs to be higher than the rate of tokens dropped in the bucket.

Resource Reservation

A flow of data needs resources such as a buffer, bandwidth, CPU time, and so on. The quality of service is improved if these resources are reserved before hand. We discuss in this section one QoS model called integrated services. Which depends heavily on resource reservation to improve the quality of service.

Admission control

Admission control refers to the mechanism used by a router, or a switch, to accept or reject a flow based on predefined parameters called flow specifications. Before a router accepts a flow for processing, it checks the flow specifications to see if its capacity (in terms of bandwidth, buffer size, CPU speed etc.) and its previous commitments to other flows can handle the new flow.

Conclusion

Although the Bluetooth have lots of advantages with very wide features discussed above, but with various limitations such as range of service is limited around 10 mts. There is further scope of study and research to overcome such limitations in future for practical purposes. Later on Bluetooth technology will take place of LAN as well as PAN.

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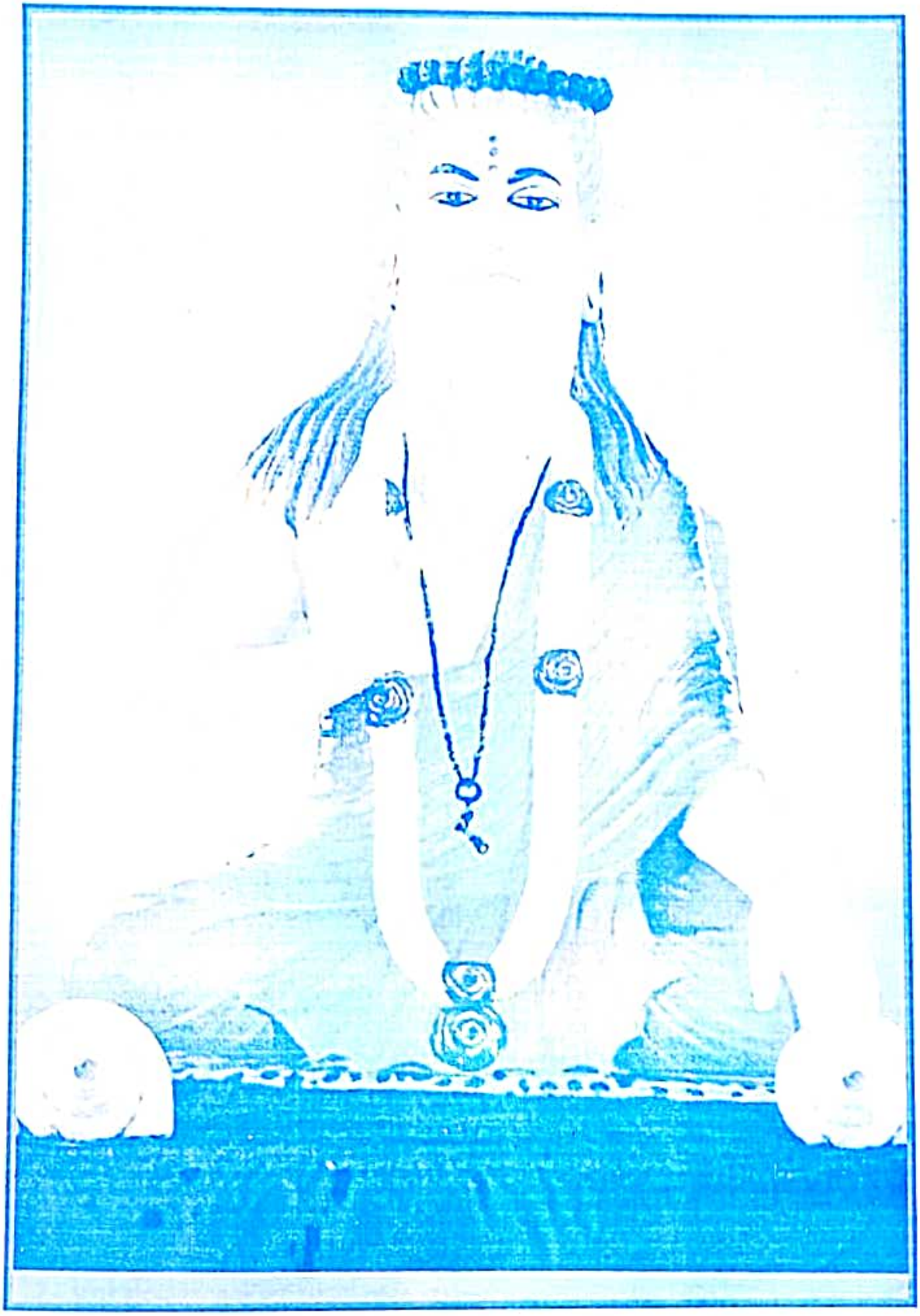

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