JNANAVARDHANA SERIES - 9

REPORT

BMS Institute of Technology and Management

(Affiliated to Visvesvaraya Technological University, Belgaum)
Avalahalli, Doddaballapur Main Road, Yelahanka

JNANAVARDHAN SERIES - 9

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Co-ordinator: Dr. Sanjay Lakshminarayanan

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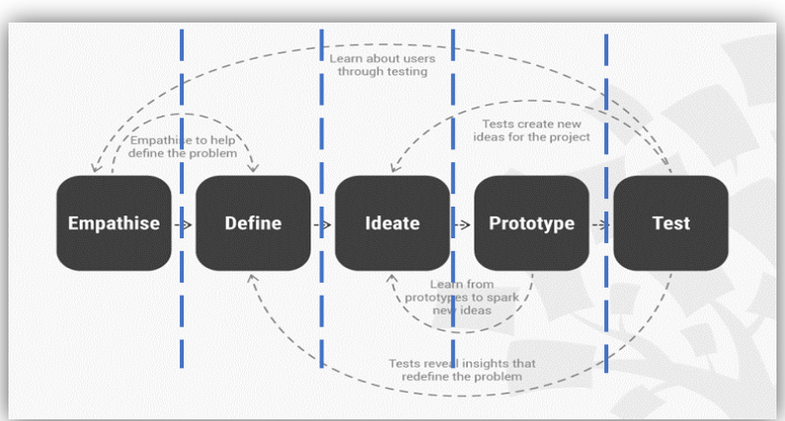
Human Factors in Design

Dr. Mohan Babu G.N.
Principal, BMSIT&M

Commonly, we see an Engineering System/product as set of interacting subsystems/components/parts that make up the whole for achieving specific purpose(s). Not all Engineering systems need to involve human beings as a part contributing to their purposes. But whenever there is one, human being should be the central in its DESIGN, for example, bicycle, house, Kitchen grinder, ATM, sofa, etc., will convince us of the centrality of humans while designing products. When such systems/subsystems are designed we need to constantly keep the users'/human capabilities in mind. It is important for the reasons of safety, efficiency, effectiveness, reliability, ease of use and maintenance, cost implications and emotional comfort relating to the system and its use by humans.

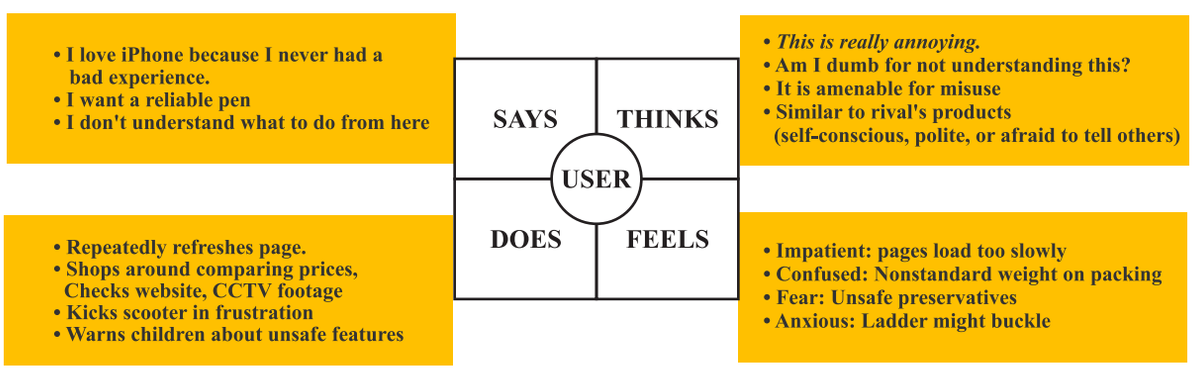
A system, to function satisfactorily, requires certain levels of sensory, physical, mental and emotional capabilities in its users. Just to revisit, (i) our sensory inputs include visual, auditory, olfactory, gustatory and tactile inputs, (ii) physical capabilities, eg. anthropometric measurements, muscular capacity, endurance, etc.), (iii) mental capabilities include reasoning, judgement, speed of information processing, concentration, intelligence, etc., (iv) emotional capacities include excitement, confidence, consistency, etc. As each individual user/human being is different in each of these capacities, it is unfair to expect him/her to adapt and be compatible with the rest of the system. Further, how much control a designer has at all on these capabilities of the User? Hardly any. Hence, designing a system around human being's sensory, physical, mental and emotional capacities is important. The purpose is to give the user the best possible experience. This is an important component of DESIGN THINKING. Here, users' emotions and feelings are given due consideration.

Design Thinking, which has human factors at its core, is an iterative and non-linear Process. For the sake of clarity in understanding we can see five important stages in this process namely, (i) Empathizing with users (ii) Defining their problem (iii) Ideation or solution development (iv) Prototyping the solution and (v) Testing it for efficacy, as shown in the figure below. It should be remembered that that the designer often loops back to earlier stages when in need of improving his work. Also, often the stages need not be sequential.



Design Engineering seeks to observe and understand the user, empathise with him/her, challenge assumptions, and redefine problem to identify alternative solutions that might not be instantly apparent, freewheel to generate as many solutions as possible, evaluate them for realizability and feasibility, and construct prototype of the product and then test it to ensure it meets all the stated objectives. Let us quickly breeze through each of these stages.

I. **Empathize with the users' problem**: For instance, as a designer, you would empathise with, (i) aged persons struggling to self-administer tablets, (ii) remote villages needing lighting (mass lighting), (iii) a farmer facing crop loss due to mice.
Designers can understand the users and the problems they face through: (i) interviewing users (eg. ERP systems, RO water purifiers, Teaching aids), (ii) taking a journey with the user (eg. Accompanying a mobile vegetable seller to design his cart), (iii) listening to user stories (eg. Stories of persons experiencing cervical spondylitis, depression, etc.), (iv) getting into their role (eg. Ploughing in the field like a farmer), (v) observing how users interact with product/service (eg. luggage, apps, etc.), (vi) studying the usage environment (eg. tyre on rough roads, visibility of a railway signal, etc.), etc. The design team continuously uses results of such enquiries to review, question and improve up on their initial assumptions, understanding and results. Other approaches include creating empathy maps (figure below) to map what users Say, Think, Do and Feel which helps to profile the users as closely as possible.



This stage deals with subjective concepts such as emotions, needs, motivations, and drivers of behaviours, apart from identifying the functional requirements (rational/analytical) of the user.

I. Define Your Users' Needs: Here designers organize and analyse the research information to produce a concise problem statement called Preliminary Need Statement (PNS). They may revisit this statement for appropriate revisions in later stages. The focus of the PNS should be on functional requirement that solves the problem instead of a specific means of a solving it. It should be generic enough to widen the solution space and narrow enough not to lose focus on the real issue. For instance, when the problem is 'Declining sales' of Lawn mower of a company, the PNS initially defined by the company was 'Design a new lawn mower that would be the most popular product in the market'. However, a better PNS was the Design a lawn mower to maintain the lawn most effectively and efficiently. The new PNS permitted an engineer during a brainstorming session to suggest that a spinning cord, like that of a yo-yo swung by a child could be used to cut grass. Otherwise, the company would have focused on improving the same technology underlying the present lawn mower.

Ideate New Solutions by Dismantling Patterns and Challenging Assumptions: Designers should think of a wide variety of possible solutions. Designers use a variety of ideation techniques to

I. generate plausible solutions. Brainstorming is one popular of them. Rules of brainstorming do not allow any criticism of the ideas suggested during the brainstorming session, but encourage building on each other's ideas. Essentially, in this stage designers churn out huge quantity of ideas regardless of their practicality. In other words, creativity of individuals is unleashed. It is very important to be aware of the persisting mental rut, and attempts should be done to overcome it. There will always be a tendency among the brain-stormers to unknowingly hinder the creative effort by thinking that an idea suggested (i) can't be done (eg. heating water in paper box, cutting wood with paper), (ii) costs very much (eg. GE's ultrasound scanner, Juggad equipments), (iii) others have already failed trying it (iv) rules don't permit it, etc.

Prototype to Start Creating Solutions: A designer has to screen the ideas generated in large number (during say, a brainstorming session) into a few workable, most promising ones that will solve users' problems. Such shortlisted few can be developed into a physical reality and the designer can slowly add greater details to them. For screening purposes, designers use some very important criteria namely, the idea's physical realizability, economic feasibility, financial viability and utility to users. The ideas are scrutinized for their physical realizability given the available technology, resources, skills, constraints, etc. The most realizable ones are later compared with respect to their economic feasibility, financial viability and utility to users. The best ideas that well meet the expectations of users are further developed. More and more details/features added for making the selected idea(s) good for functioning, manufacturing, assembly, shipping, use and maintenance, etc. The designers also work on the compatibility of the new system/product/subsystem with the existing ecosystem, processes and skills. The product thus evolved is further refined for use of optimum resources.

I. **Test Solutions:** This stage involves putting the prototypes in the hands of the user or group of users and determining whether the product/system can solve the problem and reduce frustration of the users. The designer tests the product/service on all metrics that are perceived as important by the user. Every opportunity to improve the system/solution, may be based on the users' inputs, reactions and criticisms, etc. is should be ceased by the designer. This may require the designers to shuttle between the stages iteratively.

The stages discussed above do not have to follow any specific order and can often occur in parallel and repeat iteratively. In other words, designers revisit the earlier stages in an effort to improve the product/system continuously. We should remember that the idea behind Design Thinking is to keep the user, his/her safety, convenience, comfort, affordability, etc. in mind from beginning to end, and giving due consideration to his/her emotional comfort while owning/installing/using/maintaining/disposing the system.

–ooOoo–

Title: Software Defined Radio And Its Applications - AUTHOR: DR. AMBIKA R, PROF. AND HOD, ECE

Dr. Ambika R Prof. and HoD, ECE

Introduction

From the first wireless transmissions around 1890, radio transmission techniques have continually radio era came first, in the mid-1930, at a time when limited band widths were used for analog voice communications. Then, came the golden era of broadcast transmission in the 50s with analog television broadcasts that consumed more bandwidth but provided a rich customer experience. As computers became smaller and more powerful, reaching the 60s, they began to be useful as a communication media for long distances, using both wired connectivity via ARPANET (which became later the Internet) and wireless satellite ALOHANET.

Cell phones also emerged around this time, allowing users to establish wireless voice communications from any public place or vehicle. Many modern phones are now almost portable computers, providing access to both cellular networks and the Internet, and achieving wireless communications at speeds that were unimaginable a generation ago. Despite the growth achieved by multiple technologies, an interesting and potentially problematic issue common to all mentioned devices is that their radios and protocols are mostly hardware based. Reprogramming or reconfiguration options are minimal, at least regarding radio functions. If an error occurs in the hardware, firmware, or software, no reasonable way to correct the problem: the built-in vulnerabilities are not easy to remove. These devices are commonly limited in their functionality to the hardware components and cannot be reconfigured to perform other wireless protocols beyond what the hardware itself provides. Various mobile communication standards will continue to exist even in the future. It is important to develop a handheld terminal that can be used as a multimode transceiver.

The Software Defined Radio aims to provide a solution to many of the problems described along with many other benefits. Software defined radio (SDR) has the flexibility to be a multi-standard connection with replacement of the application program, such as modem, equalizer, channel codec, synchronization, and so on. The Software Defined Radio (SDR) is a design model for wireless communication devices. Its creator - Joseph Mitola, defined the term in the early 90s as an identifier of a class of radios that could be reprogrammed and reconfigured through software. Mitola envisioned an ideal Software Defined Radio, whose physical components were only an antenna and an Analog to Digital Converter (ADC) on the receiver side.

Digital to Analog Converter (DAC) and a transmitting antenna on the transmitter side. The rest of the functions would be handled by reprogrammable processors.SDR has evolved, like most technologies, from military to civilian environments. The first operational SDR: SpeakEasy - developed by the United States' Navy between 1991 and 1995.

A government program with the following goals:

To develop a radio that could function anywhere between 2 MHz and 2 GHz

To be able to communicate with the radios used by ground forces as well as air force and naval radios in addition to satellites to develop a new signal format.

Unfortunately, the application could not be used with other than the hardware for which it was conceived as cryptography engine (security purpose) could not keep up well enough to maintain several connections at once

One more negative issue - the device fully occupied the backside of a transport vehicle.

Improved version of Speakeasy is Speakeasy II.

This achieved much greater success - due to advances in electronics, wireless communication circuits, and reusable and modular programming techniques.

Multimode SDR hardware should consist of a reconfigurable baseband digital signal processor (DSP) or field programmable gate array (FPGA) and a broadband analog radio frequency.

Definitions of SDR: Software-defined **radio** (**SDR**) is a **radio** communication system where components that have been traditionally implemented in hardware (e.g. mixers, filters, amplifiers, modulators/demodulators, detectors, etc.) are instead implemented by means **of software** on a personal computer or embedded system.

Software-Defined Radio (SDR) refers to the technology wherein software modules running on a generic hardware platform -consists of DSPs and general purpose microprocessors to implement radio functions - generation of transmitted signal (modulation) at transmitter and tuning/detection of received radio signal (demodulation) at receiver.

Software Defined Radio(SDR) is a wireless communication device in which all the signal processing is implemented in software.

SDR defines a collection of hardware and software technologies where some or all of the radio's operating functions(also referred to as physical layer processing) are implemented through modifiable software or firmware operating on programmable processing technologies (FPGA,DSP, PSoC).

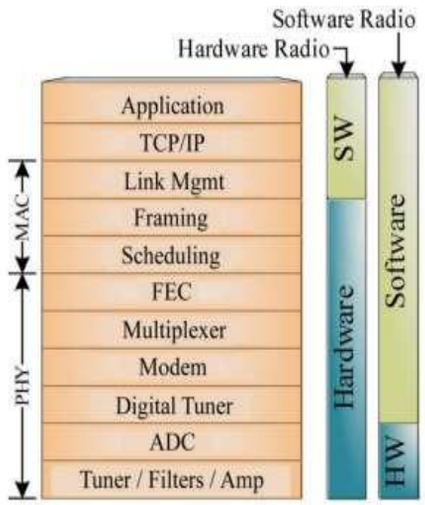


Figure 1. HW Radio and SW Radio.

Five Tiers of SDR technology

- Tier 0 – Pure hardware radios
- Tier 1 – Software controlled radios
- Tier 2 - modulation methods, band selection between wide or narrow, security mechanisms and controls - all handled by software
- Tier 3 – fully programmable radios.
- Tier 4 - radios are the absolute model of perfection, and they exist only on paper for comparison. These radios are capable of anything a user can imagine, from storing money transfer information on smart cards, to receiving satellite transmissions in real time.

Advantages of SDR

software-defined radios are flexible enough to avoid the "limited spectrum" assumptions.

Spread spectrum

- and ultrawideband techniques allow several transmitters to transmit in the same place on the same frequency with very little interference., typically combined with one or more error detection and correction techniques to fix all the errors caused by that interference.

Software defined antennas

- adaptively "lock onto" a directional signal, so that receivers can better reject interference from other directions, allowing it to detect fainter transmissions.

Applications of SDR

The concept of unified platform and the ability to correct errors in real time - are the classic applications of SDR.

SDR is also used in Dynamic Spectrum Positioning, Opportunity Driven Multiple Access (ODMA), Spectrum Regulation and Cost Reduction, GPS signals Reception, HF Propagation Analysis, Interpretation of Cellular Technology Emissions particularly the OFDM modulation, and the Identification of Radio Frequency Emissions.

Potential applications are:

Prototypes development, microscopic investigations to find the strength of the magnetic resonance, aviation tests, evaluation of multi-path communications, broadcast transmissions in multi-media mobile environments, cooperative wireless networks diversity, quantum optical communications and particularly in cognitive radio research.

–ooOoo–

Title: Quality In Software As A Medical Device (samd)

AUTHOR: Anil G.N. , Professor, HoD CSE

In this presentation, we will talk about,

- the evolution and history of Quality right from the industrial revolution to date
- the difference phases of Software development lifecycle,
- concept of quality itself
- **a**nd applying quality metrics to a software product, here SOFTWARE AS A MEDICAL DEVICE (SaMD)

Quality can be defined as "fitness for use," "customer satisfaction," "doing things right the first time," or "zero defects." These definitions are acceptable because **quality** can refer to degrees of excellence. To be able to launch sustainable and products that meet customer needs loops quality of the product from the very beginning of the development. This brings us to the development stages of the product which include :

1. Requirements analysis
2. Design
3. Development
4. Testing
5. Maintenance

During the testing phase is when the product is verified and validated. Verification is done to check if the product is functioning as intended and validation is done to check the efficiency of the product.

A very crude example: digital BP machine, verification includes software testing, physical testing under or in lab conditions and validation includes clinical trials to measure the efficiency of this device.

Moving forward once the clinical trials all results are well suited, launching into the market. This includes regulatory approvals from various bodies for different countries. The classification of these products as low, medium and high risk is the first step for seeking approval. This determines the path that needs to be taken for certification and also talks about the impact of the device in case of an adverse event. FDA and CE are the most common bodies heard by all. To be accepted by a regulatory submission, the company must prove that it's development process was according to good manufacturing or good documentation practices or good coding practices, this introduces the concept of Quality management system for a company. The first question would be 'Is your company ISO certified?' . This takes us to ISO 13485 QMS for medical devices. As part of QMS itself software quality is captured and this term is defined differently for different products/organisations. For some it could be customer exported bugs must be 0, for some others it could be ease of device compared to another method must be easier etc.

–ooOoo–

Title: Linear Algebra In Machine Learning

AUTHOR: Dr. ANNAMMA ABRAHAM, Professor, Mathematics

Linear Algebra in Machine Learning

Linear algebra is a sub-field of mathematics concerned with vectors, matrices, and linear transforms. Machine learning is a set of powerful mathematical tools that enable us, to represent, interpret, and control the complex world around us. Linear Algebra is a key foundation to the field of machine learning, from notations used to describe the operation of algorithms to the implementation of algorithms in code. Although linear algebra is integral to the field of machine learning, the tight relationship is often left unexplained or explained using abstract concepts such as vector spaces or specific matrix operations.

Linear Regression

Linear regression is an old method from statistics for describing the relationships between variables. It is often used in machine learning for predicting numerical values in simpler regression problems. There are many ways to describe and solve the linear regression problem, i.e. finding a set of coefficients that when multiplied by each of the input variables and added together results in the best prediction of the output variable. The most common way of solving linear regression is via a least squares optimization that is solved using matrix factorization methods.

Recommender Systems

Predictive modelling problems that involve the recommendation of products are called recommender systems, a sub-field of machine learning. Examples include the recommendation of books based on previous purchases and purchases by customers on Amazon, and the recommendation of movies and TV shows to watch based on viewing history of subscribers on Netflix. The development of recommender systems is primarily concerned with linear algebra methods. A simple example is in the calculation of the similarity between sparse customer behaviour vectors using distance measures such as Euclidean distance or dot products. Matrix factorization methods like the singular-value decomposition are used widely in recommender systems to distill items and user data to their essence for querying and searching and comparison. Matrix factorization is a class of collaborative filtering algorithms used in recommender systems. Matrix factorization algorithms work by decomposing the user-item interaction matrix into the product of two lower dimensionality rectangular matrices. This family of methods became widely known during the Netflix prize challenge due to its effectiveness as reported by Simon Funk in his 2006 blog post, where he shared his findings with the research community. The prediction results can be improved by assigning different regularization weights to the latent factors based on items' popularity and users' activeness.

–ooOoo–

BMS Institute of Technology & Management

30.09.2020

Title: Linear Algebra In Machine Learning

Author: Dr. Aparna K, Associate Professor & HoD, Dept. of MCA

Data security refers to the process of protecting data from unauthorized access and data corruption throughout its lifecycle. Data security includes data encryption, hashing, tokenization, and key management practices that protect data across all applications and platforms.

The Dictionary Definition of "to redact" is to censor or to hide (part of a text) for legal or security purposes. To redact is to edit, or prepare for publishing. Frequently, a redacted document, such as a memo or e-mail message, has simply had personal (or possibly actionable) information deleted or blacked out; as a consequence, redacted is often used to describe documents from which sensitive information has been expunged.

Types of Data Redaction

Full redaction. You redact all of the contents of the column data. The redacted value returned to the querying application user depends on the data type of the column. For example, columns of the NUMBER data type are redacted with a zero (0), and character data types are redacted with a single space.

Partial redaction. You redact a portion of the column data. For example, you can redact a Social Security number with asterisks (*), except for the last 4 digits.

Regular expressions. You can use regular expressions to look for patterns of data to redact. For example, you can use regular expressions to redact email addresses, which can have varying character lengths. It is designed for use with character data only.

Random redaction. The redacted data presented to the querying application user appears as randomly generated values each time it is displayed, depending on the data type of the column.

No redaction. The None redaction type option enables you to test the internal operation of your redaction policies, with no effect on the results of queries against tables with policies defined on them. You can use this option to test the redaction policy definitions before applying them to a production environment.

Benefits of using Data Redaction

- Different styles of redaction from which to choose.
- Because the data is redacted at runtime, Data Redaction is well suited to environments in which data is constantly changing.
- It is possible to create the Data Redaction policies in one central location and easily manage them from there.
- The Data Redaction policies enable you to create a wide variety of function conditions based on SYS_CONTEXT values, which can be used at runtime to decide when the Data
- Redaction policies will apply to the results of the application user's query.

Using Oracle Data Redaction with Database Applications

Oracle Data Redaction protects sensitive data that is displayed in database applications. Data Redaction is transparent to application users because it preserves the original data type and (optionally) the formatting. It is highly transparent to the database because the data remains the same in buffers, caches, and storage—only being changed at the last minute just before SQL query results are returned to the caller. The redaction is enforced consistently across all of the applications that use the same underlying database. We can specify which application users should see only redacted data by checking application user information that is passed into the database through the SYS_CONTEXT function; we can redact data based on attributes of the current database or application user; and we can implement multiple logical conditions within a given redaction policy. In addition, Data Redaction is implemented in a way that minimizes performance overhead. These characteristics make Oracle Data Redaction particularly well suited for usage by a range of applications, analytics tools, reporting tools, and monitoring tools that share common production databases. Although its primary target is redaction of production data for applications, Oracle Data Redaction also can be used in combination with Oracle Enterprise Manager Data Masking and Subsetting Pack for protecting sensitive data in testing and development environments.

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Title: Blockchain | Smart Contracts/chain Codes For Industry/business/ Other Applications

Author: Dr.Arun kumar B.R, Professor, MCA

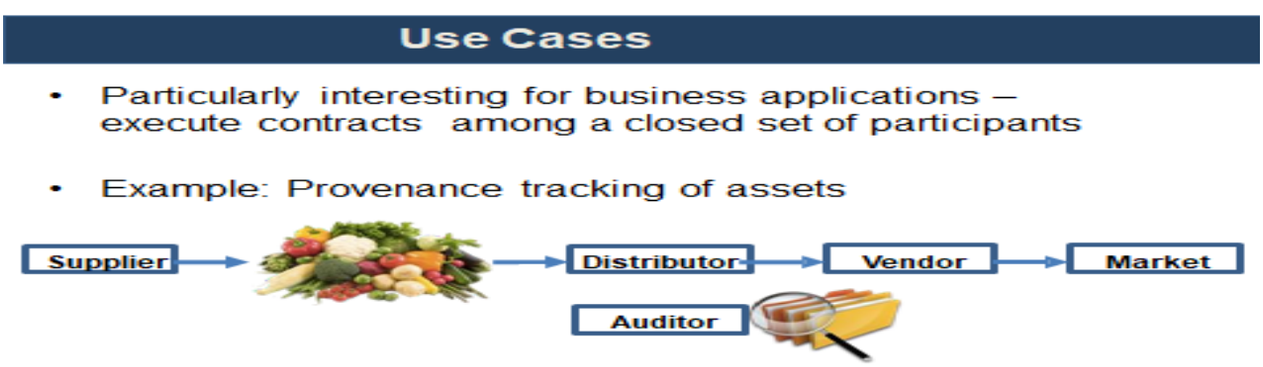
A Smart Contract (or cryptocontract) is a computer program that directly and automatically controls the transfer of digital assets between the parties under certain conditions. A smart contract works in the same way as a traditional contract while also automatically enforcing the contract. Smart contracts are programs that execute exactly as they are set up (coded, programmed) by their creators. Just like a traditional contract is enforceable by law, smart contracts are enforceable by code.

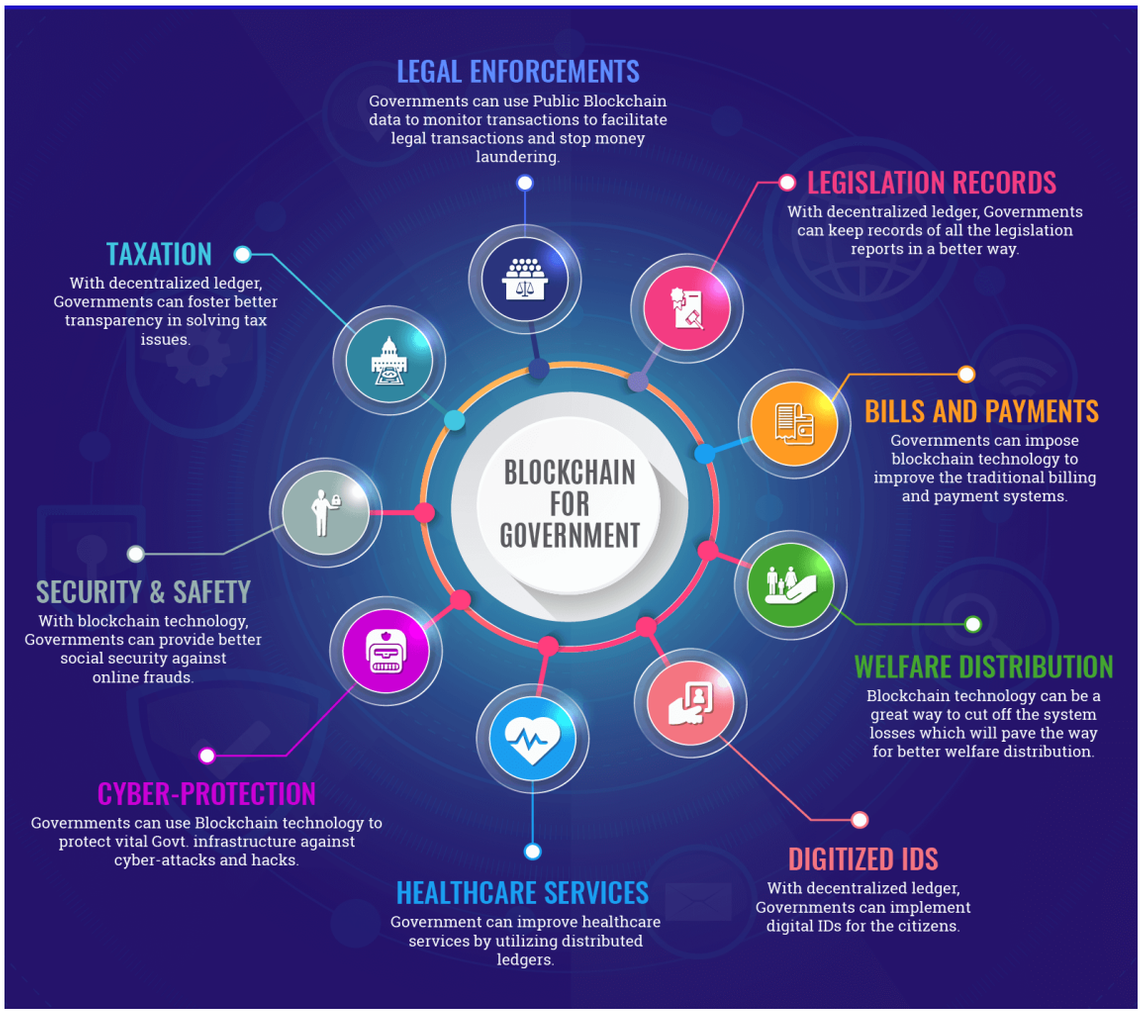
History/Introduction

In 1994, Nick Szabo, a legal scholar, and a cryptographer, recognized the application of decentralized ledger for smart contracts. He theorized that these contracts could be written in code which can be stored and replicated on the system and supervised by the network of computers that constitute the blockchain. These smart contracts could also help in transferring of digital assets between the parties under certain conditions.

How smart contracts work

A smart contract is just a digital contract with the security coding of the blockchain. A smart contract has details and permissions written in code that require an exact sequence of events to take place to trigger the agreement of the terms mentioned in the smart contract. It can also include the time constraints that can introduce deadlines in the contract.





The HF architecture offered CC trust with respect to both BC application and orders have handled the misbehaving nodes. The SC (CC) that have confidentiality requirements with respect to the transaction content and updates are found supported by HF. Ordering services implemented to allow pluggable consensus using Hyper-ledger. The SC is implemented by taking care of logical errors as well as legal aspects as applicable to the business. The HF could eliminate the hurdles of the public networks and centralized traditional database problems where transactions/data sharing is unsecured, time-consuming and uncontrollable. The B2B Hyper-ledger block chain-code manages the supply chain efficiently ensuring the transactions as per the contacts with all the advantages of the block-chain.

- The preliminary testing of the system shows that Hyper-ledger CC have established trust among the stakeholders of the supply chain by offering transaction transparency, traceability, and more agility. The techniques of cryptography, consensus algorithms coupled with smart contract implementation have contributed to implementing security, transparency, privacy, and enhancing trust.

For the considered scenario of 4 organization with multiple channels scalability of transactions was excellent. However, the same may be tested on the large scale in the future work. Further, the performance of SC can be evaluated under exceptional conditions in complex supply chain management

- This work addressed legal aspects of SC while implementing the agreement as applicable to the parties involved in the business using software layer without involvement of human element. However legal validity of the SC itself is debatable and jurisdiction dependent which is not focused in this work. Legal and regulatory aspects across the jurisdictions are to be addressed since the TL happens at cross borders.

- Further , SC implementation at the various jurisdiction levels needs to be investigated as illegal activities like smuggling, hacking and terrorist could be conducted leveraging the SC mavens such as self-execution and anonymity of smart contracts. The future work includes analysing the performance by adopting the metrics namely transaction throughput, modular consensus, ability to curb known attacks If implemented by addressing all the issues from different dimensions/perspective as mentioned can bring radical changes in business/trades at national/international scenarios. The BC has got the huge potential to create new opportunities and innovate applications that are significantly contributing to transforming the Society.

Thank You
For Your Attention

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Blockchain | Smart Contracts/chain codes for Industry/business/ other Applications

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How smart contracts work –

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The speaker will dwell on

Applications, conclusions and references

–ooOoo–

Title: Artificial Intelligence & Iot: A Covid 19 Perspective

AUTHOR: Dr.Bharathi. Malakreddy A, Professor, AI&ML, BMSIT &

"Optimism is the faith that leads to achievement. Nothing can be done without hope and confidence and technology "

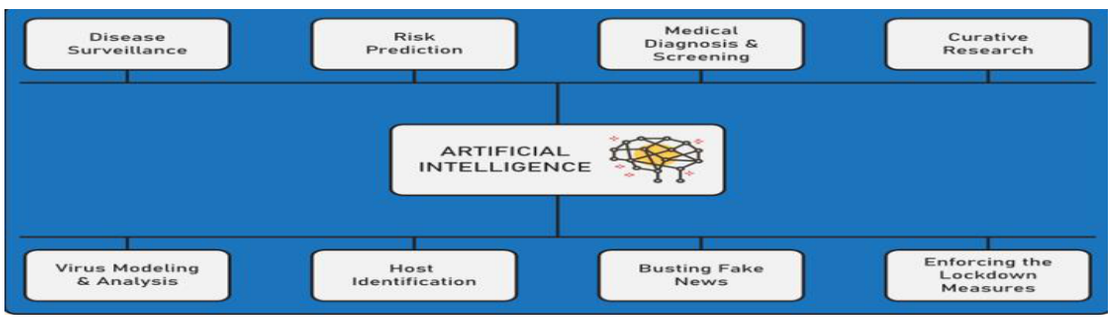
The unprecedented outbreak of the 2019 novel coronavirus, termed as COVID-19 by the World Health Organization (WHO), has placed numerous governments around the world in a precarious position. The scarcity of resources to endure the COVID-19 outbreak combined with the fear of overburdened healthcare systems had forced a majority of these countries into a state of partial or complete lockdown.. Adding to these woes, numerous false reports, misinformation, and unsolicited fears in regards to coronavirus, are being circulated regularly since the outbreak of the COVID-19.

As the novel coronavirus continues its onslaught across the globe, the world is reeling under the weight of crashing economies and piling casualties. Unfortunately, billions of people are still under a constant threat of infection, with the situation not likely to get any better in the coming days. However, a multitude of technological approaches are emerging to deal with the impacts of the COVID-19 pandemic. Among them, digital technologies, including IoT, AI, blockchain, and next-generation telecommunication networks like 5G, have been at the forefront . According to the WHO and the CDC, digital technologies can play an essential role in improving public health response to the COVID-19 pandemic.

EMERGING TECHNOLOGIES • IoT,IoMT • Drones • AI • Blockchain Tech • 5G Networks	**IoT & IoTM** • IoT in Healthcare • Smart Thermometers • IoT Buttons Telemedicine	**Drones** • Crowd Survelliance • Disinfecting Areas • Thermal Imaging • Making Deliveries
Wearables • Measuring Respiratory Rates • Contact Tracking	**Mobile Apps** • Blue tooth Based • GPS based Privacy Concerns	**AI** • Machine Learning • Deep Learning • Computer Vision Challenges
Block chain • Increased Testing • Tracking and Monitoring Patients • Distributed Database	**5G Networks** • Telemedicine • Thermal Imaging Challenges	**Conclusion**

Set up process chart for executing of the teachnologies for fighting of COVID 19 is as below in the figure below.

Predicting the risk of getting infected. Predicting the risk of developing severe symptoms once infected. Predicting the risk of using a specific line of treatment on an infected person Factors include age, travel history, hygiene habits, current health status, pre-existing health conditions, and family medical history .AI capabilities can also be used to determine the probability of survival and the requirement of ICU treatment for COVID-19 patients. Machine learning algorithms, used to correlate the patient's data parameters with a specific drug's usage. Such correlations can be used to predict the effect of the drug. Pre-emptive knowledge of these factors can enable the doctors and medical suppliers to be better prepared for the consequences



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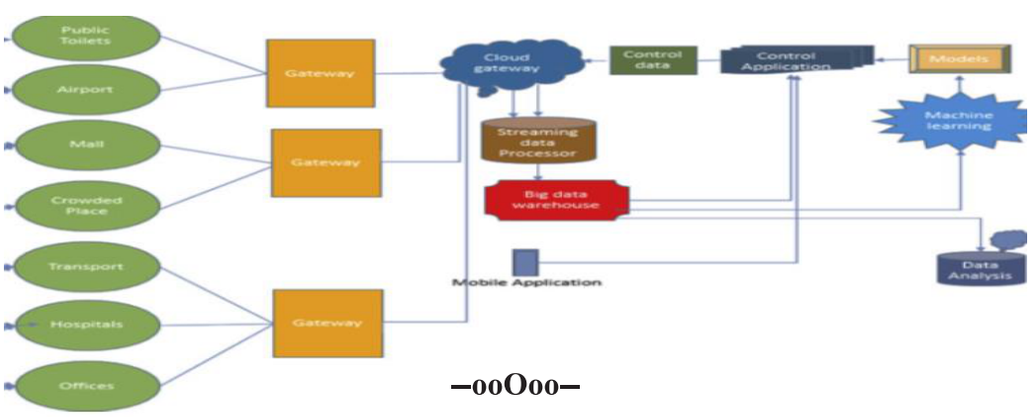

–ooOoo–

Title: Science and Tradition

Author: Chethan A S, Professor and HOD, Mathematics

Current advancement in technology and rising workload is often accompanied by stress. As a result of a few physical factors in certain occupational actions, the psychosomatic complication termed psychological stress occurs. Promoting the quality of our mind together with our material standard of living is essential to improve our quality of life.

To deal with the increasing stress of modern standard of living, Humanity is progressively turning in the direction of different meditative practices. People have been heading to attain peace of mind, since they are not able to locate calmness in the external world.

Modern psychotherapists have begun to discover various therapeutic benefits of meditation practices. Meditation induces the state of relaxation and the altered state of consciousness.

For psychological stress, Speech signal is uttered to be a considerable indicator. The speech signal expresses the information enclosed in the vocal word. Mantra is intrinsically related to sound and sound is reverberating in everything in this universe. A Mantra is a sound repeated over and over until it integrates into our consciousness. The talk gives an insight to various analysis that have been carried out to understand the importance of our traditional mantra.

–ooOoo–

Ttle: Fabrication Of Room Temperature Nano-perovskite-induced Highly Sensitive, Stable Humidity Sensors And Its Applications

AUTHOR: Dhananjaya N, Associate Professor, HOD Physics

Sometimes, after rains, the air feels moist. The water vapor seems to have suspended in the air. Moisture forms up in the air, resulting in humidity. A humidity sensor (or hygrometer) is a device that detects and measures water vapor in the atmosphere or in a gas. Humidity can be measured in various ways and the corresponding units are based on the measurement technique used. The most commonly used units are: Absolute Humidity (AB), Relative Humidity (RH) and Specific Humidity (SH). Absolute humidity is defined as the mass of water vapor per unit volume of dry air. The ratio of moisture in the air to the highest amount of moisture at a particular air temperature is called relative humidity. Relative humidity becomes an important factor when looking for comfort. The specific humidity is the ratio of the water vapor in the atmosphere to the air content on a mass basis.

In the present research work, the enhanced room temperature operable humidity sensing response of nano-perovskite based humidity sensors synthesized by solution combustion method using bio-degradable sucrose ($C_{12}H_{22}O_{11}$) as fuel is been discussed. The nano-perovskite humidity sensor prepared by the solution combustion process exhibits a significant increase in humidity sensing compared with bulk perovskite. Structural analysis are carried out by many analytical methods like X-ray diffraction (XRD), scanning electron microscopy (SEM), fourier transform infrared (FTIR) spectroscopy, transmission electron microscopy (TEM) images. The perovskite compound used for the fabrication of humidity sensor has shown a maximum sensing response of 92 % in the relative humidity (RH) range 11%–97%. The response time for the compound was found to be 40 s and 60 s and stability was tested for 3 months. The mechanism of humidity sensing is schematically represented using discussed using physisorption, chemisorption and capillary condensation. The fabricated perovskite humidity sensor shows good practical applications in sensitive environments and cost-effective functional devices that require high sensing performances.

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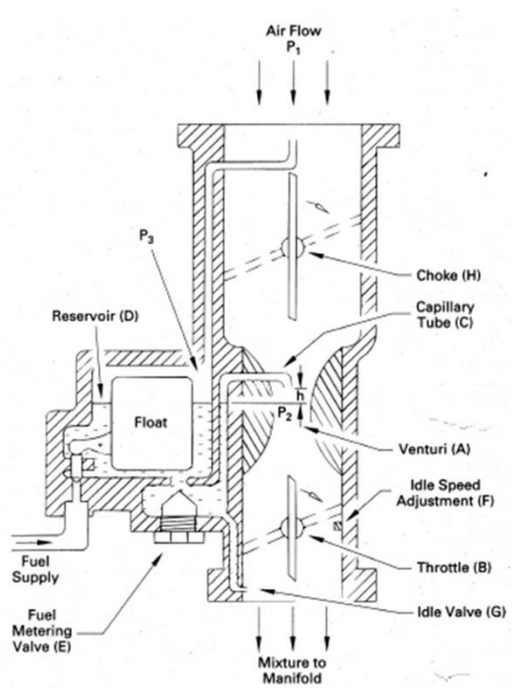
Title: Fuel Efficient Automobiles

AUTHOR: Dr. H K Govindaraju, Professor, Vice Principal

Indian automobile industries are working on developing the fuel efficient automobiles. These automobiles are environment friendly and generates more power when compared with 1990 generation automobiles. This presentation concentrates on new emission norms of automobiles and comparison of older generation automobiles with new generation fuel efficient automobiles.

Carburettor is a devise used to supply fuel and air in different proportions. The carburettor with idle circuit, choke, power and acceleration circuit is shown is fig.
These carburettors will supply the fuel different proportions, which varies from rich mixture to lean mixture.



In carburettor assisted engines fuel burning is not complete. The emissions are more in these engines. It is not possible to make a clear combustion, hence emissions are very high. In Bharath stage emission stage norms are not possible to meet form these engines.

For meeting the Bharath stage IV emission standards the new generation engines are developed these engines are fuel efficient engines, as follows.
Bharat Emission Standards':

- These are the standards set up by the Indian government which specify the amount of air pollutants from internal combustion engines, including those that vehicles can emit.
- Emission Standards have been instituted by the Central Pollution Control Board (CPCB), instituted within the Ministry of Environment Forests and Climate Change. Vehicle emission norms were introduced in India in 1991 for petrol and in 1992 for diesel vehicles.
- Bharat stage III norms have been enforced across India since October 2010.
- Bharat stage IV norms are in place since April 2010. Bharat stage IV is proposed to be enforced throughout India by April 2017. It has already been put into use in 13 major cities.
- Upgrading the emission norms requires the manufacturing companies to upgrade their technology, which in turn increases the cost of the vehicle. Cost is one of the main reasons for the slow upgrade of emission standards.
- Fuels also play a crucial role in meeting these emission norms

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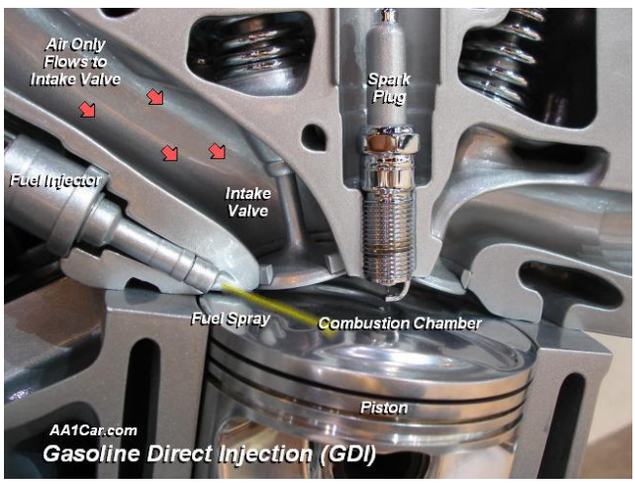
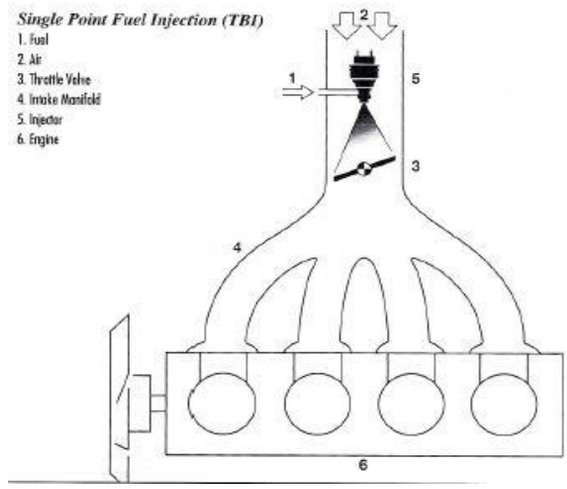
For efficient burning of the fuel, injectors are used in gasoline engines. There





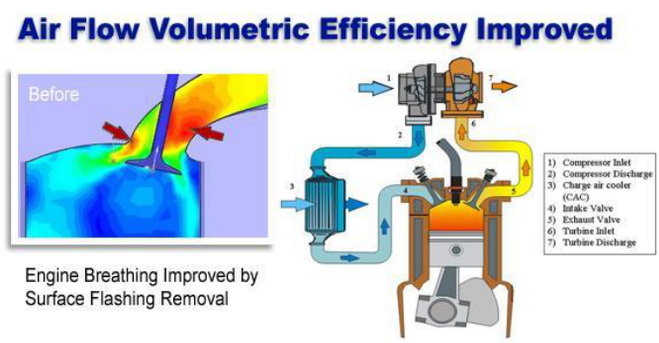
engines are called fuel efficient engines. There are two types of gasoline direct engines and induction manifold engines.

Gasoline Direct Engines: Fuel is directly injected into the cylinder (GDI) directly and the air is supplied from the manifold based on the availability of oxygen and speed of the vehicle. This makes the complete burning of the fuel. Very high injection pressure is required to spray fuel inside the cylinder.

Manifold injection engines: Fuel is injected into induction manifold and air is supplied from the induction manifold. These engines are better than the carburettor engines. The fuel and air will be controlled by the central processing unit base on the speed and availability of the oxygen. Higher injection pressures are used to spray the fuel into the manifold.

Use of super charger and turbo charger increases the volumetric efficiency of the engine, this increases the breathing capacity of the engine with complete combustion, hence emissions are reduced.

Advantages of using direct injection system in automobiles.



- Able to produce high-speed, high- performance, high volumetric efficiency 4-stroke cycle gasoline engines by applying advanced technology gained through the design and development
- Engines attained performance as high as 260 bhp/liter or nearly 4.3 bhp/cu in. at speeds of up to 25,000 rpm.
- Emissions are controlled and engines operating with less noise
- Fuel efficiency and mileage have already been a controversial topic. It does depend on how a person drives the car.
- At the end of the day, the way a person drives their vehicle is going to impact the average of the vehicle, whether positively or negatively

–ooOoo–

Title: Emd Based Image Steganography Algorithms, A Hardware Implementation Perspective

AUTHOR: Dr. M. C. HANUMANTHARAJU, Professor, ECE

Exploiting modification direction (EMD)-based image steganography algorithm has higher embedding efficiency, low distortion, and best security that finds application in secure communication, data protection, access control in digital content distribution, etc., EMD steganography encapsulates secret digit represented in (2n + 1)-ary notational system by increasing or decreasing one of the n cover pixels by one. New high-speed reconfigurable architectures and field programmable gate array (FPGA) implementation of EMD based image steganography algorithms have been proposed. Although, earlier work on FPGA implementation of steganography algorithms offer higher speed, low chip area, and better throughput it usually operates on a fixed number of pixels. The proposed system works well for both arbitrary numbers of pixel groups and variable image resolution. The developed system is capable of embedding a secret message from two to eight-pixel groups with an image resolution of 512 × 512 pixels at a real-time video rate of 549 frames/s. The complete design is implemented using RTL compliant Verilog code which fits into a single FPGA/ASIC chip with a gate density of two million gates.

Steganography was started as an art in earlier days and now it has become one of the specialized areas in cyber security. The mobile internet technology has led the internet to grow faster with a four-fold increase in internet users over the past few years. As it is evident from McKinsey report 2013, five billion individuals are using various mobile devices to connect to the internet and it is expected to increase in an exponential manner in next few years. Disruptive internet of things (IoT) and mobile internet technology have provided easy access to the internet through portable/handheld devices, and hence securing user data in public networks is a major concern. According to the identity theft resource centre (ITRC) breach report published in 2015, there are total of 780 breaches and the records exposed were 177,866,236. Therefore, the data protection using steganography and cryptography techniques is the need of the hour. The prominent applications of Steganography include secured communication, particularly in banking, defence and space explorations. Cryptography deals with the practice and study of procedures for secure communication in the presence of third parties. It means that the original data is replaced with some other data using a key and the secret data. The cryptography techniques are mainly used in securing any time money (ATM) cards, computer passwords, and electronic commerce applications etc. The cryptography algorithm must be robust enough since the message is encrypted and transmitted in the presence of third parties. However, the steganography does not reveal the existence of the secret message. Therefore, the steganography schemes are more widely used compared to cryptography techniques.

Steganography schemes work in both spatial and transform domains. In the spatial domain, the secret message is embedded by direct modification of the cover data values. In the transform domain, the cover object is converted to a transform space such as discrete Fourier transforms (DFT), discrete wavelet transforms (DWT), discrete cosine transforms (DCT) etc. Embedding of secrete message is done by changing the transform coefficients.

–ooOoo–

Title: Vlsi Testing And Verification

AUTHOR: Dr. JAYADEVA G S, Professor, ECE

In the VLSI design and production cycle, verification and testing is very important to provide reliable and cost efficient product. This presentation concentrates on difference between verification and testing, why testing is important, types of defects, faults that exists on the fabricated chips, the role of testing and example of test generation technique for combinational circuits.

The basic VLSI realization process is shown in the following Fig. (1). In this figure, the difference between the verification and testing is important and is described below.

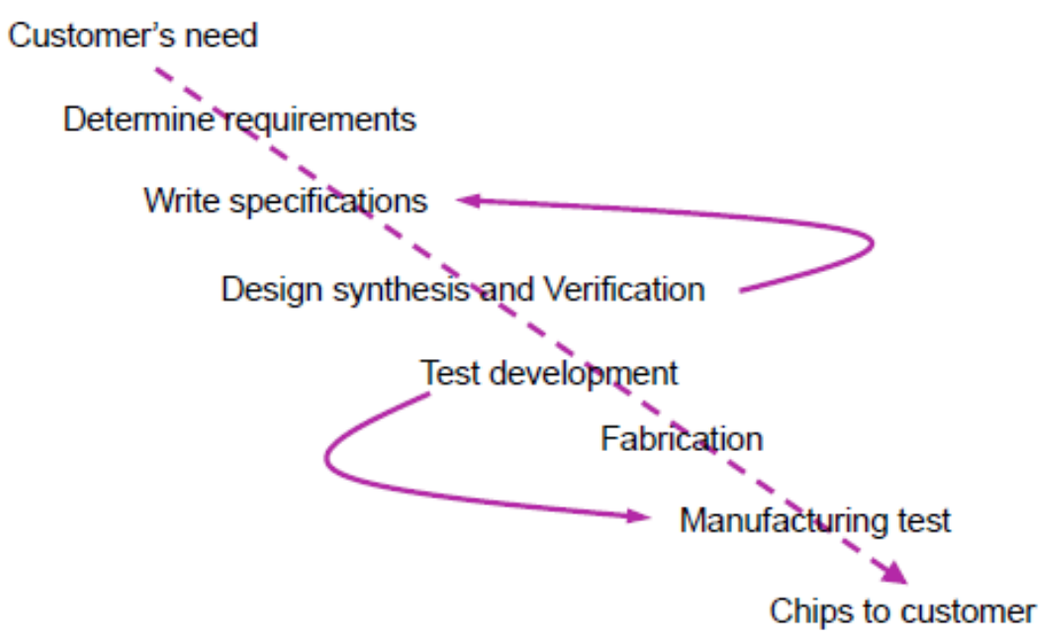


Fig. (1) VLSI Realization process

Verification refers to the predictive analysis of the synthesized design, when manufactured, will perform the given I/O function. Whereas the testing refer to those procedures that take place after chip fabrication in order to detect possible manufacturing defects. Fig. (2) shows a manufactured figure in which there is a metal discontinuity and also a crack in the wafer.

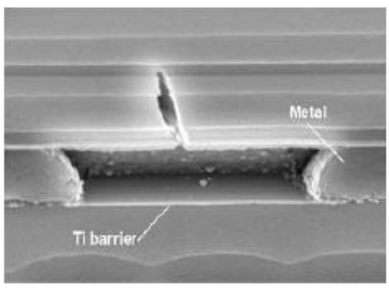


Fig. (2) Shows fabricated defects _Crack and Metal discontinuity)

As a thumb rule, the cost of detecting a defective device increases by an order of magnitude as we move from a manufacturing stage to the next (device board system). Hence detecting the defect at early stage is important. The benefits of testing are quality and economy. The most common model used for logical faults is the single stuck-at fault. Initially in this presentation faults identification assuming single stuck-at fault with a simple gate is explained using truth table method. Followed by truth table, fault matrix generation and Path Sensitization is explained for combinational circuits using specific examples.

After that one popular method known as "D-Roth Algorithm" is explained which is guaranteed of generating a test vector - if one exists for detecting a fault. This algorithm follows the following steps:

i. Generate

ii. Propagate fault from its origin to output

iii. Consistency set of inputs for detecting the fault

The above steps makes use of three different cubes namely

(a) Singular Cube

(b) Primitive D cube of a fault (PDCf) and

(c) Propagation D Cube (PDC).

The presentation explained the above steps and different cube generation in detailed and then highlighted the difference between PODEM and D-Algorithm. And also on PODEM and FAN. Where PODEM and FAN are the improved versions of D-Roth Algorithm.

- In PODEM, backtracking is allowed only on primary inputs not on any internal line.
- PODEM does not require the consistency check operation.
- The FAN algorithm is in principle similar to PODEM but is made more efficient by reducing the number of backtracks

Finally the talk was concluded by summarizing the above points.

–ooOoo–

Title: Regression Analysis

AUTHOR: Dr. JOJY JOSEPH IDICULA, Professor, Maths

Regression analysis is a statistical method used to find the relations between two or more independent and dependent variables. One variable is independent and its impact on the other dependent variables is measured. Broadly speaking, there are more than 10 types of regression models. When there is only one dependent variable and independent variable, or predictor variable, we call it simple regression. On the other hand, when there are many independent variables influencing one dependent variable we call it multiple regression.

Linear regression model is a linear approach to modeling the relationship between a scalar response and one or many explanatory variables. The case of one explanatory variable is called simple linear regression. For more than one explanatory variable, the process is called multiple linear regression.

Nonlinear regression is a form of regression analysis where data fits a model and is then expressed as a mathematical function. Nonlinear regression is computed by finding the difference between the fitted nonlinear function and every Y point of data in the set.

Multiple Linear Regression (MLR)

Multiple linear regression is the most common form of linear regression analysis. Multiple linear regression (MLR), also known simply as multiple regression, is a statistical technique that uses several explanatory variables to predict the outcome of a response variable. The goal of multiple linear regression (MLR) is to model the linear relationship between the explanatory (independent) variables and response (dependent) variable. As a predictive analysis, the multiple linear regression is used to explain the relationship between one continuous dependent variable and two or more independent variables. The independent variables can be continuous or categorical (dummy coded as appropriate). In essence, multiple regression is the extension of ordinary least-squares (OLS) regression that involves more than one explanatory variable.

Example Questions Answered:

Do age and IQ scores effectively predict GPA?

–ooOoo–

Do weight, height, and age explain the variance in cholesterol levels?

The multiple regression model is based on the following assumptions:

- There is a linear relationship between the dependent variables and the independent variables.
- The independent variables are not too highly correlated with each other.
- yi observations are selected independently and randomly from the population.
- Residuals should be normally distributed with a mean of 0 and variance σ.

Formula for Multiple Linear Regression :

$yi = \beta 0 + \beta 1xi1 + \beta 2xi2 + \beta 3xi3 + \beta 4xi4 + \ldots + \beta pxip +$

where, for i= n observations:

yi = dependent (response) variable

xi = independent (explanatory) variables

$\beta 0$ = y-intercept (constant term)

βp = slope coefficients for each explanatory variable

ε = the model's error term (also known as the residuals)

Uses of Multiple Linear Regression Analysis

There are 3 major uses for multiple linear regression analysis.

1. It might be used to identify the strength of the effect that the independent variables have on a dependent variable.
2. It can be used to forecast effects or impacts of changes. That is, multiple linear regression analysis helps us to understand how much will the dependent variable change when we change the independent variables. For instance, a multiple linear regression can tell you how much GPA is expected to increase (or decrease) for every one point increase (or decrease) in IQ.
3. Multiple linear regression analysis predicts trends and future values. The multiple linear regression analysis can be used to get point estimates. An example question may be "what will the price of gold be 6 months from now?"

When selecting the model for the multiple linear regression analysis, another important consideration is the model fit. Adding independent variables to a multiple linear regression model will always increase the amount of explained variance in the dependent variable (typically expressed as R^2). Therefore, adding too many independent variables without any theoretical justification may result in an over-fit model.

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BMS Institute of Technology & Management

26.11.2020

Title: Network Analysis – Pert And Cpm

AUTHOR: Dr. Karabi Sikdar, Professor, Department of Mathematics

Session Date: 2nd December 2020

Introduction

PERT and CPM are two well-known network techniques or models especially useful for planning, scheduling and executing large time-bound projects which involve careful co-ordination of a variety of complex and inter- related activities and resources. PERT is the abbreviated form for Program Evaluation and Review Techniques and CPM for Critical Path Method. Both the techniques were developed in U.S.A. during the late 1950s. PERT was developed by US Navy Engineers to plan and control the huge Polaris Submarine Program. CPM was developed by E.I. DuPont Nemours & Co., U.S.A. and the Univac Division of Remington Rand Corporation in 1956 in connection with the periodic overhauling and maintenance of chemical plants.

Both the techniques have been applied successfully to improve efficiency of execution of large projects within pre-determined time and cost limits. Any new venture may be regarded as a project, such as constructing a new plant, bridge, dam, shopping centre or residential complex, design of a new aircraft, manufacture of ships, R& D projects, introduction of a new product, installing pipeline, floating a new issue of shares, major repairs and overhaul of plant and machinery units, organizing a large conference/convention, handling an earthquake relief work and so on.

PERT and CPM converge on several aspects, and are almost treated as twins; there are, however, some points of difference between them which will be discussed later. The techniques recognize the systems or inter-related nature of activities on large work projects and translate the job proposed into a model by drawing a network of the activities involved. They are used in planning and controlling (monitoring) the projects. Planning in this context implies developing the overall layout of the project with estimates of time, the resources required and the detailed time scheduling and sequence of various jobs to be performed. The control, on the hand takes place during the work on the project. Gradually as resources get used and completion times are obtained, project management techniques can be used to reallocate, if necessary, the rescues, according to the revised criticality rankings of the jobs remaining to be done.

In CPM activities are shown as a network of precedence relationships using activity-on node network construction

- Single estimate of activity time
- Deterministic activity times

USED IN: Production management - for the jobs of repetitive in nature where the activity time estimates can be predicted with considerable certainty due to the existence of past experience.

In PERT activities are shown as a network of precedence relationships using activity-on-arrow network construction

- Multiple time estimates
- Probabilistic activity times

USED IN: Project management - for non-repetitive jobs (research and development work), where the time and cost estimates tend to be quite uncertain. This technique uses probabilistic time estimates.

Applications of CPM / PERT

These methods have been applied to a wide variety of problems in industries and have found acceptance even in government organizations. These include

- Construction of a dam or a canal system in a region
- Construction of a building or highway
- Maintenance or overhaul of airplanes or oil refinery
- Space flight
- Cost control of a project using PERT / COST
- Designing a prototype of a machine
- Development of supersonic planes

–ooOoo–

Title: Product Development And Arduino

AUTHOR: Dr. C S Mala, Professor and Dean, Student Welfare

A project can be carried out for any societal need using Embedded Systems. The heart of an embedded system is a microcontroller. Arduino Uno is an 8 bit microcontroller and can be used for developing any project. A project developed should be tested and bench marked to convert it into a product. Arduino can be physically embedded inside any commercial product. When it is so done it is not necessary to disclose or open-source any information about its design. The product can be manufactured and sold.

To turn an idea into a patentable, profitable product one has to first build a prototype. Inorder to build a prototype a concept sketch should be created. Then a Virtual Prototype should be developed. Later a Physical Prototype should be built. The last but the most important task should be advertisement.

The following steps are involved in turning an application using Arduino into a product:

1. Know the application
2. Draw the block diagram
3. Design the Schematic Circuits
4. Test the hardware functioning
5. Develop the Software
6. Test the software functioning
7. Integrate both hardware and software and ensure its functioning.
8. Design the Printed Circuit Board (PCB) or Get the PCB done for your design.
9. Connect the hardware on to the PCB and run the software
10. Once it functions well. Repeat its functioning and bench mark the product.
11. After testing, verification and bench marking, the product can be released to the market.
12. Adequate literature and product support information should be made ready before the release of the product.

For any application using Arduino, the resources available on an Arduino should be known. The Microcontroller in Arduino is the Atmega328p which is the brain. It has the following resources on chip

- Digital Input/Output Pins: 14 pins labeled 0 to 13
- PWM Pins: digital pins marked ~ pins 11,10, 9, 6and 5.
- Tx and RX Pins(Serial Communication): blinks during communication between Arduino and Computer
- Inbuilt LED: pin 13
- Analog Pins: A0-A5, 6 pins, used to read sensor inputs.(can also function as DIO)
- Power: 3.3V or 5V and GND
- Reset button: The program starts from the beginning, when this button is pressed. (A 5volts on this pin for Reset)
- USB Jack: To upload programs from computer to Arduino
- Power Jack: 5volts to power up(rechargeable batteries, disposable batteries, solar panel)

An Arduino reads the data input through sensors, processes, controls and outputs data motors or display devices. It can output data on DC Motors, Servo Motors or Stepper Motors. It can display data on Light Emitting Diode or on Liquid Crystal Display. It has the capacity to read Data from outside world through Sensors. Some of the sensors that are used in product development depending on the application are:

- Motion Sensor: to detect Movement
- Light Sensor: To measure quantity of light
- Humidity and Temperature Sensor: To measure Humidity and Temperature
- Ultrasonic Sensor: To determine distance to an object through Sonar
- Shields: Boards that expand the functionalities of Arduino

–ooOoo–

Title: Data Science For Engineers

AUTHOR: Dr. Manjunath T N, Prof and Dean – ER

Data science is an inter-disciplinary field that uses scientific methods, processes, algorithms, and systems to extract knowledge and insights from many structural and unstructured data. Data science is related to data mining, machine learning and big data. Data science is a "concept to unify statistics, data analysis and their related methods" in order to "understand and analyse actual phenomena" with data. It uses techniques and theories drawn from many fields within the context of mathematics, statistics, computer science, domain knowledge and information science. Turing award winner Jim Gray imagined data science as a "fourth paradigm" of science (empirical, theoretical, computational and now data-driven) and asserted that "everything about science is changing because of the impact of information technology" and the data deluge.

Data science is an interdisciplinary field focused on extracting knowledge from data sets, which are typically large (Big data). The field encompasses analysis, preparing data for analysis, and presenting findings to inform high-level decisions in an organization. As such, it incorporates skills from computer science, mathematics, statistics, information visualization, graphic design, complex systems, communication, and business. Statistician Nathan Yau, drawing on Ben Fry, also links data science to human-computer interaction: users should be able to intuitively control and explore data with various data science applications for the real life.

–ooOoo–

Title: Advances In Electrical Power Transmission

AUTHOR: Dr N Ramarao Associate Professor Department of E&EE

Power is among the most critical component of infrastructure, crucial for the economic growth and welfare of nations. The existence and development of adequate infrastructure is essential for sustained growth of the Indian economy. India's power sector is one of the most diversified in the world. Sources of power generation range from conventional sources such as coal, lignite, natural gas, oil, hydro and nuclear power to viable non-conventional sources such as wind, solar and agricultural and domestic waste. Electricity demand in the country has increased rapidly and is expected to rise further in the years to come.

By 2022, solar energy is estimated to contribute 114 GW, followed by 67 GW from wind power and 15 GW from biomass and hydropower. The target for renewable energy has been increased to 227 GW by 2022. Total installed capacity of power stations in India stood at 373.43 GW as of October 2020. Electricity production reached 1,252.61 billion units (BU) in FY20. The Government of India has released its roadmap to achieve 227 GW capacity in renewable energy (including 114 GW of solar power and 67 GW of wind power) by 2022. The Government of India is preparing a 'rent a roof' policy for supporting its target of generating 40 GW of power through solar rooftop projects by 2022. Coal-based power-generation capacity in India, which currently stands at 199.5 GW, is expected to witness total installed capacity addition of 47.86 GW by 2022.

High Voltage Power Transmission:

The foundation of modern electric power transmission was laid in 1882 when Thomas A. Edison's Pearl Street Station, a dc generator and radial line transmission system used primarily for lighting, was built in New York City. The development of AC transmission in the United States began in 1885, when George Westinghouse bought the patents for AC systems developed by L. Gaulard and J. D. Gibbs of France. Both AC and DC power systems, at that time, consisted of short radial lines between generators and loads and served customers in the immediate vicinity of generation stations.

The first high voltage AC transmission line in the United States was built in 1890, traversing 20 km between Willamette Falls at Oregon City and Portland, Oregon. Alternating current transmission technology developed quickly and many AC lines were soon constructed, but for several years most operated as isolated systems. As transmission distances lengthened and demand for electric energy grew, the need to move larger blocks of power developed, reliability factors became important interconnected systems (power grids) began to be built. Interconnected systems provide significant economic advantages. Fewer generators are required as reserve capacity for peak demand, which reduces construction costs for the utilities. Similarly, fewer generators are needed in spinning reserve to handle sudden, unexpected increases in load, which further reduces investment costs. Power grids also give utilities generation options, permitting the use of the least expensive sources of power available to the grid at any time.

Power systems continue to grow and typical regional power grids today encompass tens of large generation stations, hundreds of substations and thousands of kilometres of transmission lines. The development of extensive regional grids and inter-ties in the 1950s and 1960s resulted in greater needs for coordination of design criteria, protective relay schemes, and power flow control and has led to the development of computerized supervisory control and data acquisition (SCADA) systems.

For same amount of power transfer as voltage increases, Current drawn is less. Therefore power losses are minimum and better transmission efficiency. Volume of conductor required is less, therefore cost of conductor is reduced for given power. Voltage drop is less, hence better voltage regulation. No of circuits and land requirement reduces as transmission voltage increases. Total line cost/MW/km decreases. Interconnection of power system to grid is possible. The capacity of transmission line increases, hence bulk power can be transmitted.

Today, commercial power systems at voltages of up to 800 kV AC and ±600 kV DC are in operation worldwide. Prototype ac systems at the 1200- to 1800-kV level have been built and tested. Power transfer capabilities have increased to several thousand megawatts per line and economies of scale have led to increased ratings of substation equipment. Extra high voltage (EHV) transformer banks with ratings of 1500 MVA and above are common. Substations have become more compact, as metal-clad buses and SF_6 gas insulation are more widely used. Automatic control of power generation and power flow are essential to the effective operation of interconnected systems. Computers and microprocessors are widely used for these applications.

Transmission Line Voltages in India:

Sl.No.	Nominal Voltage (kV)	Minimum Voltage (kV)	Maximum Voltage (kV)	Distance (KM)
1	33 kV	30	36	60
2	66 kV	60	72	120
3	132 kV	122	145	240
4	220 kV	198	245	480
5	400 kV	380	420	800
6	765 kV	728	800	1500

The choice of transmission voltage depends upon the total power transmitted, the distance of transmission, the % power loss allowed, the number of circuits permissible from the point of view of land acquisition for the line corridor.

Power Handling capacity of Transmission Lines					
		System Voltage			
Line Length		400 kV	750 kV	1000 kV	1200 kV
	400 km	670	2860	6000	8625
	600 km	450	1900	4000	5750
	800 km	335	1430	3000	4310
	1000 km	270	1140	2400	3450
	1200 km	225	950	2000	2875

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Title: "distributions For Analytics Using Python"

AUTHOR: Dr. Pushpa S. K, Professor, HOD ISE

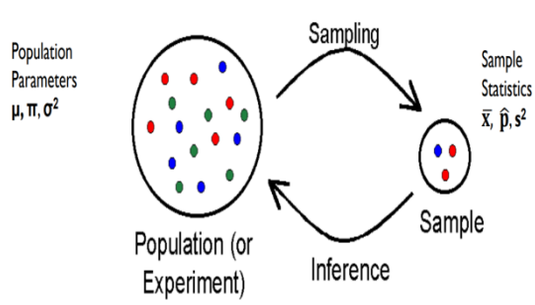
Date : 7/1/2021

Artificial Intelligence has emerged as one of the decisive expertise with applications across various industry domains. Machine learning a subset of AI is an important set of algorithms used for solving several business and social problems. Python is the leading programming languages for creating end-to-end solutions using ML.

Analytics applications involves tasks such as prediction of the probability occurrence of an event, testing a hypothesis, building models to explain variations in a key performance indicator that is of importance to the business, such as profitability, market share, demand etc. Many important tasks in analytics deal with uncertain events and it is essential to understand probability theory that can be used to measure and predict uncertain events.

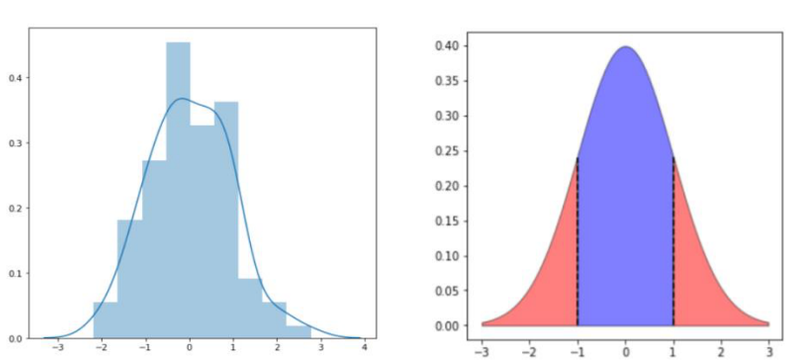
This talk was to introduce the concepts of random variables, probability distributions, distribution parameters and how they can be applied to solve real word problems. Also highlighted on various discrete and continuous distributions, probability density functions, probability mass functions and cumulative distribution functions.

Various terminologies like, Random Experiment: Machine Learning deals with uncertain events. Random experiment is an experiment in which the outcome is not known with certainty. Sample Space: Sample Space is the universal set that consists of all possible outcomes of an experiment. Individual outcomes are called the elementary events. The sample space can be finite or infinite.



Events: is a subset of a sample space and probability is usually calculated with respect to an event.

Distributions like Binomial Distributions, Poisson Distributions, Normal Distributions were mentioned with case studies. Below figure depicts Normal Distribution graphs



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Title: Wetlands Of Bengaluru- Case Study Of Sampangi

AUTHOR: Rajesh Gopinath, Assoc Professor, Dept. of Civil Engineering

13th January 2021

ABSTRACT

Urbanisation is an inevitable phenomenon bringing about drastic transitions in the natural landscape. As demography is altered, it directly and indirectly impairs the city's natural resources. The present research envisages the makeover of Bangalore and its wetlands due to urbanisation. In 1537 when the city was founded, significant prominence was given to water-bodies during the planning process. However, the city currently strikes a sorry note, as its evolution into a metropolitan has triggered rampant new land-uses. Bangalore has witnessed a profound impact on its inherent features such as landscape, water-bodies, etc. The revolution, triggered by various government initiatives, privatization and encroachments has led to significant deterioration in the water-bodies, both quantitatively and qualitatively. The current study closely follows Bangalore's urbanisation pattern from 1537AD and enlists the determinants that brought about the loss of its several wetlands. The research further persists with the analysis of the transformation pattern for Sampangi Lake with the aid of historical and current land-use maps, up to its disappearance in the current scenario. The piecemeal growth in the Bangalore city was a result of an urban sprawl, which had its immediate effect of building-up over dry lakebeds, and as the lakes were seasonal, the feeders were gradually disjointed. Severe encroachment has resulted in the shrinkage of its wetlands, thereby reducing the water yield and water holding capacity from the catchment. Even lake restoration measures by govt. authorities treat water-bodies as an isolated element and not as a part of the larger system. Hence, there is a need to propose and implement policies and guidelines for development and treat the water-network as a continuous system.

Keywords: *Urbanisation, determinants, Sampangi, quantitatively*

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Date: 23-12-2020
Time: 12.0 PM to 1.00 PM

Title: Electrochemical Sensors for Health and Environment

AUTHOR: Dr. Ramakrishnappa T Associate Professor & HoD of Chemistry

ABSTRACT

Metal toxicity or metal poisoning is the toxic effect of certain metals in certain forms and doses on life. Some metals are toxic when they form poisonous soluble compounds. Certain metals have no biological role, i.e. are not essential minerals, or are toxic when in a certain form. Heavy metal poisoning can happen when you're exposed to a lot of certain types of metals. It makes you sick and affects the way your body works. Heavy metals, like arsenic, lead, mercury, and others, are all around us. They're in the ground we walk on, in the water we drink, and in the products we use every day. But high levels of most heavy metals can cause health problems. The poisoning can happen if you eat or drink something tainted with heavy metals or if you breathe in contaminated dust or fumes. Experts say you should be careful about unproven heavy metal tests or "detox" treatments you find online. They may waste your money, and some could be dangerous. There are many heavy metals, including Arsenic, Cadmium, Copper, Iron, Lead, Mercury, Zinc. Not all of these metals are bad for you. We need small amounts of some of them, such as copper and iron, to keep our bodies healthy.

Heavy Metal Poisoning Causes and Risk Factors

One might get heavy metal poisoning if they are exposed to

- Work in a factory that uses heavy metals
- Breathe in old lead paint dust when you fix up your home
- Eat fish caught in an area with high levels of mercury
- Use herbal medicines that have heavy metals in them
- Use dinnerware that hasn't been coated well enough to prevent heavy metals from contaminating food
- Drink water contaminated with heavy metal.

Heavy Metal Poisoning Symptoms

The signs can vary, depending on the metal and the amount. **Acute poisoning** happens if we get a high dose at one time, like in a chemical accident in a factory or after a child swallows a toy made with lead. Symptoms usually come on quickly, and they include:

- Feel confused
- Go numb
- Feel sick and throw up
- Pass out

- In addition to above one should have:
- Abdominal pain
- Diarrhea
- Dehydration
- Tingling
- Anemia
- Kidney Damage
- Liver Damage
- Lung Irritation
- Fluid in your lungs
- Brain Problems or memory loss
- Horizontal lines on your Nails
- Behavioral Changes
- Weak or malformed bones
- Miscarriages or premature labor

The main sources of heavy metal toxicity includes:

- Industrial effluents Battery waste
- Nuclear waste
- Paint and pigment
- Leather industry
- Cosmetic industry
- Insecticides and pesticides
- Domestic waste

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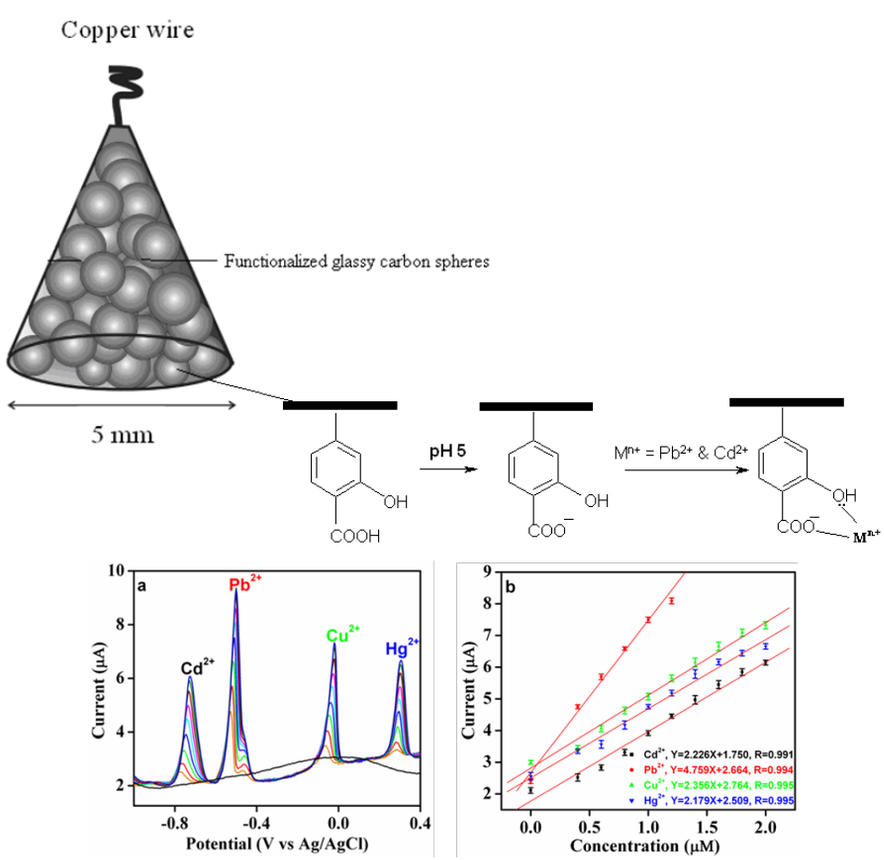
Electrochemical sensing methods for heavy metals in environmental samples

Electrochemical sensing of HMI involves the use of covalently functionalized carbon electrodes that are employed for the purpose of passing current to the aqueous solution and generate some useful and measurable electrical signal in correspond to the electrochemical reactions within the solution due to presence of metal ions.

Electro chemical Techniques used in Sensors

- Cyclic Voltammetry
- Linear Sweep Voltammetry
- Chronoamperometry
- Chronopotentiometry
- Chrono quolometry
- Square Wave Voltammtery
- Differential Pulse Voltammtery
- Stripping Voltammtery

Electrode fabrication and possible mode of its interaction with metal ions



–ooOoo–

Title: Electric Trains

AUTHOR: Dr. Sanjay Lakshminarayanan, Professor, Electrical and Electronics Engineering

The talk is about the evolution of Electric Trains with the invention of electricity parallel to the spread of the railways. One has to know something about the history of railways and the history of transport as well. The earliest reference is about 6th century BC, in Corinth, Greece. It appears that the rudiments of rails were used to transport boats constructed inland to the water edge. Much later In 1800 Thomas Leiper constructed a 60 ft long test railway in Philadelphia to show that 1 horse could haul 10 times more weight on a railed road than on an earthen road. Railway constructed of stone sleepers and wood rails. The invention of the steam engine by James Watt was an impetus to railways as this lead to the invention of the steam locomotive. Modern railways began in Great Britain. The first locomotive powered by a steam engine was built in 1804 by English engineer Richard Trevithick, to haul trucks at an ironworks. The first passenger railway was the Stockton and Darlington Railway in England, which opened in 1825. Stephenson's Rocket was an early steam locomotive which was built for and won the Rainhill Trials of the Liverpool and Manchester Railways, held in October 1829.

Today's bullet trains can top 300 mph. When Englishman Richard Trevithick launched the first practical steam locomotive in 1804, it averaged less than 10 mph. Today, several high-speed rail lines are regularly travelling 30 times as fast, and they are electric. The first electric train was developed in 1879 by German engineer Werner von Siemens. He built a train that could carry 30 passengers on a short journey. The world's first electric tram line, Gross-Lichterfelde Tramway, opened in Lichterfelde near Berlin, Germany, in 1881. It was built by Siemens. The tram ran on 180 Volt DC, which was supplied by running rails.

The first practical AC electric locomotive was designed by Charles Brown, then working for Oerlikon, Zürich. In 1891, Brown had demonstrated long-distance power transmission, using three-phase AC, between a hydro-electric plant at Lauffen am Neckar and Frankfurt am Main West, a distance of 280 km. Using experience he had gained while working for Jean Heilmann on steam-electric locomotive designs, Brown observed that three phase motors had a higher power-to-weight ratio than DC motors and, because of the absence of commutator, were simpler to manufacture and maintain. However, they were much larger than the DC motors of the time and could not be mounted in under-floor bogies, they could only be carried within locomotive bodies.

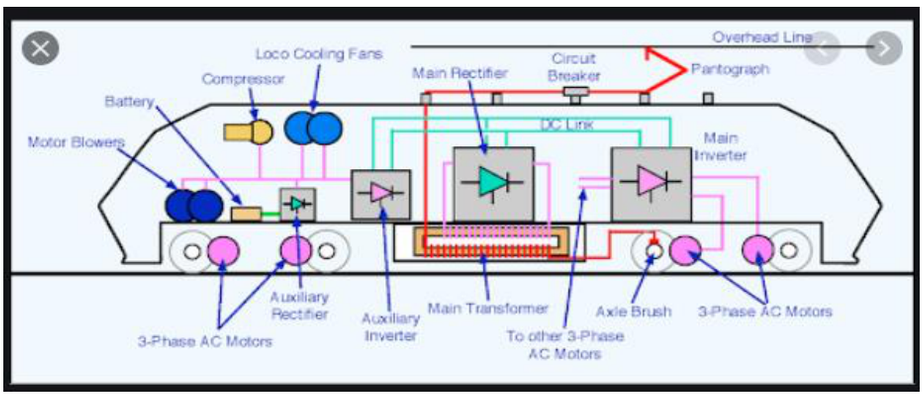


Figure : Modern Electric Locomotive

Modern trains are usually moved by Diesel-Electric Locomotives or by electric locomotives or are EMUs (Electric Multiple Units). Diesel was a convenient fuel so it was chosen for locomotives, but it is difficult to design a gear box at high power levels above 1000HP, so the diesel engine was used to turn an electric generator which in turn powered the electric traction motors connected to the wheels. This is known as diesel electric locomotive. In a pure electric locomotive, the locomotive draws electrical power from overhead lines or a third rail and turns the traction motors through rectifiers and inverters which control motors using semiconductor switches such as diodes and thyristors. In EMUs, some of the bogies carrying passengers have electric motors attached to the wheels below. The cabins at the front and back have electrical controls going to the bogies with motors. All three of these types of electric trains have operational advantages and disadvantages of one over the other.

The early diesel-electric locomotives had a diesel engine turning a DC generator which turned DC series motors attached to the wheels. This was replaced by locomotives with AC generators where the AC was rectified and again given to DC series motors driving the wheels. The present day method is to use a diesel engine to run an alternator which feeds a rectifier and power electronics in the form of inverters to run more efficient AC induction motors connected to the wheels. Even synchronous motors have been tried.

Diesel engines are highly polluting, hence pure electric trains are replacing them. Suburban trains are usually EMUs with DC series motors.

Today rectifiers and inverters are at the heart of the electric drive systems in the trains. The thyristor rectifier is used in conjunction with the three phase alternator to produce variable DC required to control DC motors such as in the older diesel-electric engines. The rectifier also plays an important part in pure electric locomotives or EMUs. In modern electric locomotives a rectifier converts AC drawn from overhead lines by a Pantograph to DC, this DC is again converted to variable frequency AC by inverters to feed the induction motors connected to the wheels. An inverter consists of a three phase bridge with 6 switches. By using pulse width modulation, it is possible to generate sinusoidal voltages of required amplitude and frequency and phase to drive AC motors efficiently. It is possible to control velocity and acceleration for four quadrant control of motors required for smooth control of electric trains. Control systems such as V/f control, field oriented control or Direct torque control are the main types of control mechanisms possible with many variations on them. During braking either regenerative braking or dynamic braking is used. To conserve energy, regenerative braking is preferred, as in dynamic braking, kineticFigure : A Thyristor Rectifier energy is converted into heat dissipated in the atmosphere in braking resistors.

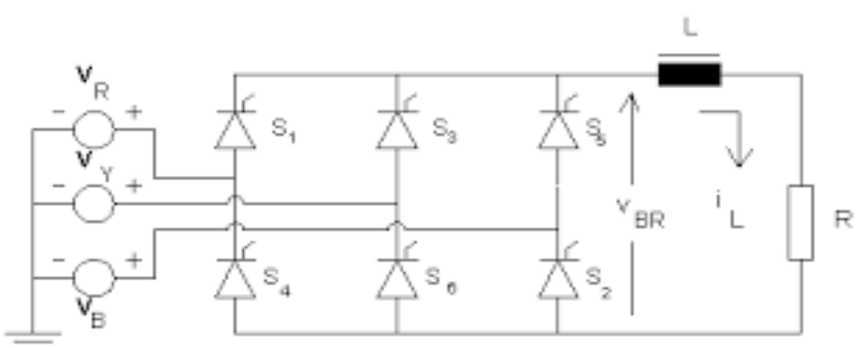


Figure 2:A Thyristor Rectifier

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Title: Flexible Automation

Dr. K.M. Sathish Kumar, Professor and HoD, Department of Mechanical Engineering

Brief Note

Flexible automation (FA) is a type of manufacturing automation which exhibits some form of "flexibility". Most commonly this flexibility is the capability of making different products in a short time frame. This "process flexibility" allows the production of different part types with overlapping life-cycles. Another type of flexibility that comes with flexible automation is the ability to produce a part type through many generations. Clearly, there are several other manifestations of flexibility.

Flexible automation allows the production of a variety of part types in small or unit batch sizes. Although FA consists of various combinations of technology, flexible automation most typically takes the form of machining systems, that is, manufacturing systems where material is removed from a workpiece. The flexibility comes from the programmability of the computers controlling the machines. Flexible automation is also observed in assembly systems.

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Title: Neural Network Methods For Fault Accommodation

Dr. Seema Singh, Professor and HoD Department of Electronics and Telecommunication Engineering

Brief Note

Sensor failures have serious effect on the performance of flight control systems (FCS), leading to instability and crossing the specified limits of the operations. It is crucial for aircraft flight control because of the significant number of incidents that have occurred due to such failures and their serious consequences.

Neural network based fault accommodation solutions are broadly of two types - the knowledge based and the model based methods, both coming under supervised learning concepts of neural networks. The experimentation is simulated using MATLAB Simulink for lateral and longitudinal dynamics for a flight control system of an aircraft model. Neural network models are designed for sensor fault detection and reconfiguration. Sensor stuck faults are modelled and analyzed to show the efficiency of neural network methods.

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Title: How High Is Our Higher Education ?

AUTHOR: Dr. THIPPESWAMY G, Professor and Dean Academics, CSE

Abstract: The world has realized that the economic success of the states is directly determined by their education systems. Education is a Nation's Strength. A developed nation is inevitably an educated nation. Indian higher education system is the third largest in the world, next to the United States and China. Since independence, India as a developing nation is contentiously progressing in the education field. Although there have been lot of challenges to higher education system of India but equally have lot of opportunities to overcome these challenges and to make higher education system much better. It needs greater transparency and accountability, the role of colleges and universities in the new millennium, and emerging scientific research on how people learn is of utmost important. India need well skilled and highly educated people who can drive our economy forward. India provides highly skilled people to other countries therefore; it is very easy for India to transfer our country from a developing nation to a developed nation. This report aims to highlight the challenges and to point out the opportunities in higher education system in India.

Introduction: India's higher education system is the world's third largest in terms of students, next to China and the United States. In future, India will be one of the largest education hubs. India's Higher Education sector has witnessed a tremendous increase in the number of Universities/University level Institutions & Colleges since independence. The 'Right to Education Act' which stipulates compulsory and free education to all children within the age groups of 6-14 years, has brought about a revolution in the education system of the country with statistics revealing a staggering enrolment in schools over the last four years. The involvement of private sector in higher education has seen drastic changes in the field. Today over 60% of higher education institutions in India are promoted by the private sector. This has accelerated establishment of institutes which have originated over the last decade making India home to the largest number of Higher Education institutions in the world, with student enrolments at the second highest. The number of Universities has increased 34 times from 20 in 1950 to 677 in 2014. Despite these numbers, international education rating agencies have not placed many of these institutions within the best of the world ranking. Also, India has failed to produce world class universities. Today, Knowledge is power. The more knowledge one has, the more empowered one is. However, India continues to face stern challenges.

Challenges in Higher Education in India: It is our 73rd year of independence still our education system has not been developed fully. We are not able to list a single university in top 100 universities of the world. Various governments changed during these six decades. They tried to boost the education system and implemented various education policies but they were not sufficient to put an example for the universe. UGC is continuously working and focusing on quality education in higher education sector. Still we are facing lot of problems and challenges in our education system. Some of the basic challenges in higher education system in India are discussed below:

- **Enrolment:** The Gross Enrolment Ratio (GER) of India in higher education is only 15% which is quite low as compared to the developed as well as, other developing countries. With the increase of enrolments at school level, the supply of higher education institutes is insufficient to meet the growing demand in the country.
- **Equity:** There is no equity in GER among different sects of the society. According to previous studies the GER in higher education in India among male and female varies to a greater extent. There are regional variations too some states have high GER while as some is quite behind the national GER which reflect a significant imbalances within the higher education system.
- **Quality:** Quality in higher education is a multi-dimensional, multilevel, and a dynamic concept. Ensuring quality in higher education is amongst the foremost challenges being faced in India today. However, Government is continuously focusing on the quality education. Still Large number of colleges and universities in India are unable to meet the minimum requirements laid down by the UGC and our universities are not in a position to mark its place among the top universities of the world.
- **Infrastructure:** Poor infrastructure is particularly the institutes run by the public sector suffer from poor physical facilities and infrastructure. There are large number of colleges which are functioning on second or third floor of the building on ground or first floor there exists readymade hosieries or photocopy shops.
- **Political interference:** Most of the educational Institutions are owned by the political leaders, who are playing key role in governing bodies of the Universities. They are using the innocent students for their selfish means. Students organise campaigns, forget their own objectives and begin to develop their careers in politics.
- **Faculty:** Faculty shortages and the inability of the state educational system to attract and retain well-qualified teachers have been posing challenges to quality education for many years. Large numbers of NET / PhD candidates are unemployed even there are lot of vacancies in higher education, these deserving candidates are then applying in other departments which is a biggest blow to the higher education system.

- **Accreditation:** As per the data provided by the NAAC, as of June 2020, "not even 25% of the total higher education institutions in the country were accredited. And among those accredited, only 30% of the universities and 45% of the colleges were found to be of quality to be ranked at 'A' level".
- **Research and Innovation:** there are very nominal scholars in our country whose writing is cited by famous western authors. There is inadequate focus on research in higher education institutes. There are insufficient resources and facilities, as well as, limited numbers of quality faculty to advice students. Most of the research scholars are without fellowships or not getting their fellowships on time which directly or indirectly affects their research. Moreover, Indian Higher education institutions are poorly connected to research centres. So, this is another area of challenge to the higher education in India.
- **Structure of higher education:** Management of the Indian education faces challenges of over centralisation, bureaucratic structures and lack of accountability, transparency, and professionalism. As a result of increase in number of affiliated colleges and students, the burden of administrative functions of universities has significantly increased and the core focus on academics and research is diluted (Kumar, 2015) is another challenge to the higher education system of India.

Suggestions Improving the System of Higher Education:

- There is a need to implement innovative and transformational approach form primary to higher education level to make Indian educational system globally more relevant and competitive.
- Higher educational institutes need to improve quality and reputation.
- There should be a good infrastructure of colleges and universities which may attract the students.
- Government must promote collaboration between Indian higher education institutes and top International institutes and also generates linkage between national research laboratories and research centres of top institutions for better quality and collaborative research.
- There is a need to focus on the graduate students by providing them such courses in which they can achieve excellence, gain deeper knowledge of subject so that they will get jobs after recruitment in the companies which would reduce unnecessary rush to the higher education.
- Universities and colleges in both public private must be away from the political affiliations.
- Favouritism, money making process should be out of education system etc.
- There should be a multidisciplinary approach in higher education so that students knowledge may not be restricted only upto his own subjects.

Conclusion: Education is a process by which a person's body, mind and character are formed and strengthened. It is bringing of head, heart and mind together and thus enabling a person to develop an all-round personality identifying the best in him or her. Higher education in India has expanded very rapidly in the last six decades after independence yet it is not equally accessible to all. India is today one of the fastest developing countries of the world with the annual growth rate going above 9%. Still a large section of the population remains illiterate and a large number of children's do not get even primary education. This not only excluded a large section of the population from contributing to the development of the country fully but it has also prevented them from utilising the benefits of whatever development have taken place for the benefit of the people. No doubt India is facing various challenges in higher education but to tackle these challenges and to boost higher education is utmost important. India is a country of huge human resource potential, to utilise this potential properly is the issue which needed to discuss. Opportunities are available but how to get benefits from these opportunities and how to make them accessible to others is the matter of concern. In order to sustain that rate of growth, there is need to increase the number of institutes and also the quality of higher education in India. To reach and achieve the future requirements there is an urgent need to relook at the Financial Resources, Access and Equity, Quality Standards, Relevance, infrastructure and at the end the Responsiveness.

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