# GIT-Journal of Engineering and Technology

# About Gandhinagar Institute of Technology

Gandhinagar Institute of Technology was established by Platinum Foundation Trust in December 2006. The Institute is affiliated to Gujarat Technological University and approved by AICTE New Delhi. It is situated near Village "Moti Bhoyan" and 24 km away from Ahmedabad city.

The Trust is registered under Public Trust Act, having Registration No. E-17490 dated 19 June 2006 at Ahmedabad, Gujarat. The members of the trust are involved in the social activities and are also promoting the technical interest of the state and country by contributing to the technical institution development.

The vision of the institute is to develop young engineers with active and creative minds. It stresses total development of the students. The Institute aims to be a leading center for research and engineering study, pursuing knowledge in both fundamental and applied area, and collaborating closely with business and industry in promoting technological innovation and economic development. The institute has team of dynamic and dedicated professors, working hard for overall development of students, so that they get ready for any kind of challenges in their life.

It offers B.E Program in Mechanical Engineering, Computer Engineering, Information Technology, Electronics & Communication Engineering, Electrical Engineering and Civil Engineering, Infrastructure Engineering, Data Science, Robotics and Electric Vehicles. It also offers M.E. in Mechanical Engineering with specialization in Thermal Engineering and CAD / CAM and M.E. in Software Engineering in Computer Engineering. It also offers MBA Program with specialization in Marketing, Finance, Human Resource and Information Systems. Gandhinagar Institute of Technology will nurture the intellectual growth of its students and serve humanity through creation, application and dissemination of knowledge relevant to technology and become one of the premier Engineering and Management Institutes and achieve the highest order of excellence in teaching.

Our students are innovative and have excellent acceptability to latest trends and technologies of present time. Our students have also participated in various technical activities as well as sports activities and have achieved various prices at state level. We have two annual publications, a National level research journal 'GIT-Journal of Engineering and Technology (ISSN 2249–6157)' and 'GIT-a Song of Technocrat' (college magazine).

# Message from the Director



"Somewhere, something incredible is waiting to be known." -Carl Sagan

GIT was established in 2006 and during a short span of fourteen years; it has accomplished the mission effectively for which it was established. Institute has been constantly achieving the glory of excellence in the field of curricular and co-curricular activities. It gives me immense pleasure that the twelfth issue of our National journal 'GIT-Journal of Engineering and Technology' is being published with ISSN 2249 – 6157 for twelfth successive year. The annual journal contains peer reviewed technical papers submitted by the researchers from all domains of engineering and technology. The issue is a result of imaginative and expressive skill and talent of GIT family. Research papers were invited from the researchers of all domains in engineering and technology across India. After peer reviewed 22 papers are selected and being published in this issue of the journal.

I am happy to announce the Special Edition for "International Conference on "Data Science and Intelligent Applications" - (ICDSIA-20)" of our National journal 'GIT-Journal of Engineering and Technology' is being published with Twelfth Volume-I, 2020, ISSN 2249 – 6157. Two days International Conference on Data Science and Intelligent Applications (ICDSIA-20) is being organized by Computer Engineering Department of Gandhinagar Institute of Technology (GIT), on 24th-25th January 2020, sponsored by Gujarat Council on Science and Technology (GUJCOST), in association with Gujarat Technological University (GTU), Ahmedabad and Indian Society for Technical Education (ISTE), New Delhi. It presents original, significant and quality research work contributions on the theories and practices on emerging technologies in the areas of Data Science, Intelligent Applications and Communication Technologies. Total 128 research papers were received on Data Science, Intelligent Applications and Communication Technologies from renowned Institutes like IIT's, Bits Pilani, Ramaiah Institute of Technology, Visvesvaraya Technological University, Gujarat Forensic Sciences University, Nirma University, L. D. College of Engineering and many more renown institutes of India. After peer reviewed, 77 research papers were selected. From these, 60 research papers are published by Springer Series: Lecture Notes on Data Engineering and Communications Technologies (LNDECT, volume 52) and 17 research papers are published in the Special Edition of GIT-Journal of Engineering and Technology (JET-2020).

It is a matter of pride that GIT has been awarded as a valuable and outstanding Blood donation camp organizer by Indian Red Cross Society, Ahmedabad District Branch. It received the award from Governor of Gujarat Honorable Shri Acharya Devvrat at Ahmedabad Management Association, Ahmedabad on 10th September 2019. GIT has also received "Eminence award for being the best engineering college" by Honorable Chief Minister Vijay Rupani on 14 December 2019, event supported by Divya Bhaskar. In Smart India Hackathon-2019, GIT got first prize worth Rs 50000 and in Smart

City Hackathon -2020, GIT got first prize worth Rs 30000. Salot Chaitya Jitendra, an MBA student has been awarded Gold Medal at the 9th convocation of Gujarat Technological University. Institute is awarded as the best Engineering College for providing best placement to the students by ASSOCHAM in 2018. Institute was awarded by 94.3 MY FM for "Excellence in Faculty (Engineering & Technology)". Institute is 3 star Super RESOURCE center for spoken tutorial project of IIT-Bombay funded by MHRD, Govt. of India. Student Team Greenitious as Best Design Award for Effi-Cycle was awarded by SAE LD Collegiate Club. Institute has also hosted GTU Zonal Techfest 2015 and 2018 of Gandhinagar Zone. Team Renosters participated in ATV car design competition "BAJA STUDENT INDIA" held at NIT, Jamshedpur and got 20th position in all over India. Institute won ISHRAE "A-Quest" quiz competition at Zonal Level and appreciated by GTU for creating student innovation and Start-up Ecosystem in campus. For the thirteen consecutive year an annual technical symposium TechXtreme 2020 was successfully organized by the institute. More than 3000 students of various technical institutions across the Gujarat participated in the Techfest. Annual cultural event Jazba 2019 was organized with participation of more than 1500 students.

When Gandhinagar Institute of technology has been closed, along with other engineering colleges in the State, it was an unforeseen situation for the students and the faculty. The management, director and faculties discussed ways and means to work out possible alternatives. The outcome was the decision to migrate to an online model to teach remotely, conduct seminars, assignments and other activities and tremendous output has been got in this pandemic situation.

I am very grateful to our respectable trustees as amidst the nationwide lockdown, no matter how uncertain, strange, challenging and stressful life is in coronavirus pandemic outbreak, the support of our management is unforgettable and appreciated. It gives me immense pride to state that as a result of the collective effort of the faculty, students and staff over the past few years Gandhinagar Institute of Technology today ranks among the top technical institutions of the state. I am hopeful of its acquiring greater heights in the years to come.

Dr H N Shah
Director & Chief Editor

# Index

# Analysis of risk in construction project

Dhruvil Devani[a], Manthan Dhavne[a], Harsh Gopani[a], Priyanka Dalal[a*]

*[a]Gandhinagar Institute of Technology, Motibhoyan, Gandhinagar, India*

**Abstract**

In construction industry decisions are based on future forecast and project environment. In early day's environment were steady because of shorter period of project but now a days project duration is in the years. There are a great chances of uncertainty found in project environment. In general, "Risk" is signifies conditions where truly outcome of an activity is likely to deviate from the projected value. Construction industry is highly risk prone, with intricate and dynamic project environments creating an atmosphere of high uncertainty and risk. As a result, the people working in the industry tolerate various failures, such as, failure of abiding by quality and operational requirements, cost overruns and uncertain delays in project completion. Objective of this research is to identify and evaluate various risk and uncertainties in a construction project through extensive literature survey and data available from contractor. Risks then will be scrutinized by various methods of risk analysis and then risks are ranked and quantified as per their probability and impact on the project cost.

*Keywords*: Risk management; Construction management; Risk analysis.

## 1. Preface

In construction industry dynamic project environments creates an atmosphere of high uncertainty and risk. The industry is susceptible to various technical, sociopolitical and business risks. The track record to cope with these risks has not been very good in construction industry. As a result, the people working in the industry bear various failures, such as, failure of abiding by quality and operational requirements, cost overruns and uncertain delays in project completion. It is challenging task to provide effective system of risk assessment and management for construction industry. Applying effective risk mitigation technique can reduce effects of foremost risks like time overrun, cost overrun, etc. In construction project, managing risk are very important. Some risk cannot be prevented like natural disaster, weather conditions, etc. but we can find source of risk and probable risk events with help of some tools and techniques.

## 2. Analyzed research data

### 2.1 Materials & Tools

The risk identification method or risk information gathering process can be achieved with the aid of diverse tools and techniques. The most common tools and techniques are: documentation reviews, adopt judgment, diagramming techniques, hypothesis analysis, information accumulation, checklists and SWOT technique.

Table 1. Materials & Tools

| Process | Tools | Outcome |
|---|---|---|
| **Risk identification** | Information source<br>Risk breakdown analysis<br>System flow analysis<br>Experts judgment<br>Brain storming | Source and potential risk events |
| **Risk analysis** | Risk quantification techniques<br>Risk ranking techniques | Risk contingency allowance & assessment |

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*Priyanka Dalal
*Email address:* priyanka.dalal@git.org.in

*2.2  Site overview*

- Type of Building: Residential Building
- Location: Gandhinagar
- G + Seven floors
- Status: Under construction
  As the site was under construction, it was easy to understand the consequences of risks associated with the project & how it overall affects the project duration & cost.

*2.3 Required Data*

- Detail drawings of site
- Scheduling of project
- Method of working
- Estimated quantities
- Current financial status of project
- Cash flow chart

## 3. Risk Identification

Risk identification is an iterative procedure that involves the project team, stakeholders and other managers affected by or who affect the project, and finally outside individuals who can comment on the completeness of the risk identification based on their similar experiences (Wysocki, 2004).

*3.1 Risk Breakdown Structure Method*

- List of likely risks: make the list as comprehensive as possible
- Assess the probability of each risk occurring and assign it a rating for instance you could use a scale of 0 to 100. Assign score 0 when a risk is extremely unlikely to occur, and use a score of 100 when the risk is extremely likely to occur.

Table 2. Identified Risks

| Sr.no | Risk Categories | Project Risks |
|---|---|---|
| 1 | Technical Risk | Unavailability of materials |
|   |   | Inadequate pre-construction survey |
|   |   | Design delay |
|   |   | Quality control issue |
|   |   | Labour accident |
|   |   | Inadequate site storage |
|   |   | Problems with designs |
|   |   | Gap of knowledge |
|   |   | Temporary diversion of sewage pipes, electricity cables, etc. Faulty plumbing installation |
|   |   | Faulty electrical installation |
| 2 | External risks | Public objection |
|   |   | Tax changes |
| 3 | Project management risks | Scheduling errors |
| 4 | Construction risks | Cost overrun |
|   |   | Technology change |
| 5 | Organizational risks | Inexperienced work force and staff turnover |
|   |   | Delayed deliveries |
|   |   | Lack of protection on site |
| 6 | Design risks | Design process takes longer time than anticipated |
| 7 | Environmental risks | Weather conditions |
|   |   | Environmental analysis incomplete |

- Estimate the impact on project, if risk is occurs. Again do this for each and every risk on your list using your 0 to 100 scale. Assign 0 for little impact and 100 for catastrophic or an enormous impact.
- Map out the evaluations on a risk impact/probability chart.
- Develop the response to each risks, according to its position in the chart.

Using risk breakdown structure, we distinguished 20 risks in seven different classifications.

*3.2 Method of Risk Assessment*

Generally subjective method of probability is used in real life situation. The two frequently used techniques are "Nominal group technique" and "Delphy method".
Procedure for Delphy method:
- Select panel of professionals from both inside and outside of company.
- Now experts make their prediction on subject.
- Amass all replies and send it to each expert for feedback.
- Repeat this process till unanimity is reached among the expert
For reference provide this table to expert to narrow down the gap

Table 3. Probability Assignment Indicator

| Probability Assignment Indicator | |
|---|---|
| Factual statement | 100 |
| Almost likely | 90 |
| Highly probable | 80 |
| Very good chance | 70 |
| Likely | 60 |
| Probable | 50 |
| Doubtful | 40 |
| Improbable | 30 |
| Unlikely | 20 |
| Little chance | 10 |
| Highly unlikely | 5 |
| No chance | 0 |

*3.3 Impact Assessment of Risk*

By use of Delphy Technique & risk impact assessment table, we tend to more filtered them as per their occurrence & impact on the project.

Table 4. Probability – Impact Matrix

| | **Risk impact** | | |
|---|---|---|---|
| **Consequences** | **Probability** | | |
| | Low 0-30% | Medium 30-60% | High Above 60% |
| Low value (say within Rs. 10000) | Low probability Low impact | Medium probability Low impact | High probability Low impact |
| Medium value (say within Rs. 10000 to Rs. 50000) | Low probability Medium impact | Medium probability Medium impact | High probability Medium impact |
| High value (say above Rs. 50000) | Low probability High impact | Medium probability High impact | High probability High impact |

# 4. Results

Table 5. Risk rating

| Sr.no | Risk Categories | Project Risk | Probability | Impact |
|---|---|---|---|---|
| 1 | Technical Risk | Unavailability of materials | Medium | Low |
| | | Inadequate pre-construction survey | Low | High |
| | | Design delay | Medium | Low |
| | | Quality control issue | Medium | High |
| | | Labour accident | Medium | High |
| | | Inadequate site storage | Medium | Medium |
| | | Problems with designs | Low | Medium |
| | | Gap of knowledge | Medium | High |
| | | Temporary diversion of sewage pipes, electricity cables, etc. Faulty plumbing installation | Low | Low |
| | | Faulty electrical installation | Low | High |
| 2 | External risks | Public objection | Low | Medium |
| | | Tax changes | Low | Medium |
| 3 | Project management risks | Scheduling errors | Medium | High |
| 4 | Construction risks | Cost overrun | High | High |
| | | Technology change | Medium | Medium |
| 5 | Organizational risks | Inexperienced work force and staff turnover | Medium | Medium |
| | | Delayed deliveries | Medium | Medium |
| | | Lack of protection on site | Medium | High |
| 6 | Design risks | Design process takes longer time than anticipated | Low | Low |
| 7 | Environmental risks | Weather conditions | Low | High |
| | | Environmental analysis incomplete | Medium | High |

# 5. Conclusion

This paper summaries that how certain risks affect construction projects significantly in terms of cost and time. Lack of protection on site causes labour accidents that have severe implications on the project reputation. For a project getting media courtesy for the incorrect reasons can demotivate stakeholders. Moreover from the economic point of view compensations made due to this causes indirect cost to surge. Gap of knowledge create an environment of confusion which leads to unforeseen delay and cost increment. Substandard material and workmanship may bear short term economic benefits but in the long run fascinates higher maintenance costs and design life decreases radically. Cost overruns and schedule delay can cause allocative inefficiency of scarce resources, contractual disputes, claims and litigation to project failure and total abandonment. Environmental Impact Assessment report becomes important when the project is believed to cause environmental imbalance in the local area. An EIA report creates a sense of cooperative faith in local public and NGOs mitigating social risks. Above mentioned risks are relevant in construction industry but a very little attention is paid to it.

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# Augmented Reality: Survey, Applications and Recent Advances

Krishna Hingrajiya[a*]

[a]*Assistant Professor, Gandhinagar Institute of Technology, Motibhoyan, Gandhinagar, India*

**Abstract**

Augmented Reality (AR) Technology, in which virtual content is seamlessly integrated with displays of real-world scenes, is a fast growing area of interactive design. This paper surveys the current state-of-art in field of Augmented Reality and describes the medical, manufacturing, visualization, path planning, entertainment and military applications that have been explored. With the increasing use of personal mobile devices capable of producing interesting augmented reality environments, the vast potential of AR has begun to be explored. Registration and sensing errors are two of the biggest problems in developing effective Augmented Reality systems, so this paper also specifies current tradeoffs and approaches taken so far to overcome these problems. Future directions and areas requiring further advancements are discussed. This survey provides a base for anyone interested in developing or using Augmented Reality.

*Keywords*: Augmented Reality, Virtual Environments, Mobile Technology

## 1. Introduction

### 1.1 Brief Background

The term "Augmented Reality" was originally coined by Tom Caudell, a former Boeing researcher, in 1990. The first applications of AR appeared in the late 1960s and 1970s. In 2002, Bruce H. Thomas invented the first outdoor Augmented Reality game ARQuake. Early mobile applications began to appear in 2008, and several AR mapping and social tools are now on the market.

### 1.2 Definition

*Augmented Reality* (AR) is a variation of *Virtual Environments* (VE), or Virtual Reality as it is more commonly called. VE technologies completely immerse a user inside a synthetic environment. While immersed, the user cannot see the real world around him. In contrast, AR allows the user to see the real world, with virtual objects superimposed upon or composited with the real world. Therefore, AR supplements reality, rather than completely replacing it. Ideally, it would appear to the user that the virtual and real objects coexisted in the same space. Augmented Reality (AR) technology is the process of superimposing digitally rendered images onto our real world surroundings, giving a sense of an illusion or virtual reality. In other words, AR is type of virtual reality that aims to duplicate the world's environment in a computer.
*Goal*

The objective of AR is to create a system in which the user cannot sense the difference between the real world and the virtual augmentation of it. AR blurs the line between what's real and what's computer-generated by enhancing what we see, hear, feel and smell. It is interactive in real time and registered in 3D. *Registration* refers to the accurate alignment of real and virtual objects. Without accurate registration, the illusion that the virtual objects exist in the real environment is severely compromised. Registration is a difficult problem and a topic of continuing research.
*Motivation*

Augmented Reality enhances a user's perception of and interaction with the real world. The virtual objects display information that the user cannot directly detect with his own senses. The information conveyed by the virtual objects helps a user to perform real-world tasks. AR is a specific example of what Fred Brooks calls *Intelligence Amplification* (IA): using the computer as a tool to make a task easier for a human to perform

## 2. Applications of AR

At the time of writing this paper, at least 12 distinct classes of AR application areas have been identified. These classes include well-established fields like medical, military, manufacturing, entertainment, visualization, and robotics. They also include original and new areas such as education, marketing, geospatial, navigation and path planning, tourism, urban planning and civil engineering. The following sub-sections describe recent research project that have been done in each area. While these do not exhaustively cover every application area of AR technology, they do cover the areas explored so far.

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*Krishna Hingrajiya
*Email address:* krishna.hingrajiya@git.org.in

*2.1 Medical*

Medical augmented reality takes its main motivation from the need of visualizing medical data and the patient within the same physical space. This would require real-time in-situ visualization of co-registered heterogeneous data, and was probably the goal of many medical augmented reality solutions proposed in literature Figure 1.

Another application for augmented reality in the medical field is in ultrasound imaging [21]. Using an optical see through display the ultrasound technician can view a volumetric rendered image of the fetus overlaid on the abdomen of the pregnant woman. The image appears as if it was inside of the abdomen and is correctly rendered as the user moves sielhorst2008. Moreover, Blum et al. describe the first steps towards a Superman-like X-ray vision where a brain-computer interface (BCI) device and a gaze tracker are used to allow the user controlling the AR visualization [22]. More recently, Wen et al. propose a cooperative surgical system, guided by hand gestures and supported by an augmented reality based surgical field [23]. The authors establish a system-assisted natural AR guidance mechanism that incorporates the advantages of the following aspects: AR visual guidance information, surgeon's experiences and accuracy of assisted surgery [24].

Doctors could use Augmented Reality to collect 3-D datasets of a patient in real time, using noninvasive sensors like Magnetic Resonance Imaging (MRI), Computed Tomography scans (CT), or ultrasound imaging. These datasets could then be rendered and combined in real time with a view of the real patient. In effect, this would give a doctor "X-ray vision" inside a patient. This would be very useful during minimally invasive surgery, which reduces the trauma of an operation by using small incisions or no incisions at all. A problem with minimally-invasive techniques is that they reduce the doctor's ability to see inside the patient, making surgery more difficult. AR technology could provide an internal view without the need for larger incisions.



(a)                                          (b)                                          (c)
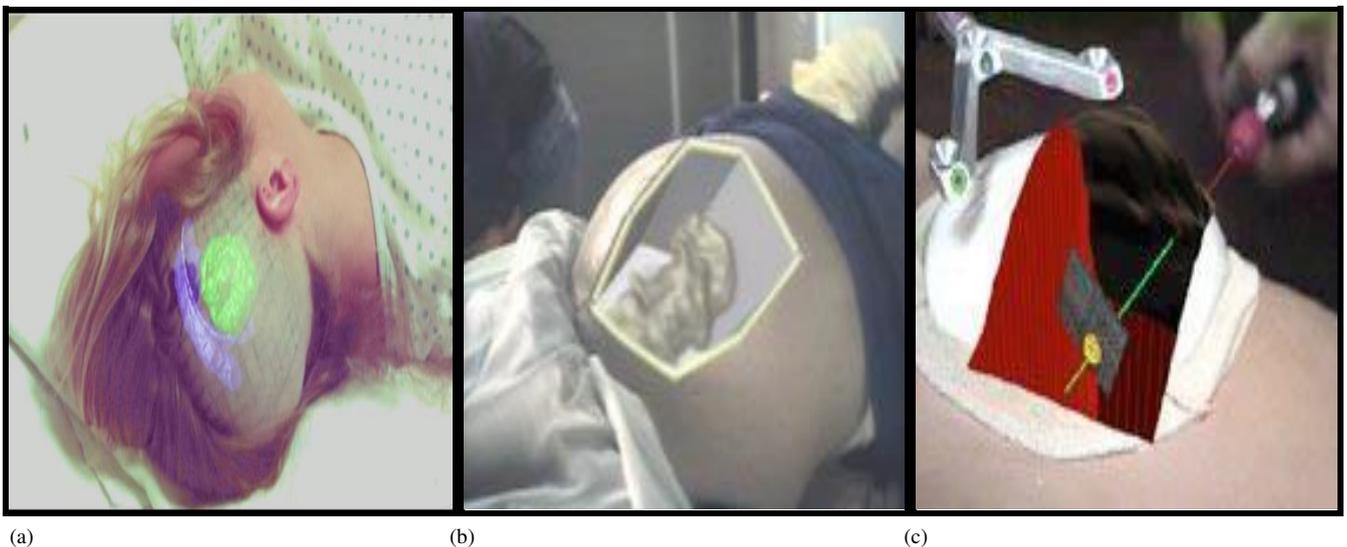
Fig. 1. AR in Medical Field (a) guided surgery (b) Virtual fetus inside womb of pregnant patient. (Courtesy UNC Chapel Hill Dept. of Computer Science.)
(c) Mockup of breast tumor biopsy. 3-D graphics guide needle insertion. (Courtesy UNC Chapel Hill Dept. of Computer Science.)

*2.2 Military*

For many years, military aircraft and helicopters have used Head-Up Displays (HUDs) and Helmet-Mounted Sights (HMS) to superimpose vector graphics upon the pilot's view of the real world. Besides providing basic navigation and flight information, these graphics are sometimes registered with targets in the environment, providing a way to aim the aircraft's weapons. For example, the chin turret in a helicopter gunship can be slaved to the pilot's HMS, so the pilot can aim the chin turret simply by looking at the target. Future generations of combat aircraft will be developed with an HMD built into the pilot's helmet [Wanstall89].

AR can be used to display the real battlefield scene and augment it with annotation information [25]. The helicopter night vision system was developed by Canada's Institute for Aerospace Research (NRC-IAR) using AR to expand the operational envelope of rotor craft and enhance pilots' ability to navigate in degraded visual conditions [28]. HMD was developed to a display that can be coupled with a portable information system in military [29]. Extra benefits specific for military users may be training in large-scale combat scenarios and simulating real-time enemy action, as in the Battlefield Augmented Reality System (BARS) by Julier et al. [30]. The BARS system also provides tools to author the environment with new 3D information that other system users see in turn [31].

*2.3 Manufacturing*

Another category of Augmented Reality applications is the assembly, maintenance, and repair of complex machinery. Instructions might be easier to understand if they were available, not as manuals with text and pictures, but rather as 3-D drawings superimposed upon the actual equipment, showing step-by-step the tasks that need to be done and how to do them. These superimposed 3-D drawings can be animated, making the directions even more explicit.

The challenge in the manufacturing field is to design and implement integrated AR manufacturing systems that could enhance manufacturing processes, as well as product and process development, leading to shorter lead-time, reduced cost and improved quality [4].

The ultimate goal is to create a system that is as good as the real world, if not better and more efficient. AR can enhance a person's perception of the surrounding world and understanding of the product assembly tasks to be carried out [32]. Using an AR approach, graphical assembly instructions and animation sequences can be pre-coded at the design stage for typical procedures Figure 2(a). These sequences can be transmitted upon request and virtually overlaid on the real products at the assembly lines as and when they are needed. The instructions and animations are conditional and can be automatically adjusted to actual conditions at the assembly lines. These instructions and animated sequences can be updated periodically with updated knowledge from the manufacturers. This approach can reduce the information overload and the training required for assembly operators. It can reduce product assembly time, thus reducing product lead-time.



(a)                                (b)                                (c)

Fig. 2. (a) product assembly (b) Virtual lines help display geometry of shuttle bay, as seen in orbit. (Courtesy David Drascic and Paul Milgram, U. Toronto.) (c) navigation in urban environments.

*2.4 Visualization*

AR is a useful visualization technique to overlay computer graphics on the real world. AR can combine visualization method to apply to many applications [34]. A vision-based AR system was presented for visualization interaction in [35]. A device, GeoScope, was developed to support some applications such as city, landscape and architectural visualization in [36]. AR visualization for laparoscopic surgery was approached in [37].

An architect with a see through HMD might be able to look out a window and see how a proposed new skyscraper would change her view. If a database containing information about a building's structure was available, AR might give architects "X-ray vision" inside a building, showing where the pipes, electric lines, and structural supports are inside the walls [Feiner95]. Researchers at the University of Toronto have built a system called Augmented Reality through Graphic Overlays on Stereovideo (ARGOS), which among other things is used to make images easier to understand during difficult viewing conditions [Drascic93a]. Figure 2 (b) shows wireframe lines drawn on top of a space shuttle bay interior, while in orbit. The lines make it easier to see the geometry of the shuttle bay. Similarly, virtual lines and objects could aid navigation and scene understanding during poor visibility conditions, such as underwater or in fog.

*2.4 Navigation and Path Planning*

Navigation in prepared environments has been tried and tested for some time. Rekimoto [6] presented NaviCam for indoor use that augmented a video stream from a hand held camera using fiducial markers for position tracking. Starner et al. [7] consider applications and limitations of AR for wearable computers, including problems of finger tracking and facial recognition. Narzt et al. [8] discuss navigation paradigms for (outdoor) pedestrians and cars that overlay routes, highway exits, follow-me cars, dangers, fuel prices, etc Figure 2(c). They prototyped video see-through PDAs and mobile phones and envision eventual use in car windshield heads-up displays.

Results clearly show that the use of augmented displays result in a significant decrease in navigation errors and issues related to divided attention when compared to using regular displays [7]. Nokia's MARA project31 researches deployment of AR on current mobile phone technology.

*2.5 Entertainment and Games*

Augmented reality has been applied in the entertainment field to create games, but also to increase visibility of important game aspects in life sports broadcasting. In these cases where a large public is reached, AR can also serve advertisers to display virtual ads and product placements. Swimming pools, football fields, race tracks and other sports environments are well-known and easily prepared, which video see-through augmentation through tracked camera feeds easy [13]. One example is the Fox-Trax system [37], used to highlight the location of a hard-to-see hockey puck as it moves rapidly across the ice, but AR is also applied to annotate racing cars, snooker ball trajectories, life swimmer performances, etc [38]. Thanks to predictable environments (uniformed players on a green, white, and brown field) and chroma-keying techniques, the annotations are shown on the field and not on the players [39].

At SIGGRAPH '95, several exhibitors showed "Virtual Sets" that merge real actors with virtual backgrounds, in real time and in 3-D. The actors stand in front of a large blue screen, while a computer-controlled motion camera records the scene. Since the camera's location is tracked, and the actor's motions are scripted, it is possible to digitally composite the actor into a 3-D virtual background. The ALIVE project from the MIT Media Lab goes one step further by populating the environment with intelligent virtual creatures that respond to user actions [Maes95].

*2.6 Robotics*

AR is an ideal platform for human-robot collaboration [40]. Medical robotics and image guided surgery based AR was discussed in [32]. Predictive displays for telerobotics were designed based on AR [33]. Using AR tools for the teleoperation of robotic systems was described in [34]. It was developed how to improve robotic operator performance using AR in [35]. It was explored for AR technique to improve immersive robot programming in unknown environments in [36]. Figure 3 shows how a virtual outline can represent a future location of a robot arm.
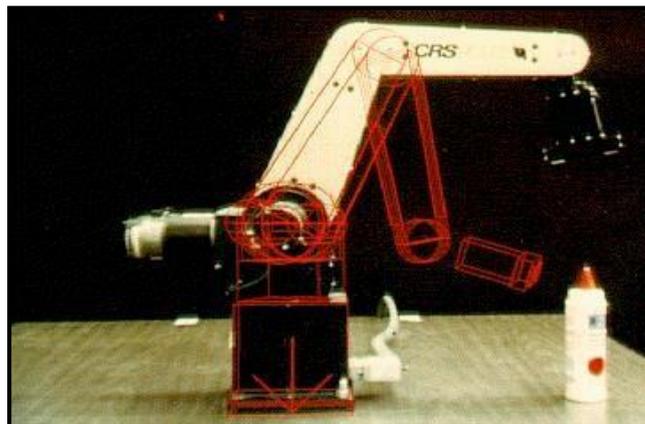


Fig. 3. Virtual lines show a planned motion of a robot arm (Courtesy DavidDrascic and Paul Milgram, U. Toronto.)

Teleoperation of a robot is often a difficult problem, especially when the robot is far away, with long delays in the communication link. Under this circumstance, instead of controlling the robot directly, it may be preferable to instead control a virtual version of the robot. The user plans and specifies the robot's actions by manipulating the local virtual version, in real time. The results are directly displayed on the real world. Once the plan is tested and determined, then user tells the real robot to execute the specified plan. This avoids pilot-induced oscillations caused by the lengthy delays. The virtual versions can also predict the effects of manipulating the environment, thus serving as a planning and previewing tool to aid the user in performing the desired task. The ARGOS system has demonstrated that stereoscopic AR is an easier and more accurate way of doing robot path planning than traditional monoscopic interfaces [Drascic93b] [Milgram93].

*2.7 Education*

New possibilities for teaching and learning provided by AR have been increasingly recognized by educational researchers. The coexistence of virtual objects and real environments allows learners to visualize complex spatial relationships and abstract concepts [16], experience phenomena those are not possible in the real world, interact with two and three dimensional synthetic objects in the mixed reality, and develop important practices that cannot be developed and enacted in other technology-enhanced learning environments. These educational benefits have made AR one of the key emerging techniques for education over the next five years.

*2.8 Marketing*

Augmented reality was first used for advertising in the automotive industry. Some companies printed special flyers that were automatically recognized by webcams, causing a three dimensional model of the advertised car to be shown on the screen. This approach then spread to various marketing niches, from computer games and movies to shoes and furniture. An example of more complex augmented reality is virtually trying on shoes. The user wears a special pair of socks, then walks in front of a camera and sees his image on the screen wearing a desired pair of shoes. The model, color and accessories of the shoes can be changed in an instant, allowing the user to easily find the most attractive footwear. On a larger scale, AR techniques for augmenting for instance deformable surfaces like cups and shirts and environments also present direct marketing agencies with many opportunities to offer coupons to passing pedestrians, place virtual billboards, show virtual prototypes, etc. With all these different uses, AR platforms should preferably offer a filter to manage what content they display.

*2.10 Tourism*

The ARCHEOGUIDE, a project AR based cultural heritage on-site guide, was described to provide cultural-heritage sites with archaeological information to visitors [27]. One design, Augmented City, with information sharing and filtering was proposed for tourist guide based on AR technology in [29].

The design of AR interfaces was approached for guided tours (visiting cultural heritage places) using multimedia sketches in [28]. AR technologies were used to enhance tourists' knowledge exploration experience, exhibitions, mobile multimedia museum guide and viewing in museum in [7] respectively.

*2.11 Geospatial*

Hardware and software were described for collaborative geographic data representation and manipulation using two interfaces based AR. AR can be used for planning of military training in urban terrain. A tangible augmented street map (TASM) based AR was developed in [18]. One system based MAR techniques was developed for building and presenting geographical information in [8].

*2.12 Urban Planning and Civil Engineering*

AR is a decision support way of in architecture and interior design. A system was presented for constructing collaborative design applications based on distributed AR in [13]. It was developed for using AR systems to improve methods for the construction, inspection, and renovation of architectural structures in [15] Figure 4.

A System based on AR with a tangible interface was demonstrated for city planning in [9]. AR user interaction techniques were developed to support the capture and creation of 3D geometry of large outdoor construction structures in [1]. A co-operative AR design system, A4D, for AEC (architectural, engineering and construction) was approached in [2]. It was presented that a system with human computer interaction, AR visualization and building simulation can interact with buildings [3]. AR as tool was approached to be used in architecture, building performance visualization, retrieving information of building equipment and construction management in [4] respectively.
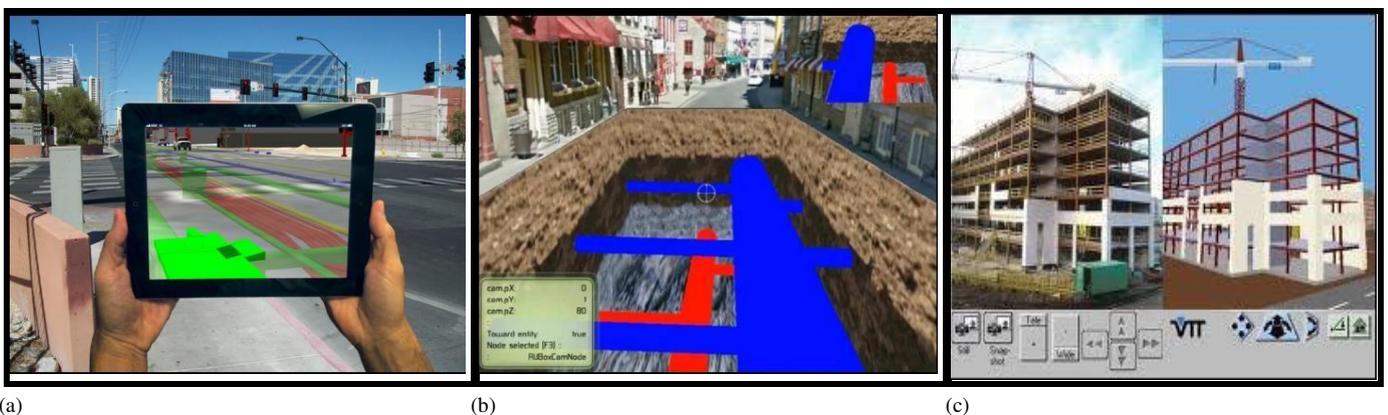


(a)                                        (b)                                        (c)

Fig. 4. Applications of AR in the area of ACE (Architecture, Construction and Engineering).

## 3. Challenges and Issues

Despite the growing interest in AR and the large body of advancements and research, several challenges and issues still exist and need to be overcome. In this section, the limits that characterize the current state of the art of AR based on the following aspects are classified: technology, social acceptance, usability. Considerable advancements made in each of the aspects discussed in this paper. AR system has to deal with large amount of information in reality. Therefore the hardware used should be compact, light, and easily portable and fast enough to display graphics. Also the battery life used by these complicated AR devices is another limitation for AR's uses. Also, AR tracking needs some system hardware such as GPS to provide accurate marker, ask them to be both accurate and reliable enough. These hardware obstacles need to be resolved for practical AR use. AR systems usually obtain a lot of information, and need software to filter the information, retain useful information, discard useless data and display it in a convenient way.

## 4. Conclusion

Several possible future directions are speculated for further research. Many HMDs created specifically with AR in mind need to be developed. HMDs are still too clumsy and have limited field of vision, contrast and resolution. HMDs and other wearable equipments, such as data-gloves and data suits, is a limitation for the user. All wearable equipments need be developed to be lighter, smaller and easier to work with the user. Also the AR system researchers need consider other challenges such as response time delays, hardware or software failures from AR systems. One limitation of AR systems is registration error. Occlusion detection is an active area of study of AR systems. Analyzing various tracking methods, possible tracking research directions are identified that allow researchers to effectively capitalize on knowledge in video frames or integrate vision-based methods with other sensors in a novel way.

## 5. Future Trends

Despite the many recent advances in AR, much remains to be done. Here are nine fields requiring further research if AR is to become commonly deployed.

*Ubiquitous tracking and system portability:* Several impressive AR demonstrations have generated compelling environments with nearly pixel-accurate registration. However, such demonstrations work only inside restricted, carefully prepared environments. The ultimate objective is a tracking system that supports accurate registration in any arbitrary unprepared environment, indoors or outdoors, allowing AR systems to go anywhere also requires portable and wearable systems that are comfortable and unobtrusive.

*Ease of setup and use:* Most existing AR systems require expert users (generally the system designers) to calibrate and operate them. If AR applications are to become commonplace, then the systems must be deployable and operable by non-expert users. This requires more robust systems that avoid or minimize calibration and setup requirements. Some research trends supporting this need include calibration-free and auto calibration algorithms for both sensor processing and registration.

*Broader sensing capabilities:* Since an AR system modifies the user's perception of the state of the real environment, ideally the system needs to know the state of everything in the environment at all times. Instead of just tracking a user's head and hands, an AR system should track everything: all other body parts and all objects and people in the environment. Systems that acquire real-time depth information of the surrounding environment, through vision-based and scanning light approaches, represent progress in this direction.

*Interface and visualization paradigms:* Researchers must continue developing new interface techniques to replace the WIMP standard, which is inappropriate for wearable AR systems. New visualization algorithms are needed to handle density, occlusion, and general situational awareness issues. The creation and presentation of narrative performances and structures may lead to more realistic and richer AR experiences.

*Proven applications:* Many concepts and prototypes of AR applications have been built but what is lacking is experimental validation and demonstration of quantified performance improvements in an AR application. Such evidence is required to justify the expense and effort of adopting this new technology [15].

*User studies and perception issues:* Few user studies have been performed with AR systems, perhaps because few experimenters have access to such systems. Basic visual conflicts and optical illusions caused by combining real and virtual require more study. Experimental results must guide and validate the interfaces and visualization approaches developed for AR systems.

*Photorealistic and advanced rendering:* Although many AR applications only need simple graphics such as wireframe outlines and text labels, the ultimate goal is to render the virtual objects to be indistinguishable from the real. This must be done in real time, without the manual intervention of artists or programmers. Some steps have been taken in this direction,

although typically not in real time. Since removing real objects from the environment is a critical capability, developments of such Mediated Reality approaches are needed.

*AR in all senses:* Researchers have focused primarily on augmenting the visual sense. Eventually, compelling AR environments may require engaging other senses as well (touch, hearing, etc.) For example, recent systems have demonstrated auditory [5] and haptic AR environments [8].

*Social acceptance:* The tracking required for information display can also be used for monitoring and recording. How will non-augmented users interact with AR-equipped individuals? Even fashion is an issue: will people willingly wear the equipment if they feel it detracts from their appearance?

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# Castigation of Ransomware and Malware: Malware Analysis for Cyber Security

Nisha Patel[a*]

*[a]Assistant Professor, Gandhinagar Institute of Technology, Motibhoyan, Gandhinagar, India*

**Abstract**

As this is the technocrat era of cyber attacks, we all are having fear of losing whether it may be information or our own cyber privacy or resources. During a castigation that the castigator is, in their own misguided way, trying to make you a better person. In the context of this meaning the castigation of hackers and crackers are meant by itself the attack defensive techniques by their exploration times or its execution times. This paper depicts the brief concepts of malware and ransomware attacks and malware analysis process along with the malware **Stuxnet** in appendix of a paper which is a computer worm that was discovered in June 2010. It was designed to attack industrial programmable logic controllers (PLCs). Stuxnet has gained a lot of attention from malware researchers and media in the last year.

*Keywords*:  Malware Analysis, Malware attack, Ransomware attack, Botnet, Vulnerability

## 1. Introduction

Malware — a term used for viruses, Trojans, spywares or any malicious code — is widespread today. Malware (for "malicious software") is any program or file that is harmful to a computer user. Ransomware is a type of malware which restricts access to the computer system that it infects, and demands a ransom paid to the creator(s) of the malware in order for the restriction to be removed. Some forms of ransomware encrypt files on the system's hard drive (cryptoviral extortion, a threat originally envisioned by Adam Young and Moti Yung), while some may simply lock the system and display messages intended to coax the user into paying.

*1.1 Malware Life Cycle*

In order to effectively analyze malware we first need to have a basic understanding of the types of malware and the typical life cycle of it. Below in this page, the most typical parts of the cycle are described. However, the life cycle may vary greatly depending on a number of circumstances, such as type of malware, author, environment and many more [1]. Since our last Security Threat Report, malware and related IT security threats have grown and matured, and the developers and publishers of malicious code and websites have become far more creative in camouflaging their work. In 2013, botnet and exploit kit innovations that were once restricted to the cutting edge have proliferated, as new malware authors learn from the experiences and released source code of their predecessors. Cybercriminals have become more adept at eluding identification, relying more heavily on cryptography and increasingly placing their servers in the darknet—closed, anonymous areas of the Internet designed to resist surveillance [3].

*1.2 Security Insights across four key areas*

➤ Trust

All organizations should be concerned about finding the right balance of trust, transparency, and privacy because much is at stake. In this area, we address three pressures that make security practitioners' attempts to help their organizations achieve this balance even more challenging:

• Greater attack surface area.
• Proliferation and sophistication of the attack model.
• Complexity of threats and solutions [4].

➤ Threat Intelligence

Using the largest set of detection telemetry available, Cisco and Sourcefire together have analyzed and assembled security insights from the past year:

*Nisha Patel
*Email address*: nisha.patel@git.org.in

• Attacks against infrastructure are targeting significant resources across the Internet.
• Malicious actors are using trusted applications to exploit gaps in perimeter security.
• Indicators of compromise suggest that network penetrations may be undetected over long periods [4].

➢ Industry

In this section, Cisco Security Intelligence Operations (SIO) investigators elevate the discussion around industry trends that extend beyond Cisco's telemetry, yet still affect security practices—from brute-force login attempts, large-scale DDoS activity, and ransomware efforts to the growing reliance on the cloud, lack of security talent, and other concerns [4].

➢ Recommendations

Organizations are facing a greater attack surface, the growing proliferation and sophistication of attack models, and increasing complexity within the network. Many are struggling to solidify a security vision supported by an effective strategy that uses new technologies, simplifies their architecture and operations, and strengthens their security teams. This section covers how a threat-centric security model enables defenders to address the full attack continuum, across all attack vectors, and to respond at any time, all the time, in a continuous fashion—before, during, and after an attack [4].

*1.3  Infection Technique through a dropper written as a Java Applet*

This commonly involves a "malicious" and volatile routine, a dropper that usually doesn't stay resident in the target system. This may be in the form of a JavaScript, Java Applet, and Flash Animation, a weaponized document, media file or any other temporary routine executed in the target computer. The most common routine is as simple as; download and execute in the context of the current user, and this routine is not very malicious per se. Below is an example of a dropper written as a Java Applet for Facebook Apps that I reverse engineered some years ago [1]:

```java
1
2  import java.applet.Applet;
3  import java.io.*;
4  import java.net.URL;
5  import java.net.URLConnection;
6
7  public class TargetOrganization extends Applet
8  {
9
10     public TargetOrganization()
11     {
12     }
13
14     public void init()
15     {
16         String s = "java.exe";
17         String s1 = System.getenv("TEMP");
18         String s2 = "";
19         try
20         {
21             FileOutputStream fileoutputstream = new FileOutputStream(( \
22                 new StringBuilder()).append(s1).append(s).toString());
23             URL url = new URL("http://apps.feacaebook.com/some-target-org/java.exe");
24             URLConnection urlconnection = url.openConnection();
25             InputStream inputstream = urlconnection.getInputStream();
26             byte abyte0[] = new byte[1024];
27             int i;
28             while((i = inputstream.read(abyte0, 0, abyte0.length)) != -1)
29                 fileoutputstream.write(abyte0, 0, i);
30             inputstream.close();
31             fileoutputstream.close();
32             Runtime runtime = Runtime.getRuntime();
33             runtime.exec((new StringBuilder()).append(s1).append(s).toString());
34         }
35         catch(IOException ioexception) { }
36     }
37  }
```

Fig. 1. Example of a dropper written as a Java Applet for Facebook Apps [1].

As you can see, it's quite simple really. It just downloads another program and executes it, nothing more. The URL gives us a hint that this is just one of many attack campaigns as this sample is sorting us in into our own directory. The real name of the organization has been exchanged for the string "some-target-org" [1].

WARNING! The link in the code listing above did supply live malware a while ago. Do not visit this link other from a dedicated analysis station. Malware providing sites like these tend to come and go before the eventually die [1].

**2. The Malware Analysis Process**

We can define "Malware Analysis" to encompass how organizations confirm, analyze, and then address malware infections. This is important because anti-malware defenses are clearly insufficient, and far too much malware makes it through. When you get infected, you initiate a process to figure out what happened. First you need to figure out what the attack is, how it works, how to stop or work around it, and how far it has spread within your organization. That's all before you can even think about *fixing* anything. So let's jump in with both feet [2]. Modern malware is all about stealth. **Advanced persistent threats (APTs)**, one of the most vicious examples of a stealth threat precisely target individuals, businesses, governments and their data. APTs are a sophisticated weapon to carry out targeted missions in cyber space. Data leaks—including espionage and exposure of corporate data—were a primary theme this past year. Reflecting on the security and threat landscape of 2013, one trend that stands out is the growing ability of malware authors to camouflage their attacks. Widespread dissemination of advanced botnet and exploit kit source code allows more malware authors to create innovative and diverse new attacks [3].
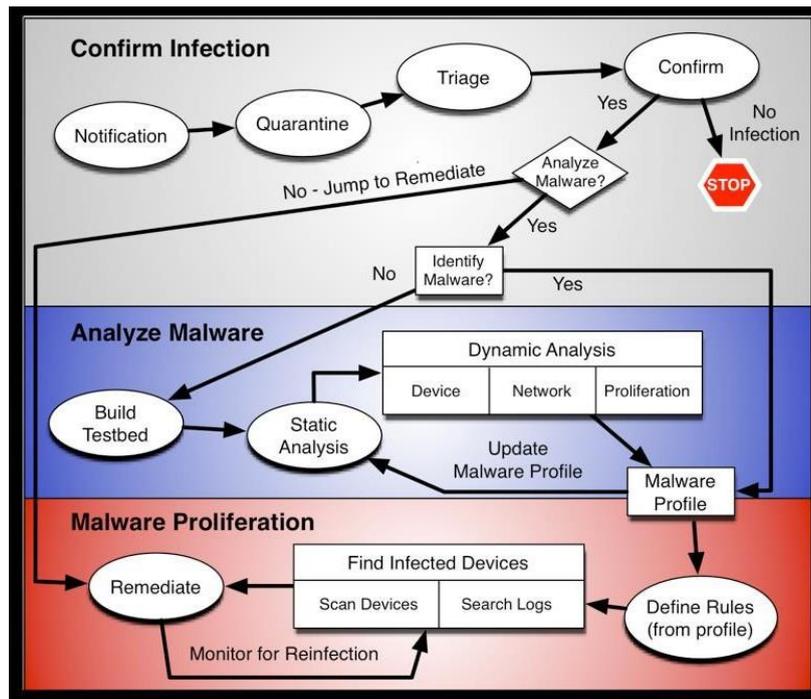


Fig. 2. The Malware Analysis Process [2].

The process is broken up into 11 separate phases across three subprocesses:

➢   Confirm Infection

This process typically starts when the help desk gets a call. How can they confirm a device has been infected?

1. Notification: The process can start in a number of ways, including a help desk call, an alert from a third party (such as a payment processor or law enforcement), or an endpoint suite alert. However it starts you need to figure out whether it's a real issue [2].

2. Quarantine: The initial goal is to contain the damage, so the first step is typically to remove the device from the network to prevent it from replicating or pivoting (jumping to another device on your network) [2].

3. Triage: With the device off the net you have a chance to figure out how sick it is. This involves all sorts of quick and dirty analysis to figure out whether it's a serious problem – exactly what it is can wait [2].

4. Confirm: At this point you should have enough information to know whether the device is infected and by what. Now you have to decide what to do next [2].

➢   Analyze Malware

At this point you know there is an infection but not what it is. The next step is to analyze the malware to figure out what it does and how, and communicate that information through a detailed profile [2].

**3. Analyze Malware Subprocess**

By now you know there is an infection but probably not what it is. Is it just an annoyance, or is it stealing key data and posing a clear and present danger to the organization? Here are some typical malware analysis steps for building a detailed profile [2].

*1. Build Testbed*

It's rarely a good idea to analyze malware on production devices connected to production networks. So your first step is to build a testbed to analyze what you found. This is mostly a one-time effort, but you will always be adding to the testbed based on the evolution of your attack surface [2].

*2. Static Analysis*

The first actual analysis step is static analysis of the malware file to identify things like packers, compile dates, and functions used by the program [2].

*3. Dynamic Analysis*

There are three aspects of what we call Dynamic Analysis: device analysis, network analysis, and proliferation analysis. To dig a layer deeper, first observe the impact of the malware on the specific device, dynamically analyzing the program to figure out what it actually does. Here you are seeking insight into memory usage, configuration, persistence, new executables, and anything else interesting associated with execution of the malware. This is done by running the malware in a sandbox. After understanding what the malware does to a device, you can begin to figure out its communications paths. This includes command and control traffic, DNS tactics, exfiltration paths, network traffic patterns, and other clues to identify the attack. Finally you need to understand whether and how the malware spreads, which we call proliferation analysis. You look at the kind of reconnaissance it performs, along with any other clues that indicate the malware is running rampant in your environment [2].

*4.* **The Malware Profile**

Finally we need to document what we learned during our analysis, which we package up into a malware profile [2].

➢ *Assess Malware Proliferation*

Thanks to the last subprocess you know what the malware does, so now you need to figure out whether it's spreading, how much, and what to do about it [2].

Malware Proliferation Subprocess

Now that you know what the malware does, you need to figure out whether it's spreading, and if so how widely. This entails four more steps [2]:

1. Define Rules: Take your malware profile and turn it into something you can search on with the tools at your disposal. This might involve configuring vulnerability scanning, IDS/IPS rules, asset management queries, etc [2].

2. Find Infected Devices: Then take your rules and use them to search for badness in your environment. This typically entails two separate functions: first run a vulnerability and/or configuration scan on all devices, then search logs for indicators defined in the Malware Profile. If you find matching files or configuration settings, you get alerted to another compromised device. Then search the logs, as malware may be able to hide itself from a traditional vulnerability scan but not to hide its presence from log files. Of course this assumes you are actually externalizing device logs. Likewise you might be able to pinpoint specific traffic patterns that indicate compromised devices, so look through your network traffic logs, which might include flow records or even full packet capture streams [2].

3. Remediate: Finally you need to figure out whether you are going to remediate the malware (via reimaging or cleaning the device), and if so how. Can your endpoint agent clean it? Do you need to reimage? Obviously the cost of cleanup must be weighed against the likelihood of reinfection [2].
4. Monitor for Reinfection: One of the biggest issues in the fight against malware is reinfection. It's not like we are dealing with static attacks. Malware changes constantly – especially targeted malware. Additionally, some of your users might make the same mistake and become infected with the same attack. Right, oh joy, but it happens – a lot. So both making sure you update the malware profile as needed and checking continuously for new infections are key parts of the process [2].

As users continue to focus on mobile devices and web services, so have malware authors. Android attacks grew in complexity and maturity this year; and well-hidden attacks like Darkleech placed thousands of web servers under malicious control. Meanwhile, legacy Windows users are bracing for Microsoft's April 8, 2014 deadline to end security updates for Windows XP and Office 2003—and wondering what dangerous "zero-day-forever" attacks may follow it [3].

## 5. Botnet Grow in Size and Stealth with rise in Ransomware

In the past 12 months, botnets have become more widespread, resilient and camouflaged—and they seem to be finding some dangerous new targets. Botnet source code has traditionally been tightly protected by its owners. Even when cybercriminals choose to retire from running botnets, they can often sell their code at high prices. But in recent years, working botnet source code has been leaked. This allows imitators to create their own new botnets, and then evolve them to behave in ways the original coders never imagined [3]. For instance, the leaking of Zeus source code a few years ago led others to develop Gameover, which replaces Zeus's traditional centralized command and control (C&C) link with a peer-to-peer network of infected devices. Gameover added backup communications mechanisms; made greater use of encryption; and gave the botmasters more flexibility in setting rules for the botnet's behavior such as the ability to participate in widespread DDoS (distributed denial-of-service) attacks [5].

### 5.1 Botnets are more resilient

Botnets are now integrating multiple backup forms of command and control. For example, if a botnet-infected client such as Gameover can't connect to addresses of other infected machines on the network, it runs built-in "domain generation" algorithms. If these algorithms discover even one of the new C&C servers that have been established, the client can restore its active role on the botnet [6]. Botnet operators are also faster and more effective at responding to countermeasures. One antivirus company took control of part of the ZeroAccess botnet, redirecting traffic from 500,000 infected clients to a server controlled by the antivirus company (what we call sinkholing).3 In response, working with affiliate networks, the botnet's owners quickly ramped up the number of new droppers they were placing on clients. Within weeks, they had replaced those that were lost—and the new versions aren't vulnerable to the same countermeasure [8].

### 5.2 Botnets delivering more dangerous ransomware

As users grow more resistant to fake alerts and antivirus scams, more botnets are delivering ransomware instead. Now, users are faced with an absolute demand to pay exorbitant sums in order to restore access to their own data. Perhaps the most dangerous and widespread current example is Cryptolocker. This ransomware adds itself to the list of Windows programs that run at startup, tracks down an infected server, uploads a small ID file from your computer, retrieves a public key from that server (which stores a matching private key), and then encrypts all the data and image files it can find on your computer. Once your data has been encrypted by the bad guys, the only way to retrieve it is with the private key stored on their server—for which you have to pay the criminals (which is not recommend) [7].

### 5.3 Banking malware botnets appear to be growing

The source code of Carberp, a banking-oriented, credential-stealing botnet kit used to steal over $250 million from financial institutions and their customers, was leaked in mid-2013 [8]. Long centered in Russia, we have recently seen evidence of Carberp activity worldwide, and elements of the leaked software are beginning to appear in other botnets. These include code based on Power Loader, which includes some of the most sophisticated techniques yet created to avoid detection while dropping malware onto a computer [9]. Meanwhile, throughout the UK and Europe, many users have recently encountered Shylock/Caphaw, botnet-delivered financial malware that specifically targets customers of many leading global financial institutions, from Barclays and Bank of America to Capital One, Citi Private Bank, and Wells Fargo [10].

### 5.4 Botnets are more evasive

On some botnets, the first C&C check-in address an infected client tries to contact isn't part of a botnet: it's a legitimate (but compromised) domain that can't conveniently be blocked. Often, the botnet client's first check-in is now a lightweight PPP server (a type of remote access server) in proxy mode, which in turn sends the connection somewhere else. When you target the first server for takedown, all you've disabled is a proxy: you haven't reached the botnet's actual command center [8].

### 5.5 Botnets are increasingly relying on the "darknet"

Botnets increasingly use hidden networks such as Tor that are designed to resist surveillance [11]. Tor has gained publicity as a key tool used by Wikileaks and others to protect their sources; and as host for the Silk Road online black market recently accused of facilitating illegal transactions. Botnets can store C&C servers as hidden services on the Tor network, making them far more difficult to track down. Enterprises often respond by making an executive decision that their employees should not use Tor, and using application control technology to prevent use of the Tor browser client software [3].

*5.6 Ransomware comes to Android*

Ransomware has a long and sordid history—the first versions were detected 25 years ago. For those unfamiliar with it, ransomware makes your files or device inaccessible, and then demands a payment to free them. In June 2013, Sophos researcher Rowland Yu discovered the first ransomware attack against Android devices. Called Android Defender, this hybrid fake antivirus/ransomware app demands a $99.99 payment to restore access to your Android device [3]. Upon starting, Android Defender uses a variety of social engineering tactics and an unusually professional look and feel to repeatedly seek Device Administrator privileges. If given those privileges, it can restrict access to all other applications, making it impossible to make calls, change settings, kill tasks, uninstall apps, or even perform a factory reset. It presents a warning message about infection that is visible on screen, no matter what a user is doing. It can even disable Back/Home buttons and launch on reboot to resist removal. About the only thing it doesn't do is encrypt your content or personal data [12].

## 6. Conclusion

Defending against the new attacks requires us all to get smarter. Whether you're an IT professional, entrepreneur, or individual user, chances are you're getting smarter about security too. You are (or should be) making sure all your systems are protected, whatever conventional or mobile platform they're running on. Stay up to date with patches, because most attacks are aimed at old vulnerabilities. And do the security basics right (like using strong passwords, and training your users to evade social engineering). The battle for IT security won't end any time soon. Basically this paper will be surely helpful to improve the influence base of malware and ransomware which are playing a very dangerous role in getting cyber security and web security to be focused more and more in the direction of malware analysis. Most importantly the real case occurrences of ransomware attacks through botnets included in third chapter are really useful to understand these kinds of viruses' natures. The research work based on malware and ransomware analysis is now prominently needed to establish a defensive wall against the cyber criminals and the criminal mind-sets in computer/IT environment. At last I would like to conclude that the castigation of malware and ransomware will lead all IT professionals towards the malware analysis to provide the secured environment for the forthcoming technocrat generations.

- Internal Reports

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Appendix A. Stuxnet Malware

A.1 Stuxnet Malware Live Cycle

*1. Introduction*

Stuxnet is not only a new virus or worm but it's a new era of malware. This virus changed the meaning of malware and their goals. You hear about a virus annoying people or stealing banks or credit cards, but that's the first time you hear about virus damages buildings, destroys machines or kills people and that's Stuxnet. Stuxnet has gained a lot of attention from malware researchers and media in the last year. It's created to sabotage Iran's nuclear program. This complex threat uses up to four zero-day vulnerabilities in windows OS and includes many tricks to avoid being detected by the behavioral-blocking antivirus programs. It damaged the Iranian nuclear reactor and its machines by infecting the PLCs (Programmable Logic Controller) that control the machines there. That makes it modify the control program which changes the behavior of the machine. Here we will talk about the technical details about stuxnet and the experience that I got from analyzing this malware. We will talk about how stuxnet works and the stuxnet life cycle. But here we will not talk about the SCADA systems and how stuxnet infects them and we will take a hint on the vulnerabilities that are used by stuxnet.

*2. Payload*

This worm was created mainly to sabotage the Iranian Nuclear Program. Once installed on a PC, Stuxnet uses Siemens' default passwords to gain access to the systems that run the WinCC and PCS 7 programs which control and modify the code of the PLCs (programmable logic controller) which control the machines themselves Stuxnet operates in two stages after infection, according to Symantec Security Response Supervisor Liam O'Murchu. First it uploads configuration information about the Siemens system to a command-and-control server. Then the attackers are able to pick a target and actually reprogram the way it works. "They decide how they want the PLCs to work for them, and then they send code to the infected machines that will change how the PLCs work," O'Murchu said. It managed to infect facilities tied to Iran's controversial nuclear programme before reprogramming control systems to spin up high-speed centrifuges and slow them down.

*3. Suspects*

Israel is an obvious suspect. Israel considers a nuclear Iran to be a direct existential threat. But, until now, there's no real evidence says that Israel who really creates this worm. There are some theories said that there are evidences on Israel as the creator depending on some dates and words found inside the malware and also there's an analysis from the industrial control-systems maker "Siemens" reportedly backs speculation that Iran may have been the target of Stuxnet's attack and that Israel may have been involved. A report by the New York Times suggested Stuxnet was a joint US-Israeli operation that was tested by Israel on industrial control systems at the Dimona nuclear complex during 2008 prior to its release a year later, around June 2009. The worm wasn't detected by anyone until a year later, suggesting that for all its possible shortcomings the worm was effective at escaping detection on compromised systems. But these evidences aren't real evidences in the court and the worm's still a perfect crime.

*4. Technical Details*

*4.1 Stuxnet Live Cycle*
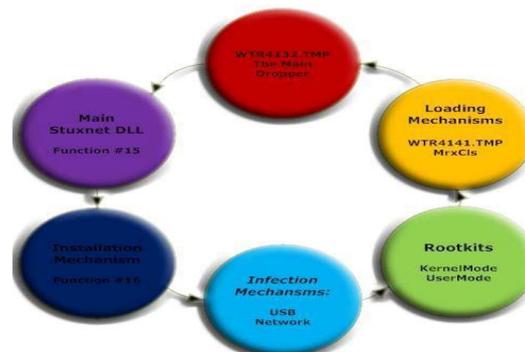


This is the live cycle of stuxnet virus on windows OS. We will describe every step in this cycle beginning by WTR4132.TMP File and that's the main dropper of stuxnet worm.

*4.2 Main Dropper (~WTR4132.TMP)*

This File is a dynamic link library file loaded into Explorer.exe. It begins the execution by searching for a section in it named ".stub" section.

This section contains the main stuxnet DLL file. And this DLL contains all stuxnet's functions, mechanisms, files and rootkits. And that's the MZ File inside .stub section:



This Section (".stub") includes also the configuration data of stuxnet which is so important on the spreading mechanism, updating mechanism and many other things. After finding this section, it loads stuxnet DLL file in a special way. First, it allocates a memory buffer for the DLL file to be loaded. Then, it patches 6 ntdll.dll APIs with these names:

*1. ZwMapViewOfSection;*
*2. ZwCreateSection;*
*3. ZwOpenFile;*
*4. ZwClose;*
*5. ZwQueryAttributesFile;*
*6. ZwQuerySection;*

To force these APIs to make .stub section like the file which you need to open with ZwOpenFile and to read from this section as it's a file on the harddisk. These patches make LoadLibraryA load a DLL file not from the harddisk (as usual) but from a place in the memory. It calls LoadLibraryA with the DLLName like KERNEL32.DLL.ASLR.XXXX to load the Main DLL File as I described above and at then end, it calls to Function #15 in the Main Stuxnet DLL.

# Clustering in Data Mining: A Brief Review

Jalay Maru[a*], Dhaval Vaja[a]

[a]*Computer Engineering Department,Gandhinagar Institute of Technology, Moti Bhoyan,Gujarat, India*

**Abstract**

Retrieval of information from the databases is now a day's significant issues. The thrust of information for decision making is challenging one. To overcome this problem, different techniques have been developed for this purpose. One of techniques is data clustering. Some applications of data clustering like data mining using data clustering and similarity searching in medial image databases are also discussed. Clustering is the unsupervised classification of patterns (data item, feature vectors, or observations) into groups (clusters). Clustering in data mining is very useful to discover distribution patterns in the underlying data. Clustering algorithms usually employ a distance metric-based similarity measure in order to partition the database such that data points in the same partition are more similar than points in different partitions. Clustering is a division of data into groups of similar objects. The scope of applying clustering algorithms is to discover useful but unknown classes of items. The clustering methods are presented, divided in to: hierarchical, partitioning, density-based, model-based and grid-based methods. In this study, data clustering methods are discussed along with its traditional approaches and their algorithms.

*Keywords:* Clustering, Data Mining, Unsupervised learning

## 1. Introduction

Now days we are living in a world full of data. People need to store or represent it as data, for further analysis and management. Cluster analysis is unsupervised learning methods used for the exploration of inter- relationships among a collection of patterns, by organizing them into homogeneous clusters. Clustering aims to organize a collection of data items into clusters, such that items within a cluster are more "similar" to each other than they are to items in the other clusters. Clustering algorithms partition data into a certain number of clusters (groups, subsets, or categories). Detailed surveys of this domain can be found in [1], [2] or [3]. This surveys emphasis is on clustering in data mining. Such clustering is characterized by large datasets with many attributes of different types. Some of the applications of clustering are like Marketing in which clustering is used for discovering of distinct customer groups in a purchase database. Another application is Land use which identifying of areas of similar land use in an earth observation database. Next is Insurance in which clustering is used to identifying groups of motor insurance policy holders with a high average claim cost. One more application is City-planning identifying groups of houses according to their house type, value, and geographical location.

The rest of this paper is organized as follows: - In section 2, I discuss measures of Similarity and Dissimilarity feature. In section 3, different clustering methods of data mining are described. I conclude my survey in section 4.

## 2. Measures of similarity and dissimilarity

Since clustering is the grouping of similar instances/objects, some sort of measure that can determine whether two objects are similar or dissimilar is required. There are two main type of measures used to estimate this relation: distance measures and similarity measures .Similarity function is an alternative concept to that of the distance is the similarity function $s(p_k, p_q)$ that compares the two vectors $p_k$ and $p_q$ [4]. The definition of similarity or dissimilarity between objects depends on the type of the data considered and what kind of similarity we are looking for. It is useful to denote the distance between two instances $p_k$ and $q_k$ as: dist $(p_k, q_k)$. Table 1 shows some of the similarity and dissimilarity measure.

*Jalay Maru
*Email address:* jalay.maru@git.org.in

Table 1. Measures of similarity and dissimilarity

| Measures | Forms |
|---|---|
| Minkowski Distance | $dist = (\sum_{k=1}^{n} |p_k - q_k|^r)^{\frac{1}{r}}$ |
| Euclidian Distance | $dist = \sqrt{\sum_{k=1}(p_k - q_k)_2}$ |
| Cosine Similarity | $s(P_k, P_q) = \dfrac{P_k{}^t P_q}{\|P_k\|\|P_q\|}$ |
| Extended Jaccard Measure | $s(P_k, P_q) = \dfrac{P_k{}^t P_q}{\|P_k\|^2 + \|P_q\|^2 - P_k{}^t P_q}$ |
| Dice Coefficient Measure | $s(P_k, P_q) = \dfrac{2 P_k{}^t P_q}{\|P_k\|^2 + \|P_q\|^2}$ |

## 3. Classification of Clustering Algorithm

### 3.1 Hierarchical Methods

In data mining, hierarchical clustering is a method of cluster analysis which seeks to build a hierarchy of clusters. Hierarchical clustering has the distinct advantage that any valid measure of distance can be used. Strategies for hierarchical clustering generally fall into two types build a tree-based hierarchical taxonomy (dendrogram) from a set of documents.

Generally, clustering algorithms can be categorized into partitioning methods, hierarchical methods, density-based methods, grid-based methods, and model-based methods. For reader's convenience I provide a classification closely followed by this survey. Corresponding terms are explained below.
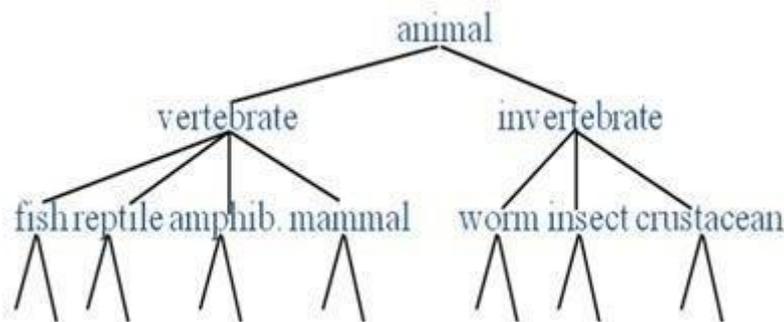


Fig. 1. Hierarchical Clustering

Agglomerative algorithms clustering starts with one-point clusters and recursively merges two or more most appropriate clusters. And second is Divisive algorithm starts with one cluster of all data points and recursively splits the most appropriate cluster. A top-down clustering method and is less commonly used.

Some of the hierarchical clustering algorithms are: Balanced Iterative Reducing and Clustering using Hierarchies – BIRCH [5], Clustering Using REpresentatives – CURE [6] and CHAMELEON [7].

### 3.2 Partitioning Methods

In partitioning methods instances move from one cluster to another, starting from an initial partitioning. In this type of clustering methods numbers of clusters are pre-defined by the user. There are various types of partitioning methods are

available but I shall only brief two approaches in this section: K-means [2] and k-medoids [3].

K-means

K-means algorithm is a simple yet popular method for clustering analysis. Its performance is determined by initialization and appropriate distance measure. Choosing the proper initial centroids is the key step of the basic K-means procedure. The algorithm is composed of the following steps:

1. Select K points as the initial centroids.
2. Assign all points to the closest centroid.
3. Re compute the centroid of each cluster.
4. Repeat steps 2 and 3 until the centroids don't change.

Although it is efficient algorithm it has some disadvantage like, first we have to define mean. Next is we need to specify k, the number of clusters, in advance. It is not able to handle noisy data and outliers. It is not suitable to discover clusters with non-convex shapes.

K-medoid

The objective of K-medoid clustering [3] is to find a non-overlapping set of clusters such that each cluster has a most representative point. These representative points are called medoids. Once again, the algorithm is conceptually simple. Basic K-medoid Algorithm for finding K clusters.

1. Select K initial points.
2. Consider the effect of replacing one of the selected objects (medioids) with one of the non-selected objects.
3. Select the configuration with the lowest cost.
4. Otherwise, associate each non-selected point with its closest selected point (medoid) and stop.

PAM (Partitioning Around Medoids) [3] is a "K-medoid" based clustering algorithm. CLARA (Clustering LARge Applications) [9] is an adaptation of PAM for handling larger data sets.

*3.3 Density Based Clustering*

Density-based clustering algorithms based on density (local cluster criterion), such as density-connected points. It is basically depend on two parameters:

Eps: Maximum radius of neighborhood
MinPts: Minimum number of points in an Eps-neighborhood of a point.

One of the most well known density-based clustering algorithms is the DBSCAN [9]. DBSCAN separate data points into three classes CLIQUE and MAFIA are specifically designed for handling clusters in high-dimensional data. Another density-based algorithm is the DENCLUE [10]. It is good for data sets with large amounts of noise. It allows a compact mathematical description of arbitrarily shaped clusters in high-dimensional data sets. Significantly faster than other algorithms, but needs a large number of parameters.

*3.4 Grid-Based Methods*

These types of clustering algorithm are popular for mining clusters in large multidimensional space where in clusters are regarded as denser region than their surroundings. The computational complexity of most clustering algorithms is at least linearly proportional to the size of the data set. The great advantage of grid-based clustering is its significant reduction of the computational complexity, especially for clustering very large data sets.

The grid-based clustering approach differs from the conventional clustering algorithms in that it is concerned not with the data points but with the value space that surrounds the data points. In general, a typical grid-based clustering algorithm consists of the following five basic steps [11].

1. Creating the grid structure, i.e., partitioning the data space into a finite number of cells.
2. Calculating the cell density for each cell.
3. Sorting of the cells according to their densities.
4. Identifying cluster centers.
5. Traversal of neighbor cells.

Some grid based methods are CLIQUE (CLustering In QUEst) [12], STING (STatistical INformation Grid) [13], MAFIA (Merging of Adaptive Intervals Approach to Spatial  Data Mining) [14].

*3.5 Model based Methods*

MLE (maximum likelihood estimation) is used in model-based clustering method to find the parameter inside the probability model. Since the probability function is a mixture summation of a couple of probability function, it makes the traditional method infeasible to find the maximum value. One model based method is the SOM net [16]. The SOM net can be thought of as two layers neural network. Each neuron is represented by n-dimensional weight vector, $m = (m_1, \ldots, m_n)$, where n is equal to the dimension of the input vectors. The neurons of the SOM are themselves cluster centers; but to accommodate interpretation the map units can be combined to form bigger clusters.

## 4. Conclusion

My aim was to describe different clustering technique available in Data mining. I can say that generally partitioning algorithms typically represent clusters by a prototype. Density-based approaches apply a local cluster criterion and are very popular for the purpose of data set mining. Grid-based clustering algorithms first separate the clustering space into a finite number of cells and then perform the required operations on the quantized space.

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# Design & Implementation of Reactive Power compensation using FC-TCR

Mohammed Rahish Silavat[a*], Abhishek Harit[a], Hitesh Manani[a], Naitik Trivedi[a], Purv Mistry[a]

*[a]Gandhinagar Institute of Technology, Khatraj, Kalol, Gandhinagar-382721, India*

## Abstract

In this project demonstration of how SVC (Static VAR compensator) is used to improve reactive power and voltage profile is shown. In the introduction part, we have explained need of reactive power compensation in transmission lines. And then importance of different types of FACTS devices is explained. First power flow results are obtained and power profile have been studied for an uncompensated medium transmission line then results are compared with the results obtained after compensating reactive power of medium transmission lines using close loop simulation of FC –TCR in MATLAB. Then harmonics in TCR current are reduced using filter circuit.

*Keywords*: reactive power, thyristor controlled reactor, heating and voltage drops

## 1. Introduction

Over the last few years, the interest in reactive power compensation has been growing, mainly because of the way in which energy supplier charges a customer for reactive power. Moreover, inflation in energy prices forces the industry plants and individual customers to minimize energy consumption, including reactive power. The aim is to minimize reactive power flow in supplying and distribution systems, eliminate or minimize the charge for reactive power as well as aspire to active energy limitation, in result, reducing fare for electrical energy. In the matter of fact, the energy providers want their customers to compensate reactive power. Energy suppliers determine the value of power factor which has to be kept in limit in order to avoid paying for reactive power. There are few solutions, that allow handle the problem of reactive power compensation. One of them is reactive power compensator basing on power capacitors. This is the most popular compensating device, mainly because of economic reasons, they are relatively cheap comparing with i.e. active filters or compensation by means of electric motors.

*1.1 Purpose of work*

The aim of this project is to carry out design, modelling, analysis and Simulation of SVC (FC-TCR type).As discussed earlier reactive power compensation has is must requirement for every industry. FC-TCR (Fixed Capacitor Thyristor Controlled Reactor) is SVC which is connected in shunt for the exchange of reactive power. Open loop simulations have been carried out on MATLAB software and objective is to minimize reactive power flow from source with the help of proper triggering of thyristor switches in TCR.

*1.2 FC-TCR*

TCR provides continuously controllable reactive power only in the lagging power factor range. To extend the dynamic controllable range to the leading power factor domain, a fixed capacitor bank is connected in shunt with the TCR. The TCR MVA is rated larger than the fixed capacitor to compensate (cancel) the capacitive MVA and provide net inductive reactive power should a lagging power-factor operation be desired. The fixed capacitor banks, usually connected in a star configuration, are split into more than one 3-phase group. Each capacitor contains a small tuning inductor that is connected in series and tunes the branch to act as a filter for a specific harmonic order
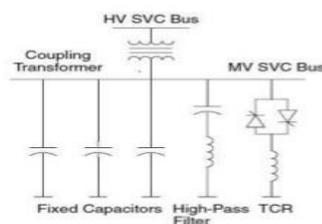


Fig. 1. FC-TCR

*Mohammed Rahish Silavat
Email address:* rahish.silavat@git.org.in

## 2. Experimental Simulation of Short Transmission Line

The aim of the simulation is to determine the relationship between loading and voltage on receiving side. As shown in fig 1 Simulation results are in close proximity with experimental results. With the increase in loading (R and R-L), the voltage at the receiving end side dips. Voltage sags are more pronounced when the inductive loading is present.
Different parameters for carrying out simulation are as follows:

Transmission line parameters
Load side parameters
R=5Ω
Load voltage= 230V(rms)
L=0.06mH
Required active power = 1000Watt
Required reactive power = 1000 VAR
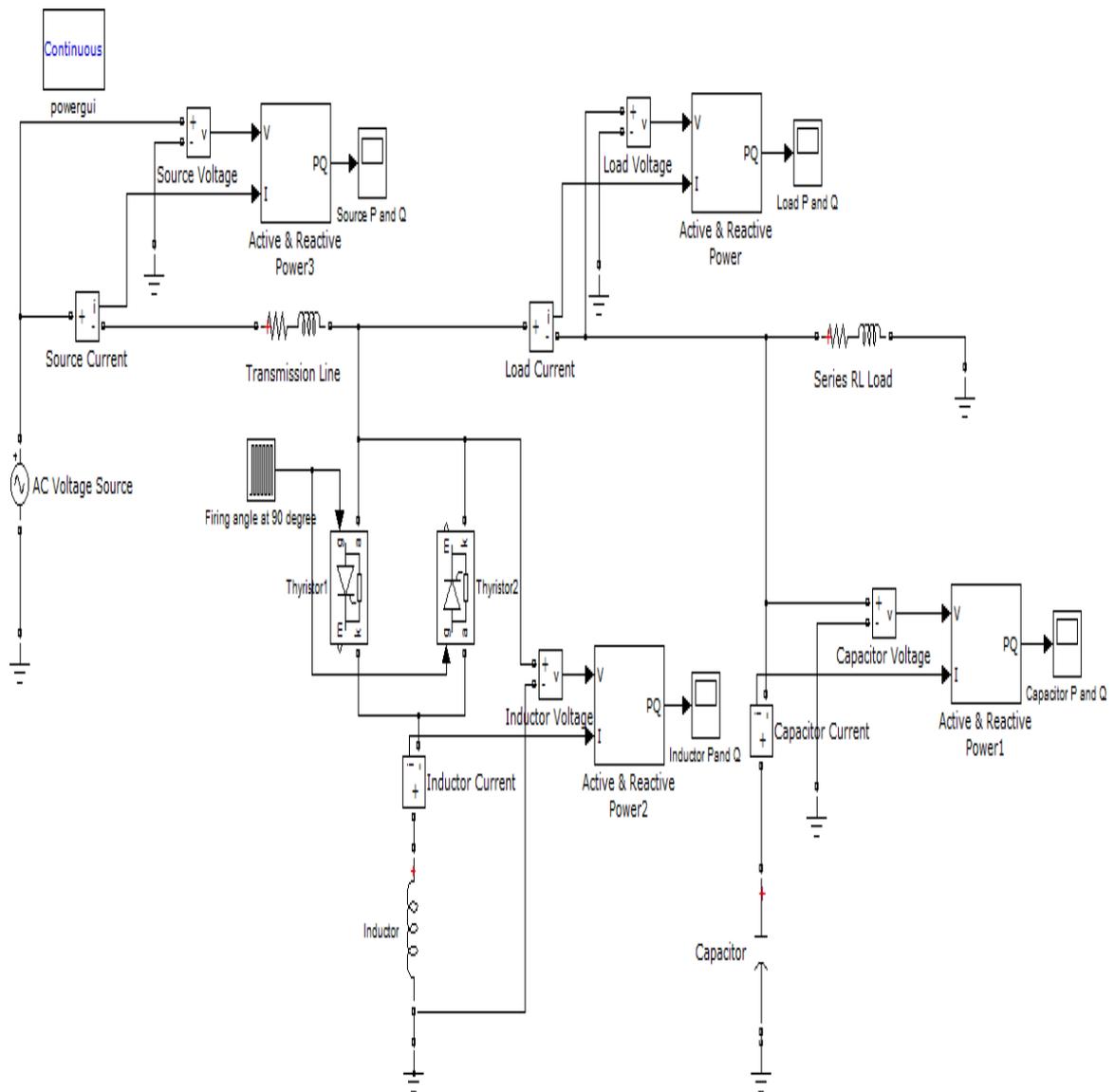


Fig. 2. Matlab simulation of Open-loop FC-TCR

*2.1 Waveforms with FC-TCR*
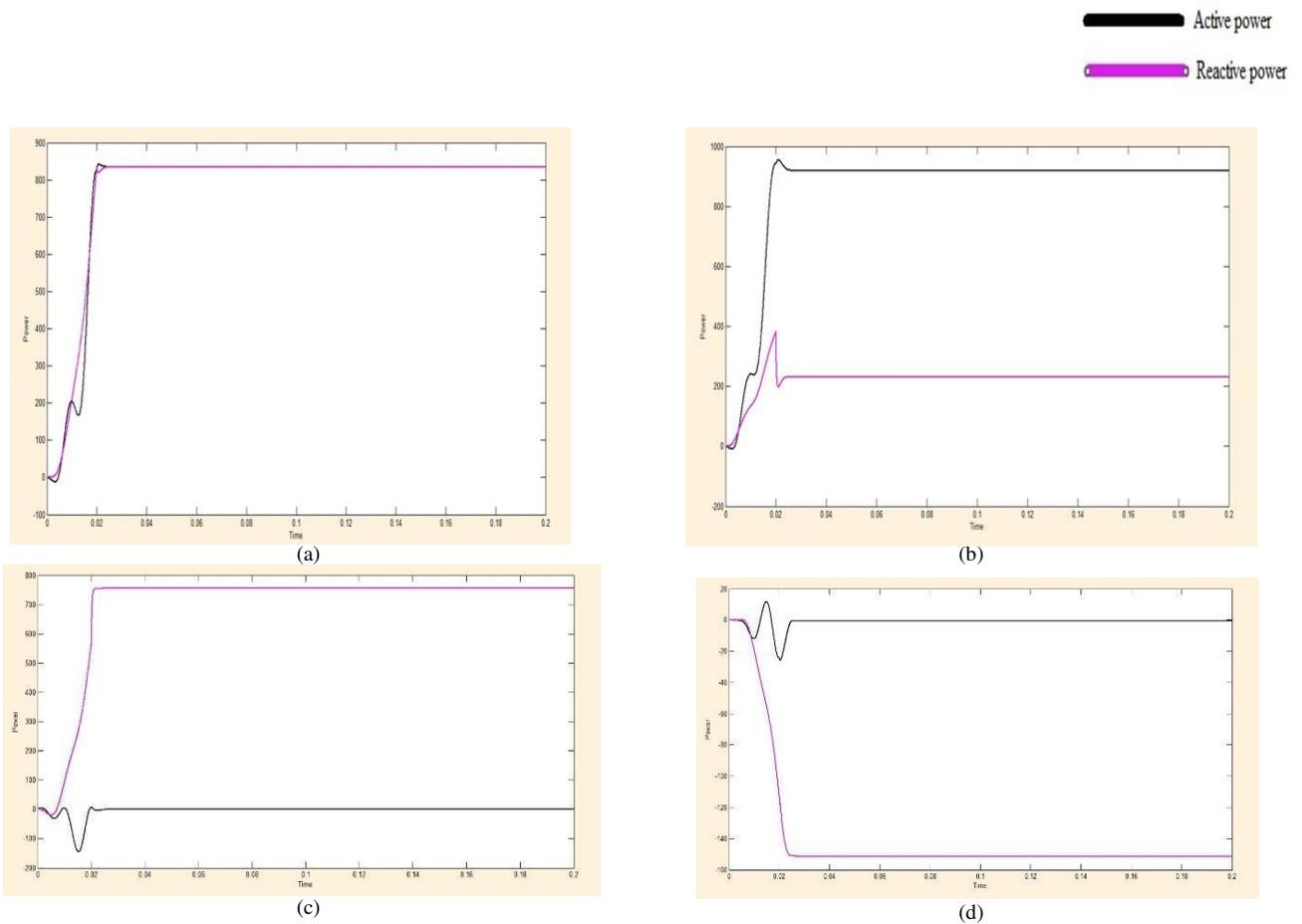


Fig. 3. Different waveforms with FC-TCR (a) Active and Reactive power waveforms of load side (b) Active and Reactive power waveforms of source side
(c) Power supplied by FC (d) Power absorbed by TCR

## 3. Experimental Simulation of Medium Transmission Line

The aim of the simulation is to determine the relationship between loading and voltage on receiving side. As shown in fig 2 Simulation results are in close proximity with experimental results. With the increase in loading (R and R-L), the voltage at the receiving end side dips. Voltage sags are more pronounced when the inductive loading is present. Loads are changed with the help of breakers attached to the resistor and inductor

Different parameters for carrying out simulation are as follows:

Transmission line parameters
 Load side parameters
R1=R2=2.5Ω
R1=R2=R3=R4=R5= 1200 Ω
L1=L2= 0.03184mH (XL=10 Ω)
L=0.076917(XL=250 Ω)
C=1μF
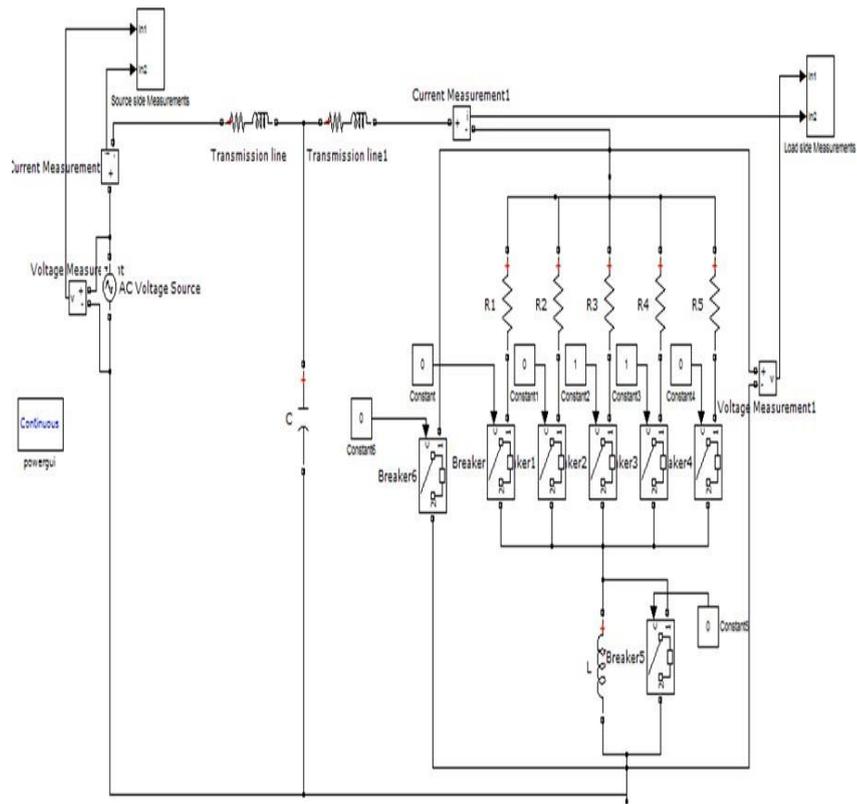
Fig. 4. Matlab simulation of Close-loop FC-TCR

Table 1. Reactive power supplied by the source with only R load

| | SOURCE SIDE | | | | LOADSIDE | | | |
|---|---|---|---|---|---|---|---|---|
| P | Q | V | I | LOAD (in Ω) | P | Q | V | I |
| 40.41 | 15.14 | 229.1 | 0.1933 | 1200 | 40.23 | 1.392e-7 | 228.2 | 0.1913 |
| 80.2 | 15.08 | 229.1 | 0.376 | 600 | 79.52 | 5.491e-7 | 227.3 | 0.3797 |
| 119.6 | 15.01 | 229.1 | 0.5609 | 400 | 118.2 | 1.223e-6 | 226.3 | 0.5665 |
| 158.8 | 14.95 | 229.1 | 0.7453 | 300 | 156.2 | 2.154e-6 | 225.4 | 0.7518 |
| 197.6 | 14.88 | 229.1 | 0.9285 | 240 | 193.5 | 3.336e-6 | 224.5 | 0.9356 |

Table 2. Reactive power supplied by the source with RL load

| | SOUCRE SIDE | | | | LOADSIDE | | | |
|---|---|---|---|---|---|---|---|---|
| P | Q | V | I | LOAD (in Ω) | P | Q | V | I |
| 40.35 | -14.33 | 229.1 | 0.1923 | 1200.24 | 40.17 | 0.8128 | 228.2 | 0.1915 |
| 80.02 | -11.88 | 229.1 | 0.375 | 600.48 | 79.35 | 3.201 | 227.3 | 0.3811 |
| 119.2 | -7.886 | 229.1 | 0.5604 | 400.72 | 117.7 | 7.116 | 226.3 | 0.5695 |
| 157.7 | -2.447 | 229.1 | 0.7453 | 300.97 | 155.1 | 12.5 | 225.4 | 0.7566 |
| 195.6 | 4.412 | 229.1 | 0.9291 | 241.21 | 191.6 | 19.3 | 224.5 | 0.942 |

## 4. Experimental Simulation of Medium Transmission Line with Filter Circuit

In this simulation filter circuit is attached along with the FC-TCR so the harmonics coming due to the switching of the thyristors can be removed. The parameters used to design the filter is shown in the table 3.6.1(a). By using Filter Circuit THD will be reduced which is shown in table 3.6.1(b) at different firing angles.
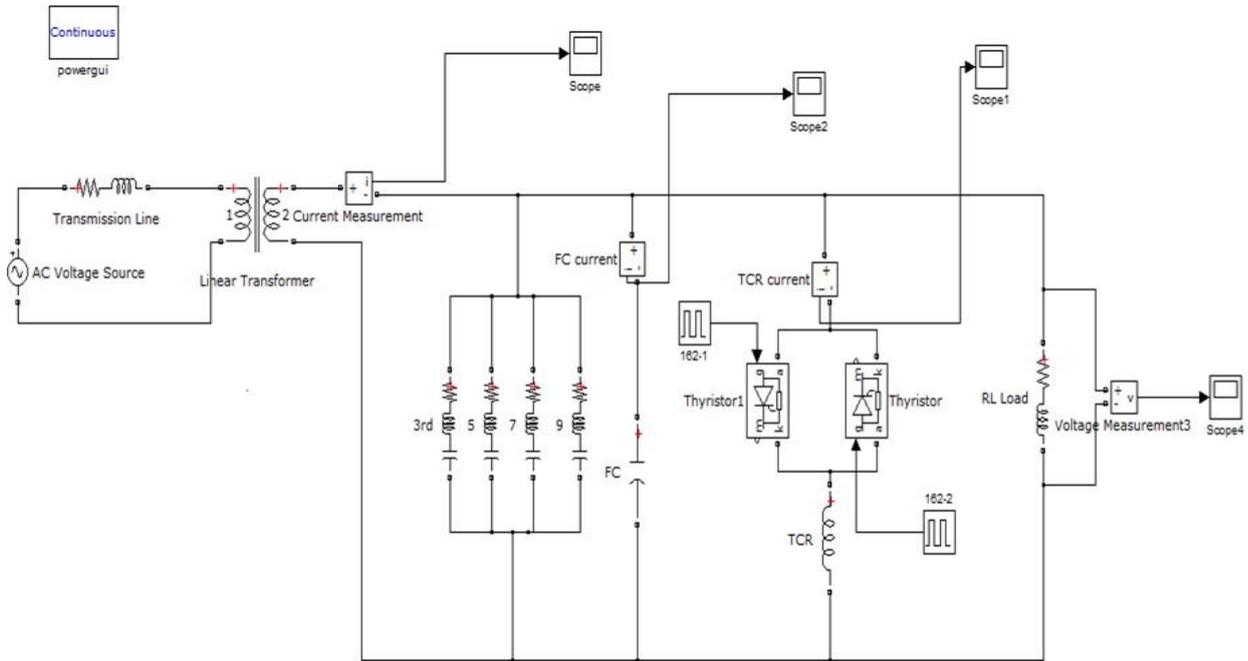


Fig. 5. Matlab simulation of FC-TCR with filter circuit

Table 3. Parameters used to design the filter circuit

| Tuning frequency in (Hz) | Resistance (in OHM) | Inductance (in mH) | Capacitance (in µF) |
|---|---|---|---|
| 150 | 0.375 | 16.7 | 67.5 |
| 250 | 0.375 | 9.9 | 40.75 |
| 350 | 0.375 | 7.1 | 28.92 |
| 450 | 0.375 | 5.6 | 22.49 |

Table 4. Comparison of THD with and without filter circuit at different firing angles

| Firing angle (in degrees) | Delay in thyristor 1 (in ms) | THD (without filter in %) | THD (with filter in %) |
|---|---|---|---|
| 90 | 5 | 61.77 | 0.14 |
| 108 | 6 | 82.85 | 0.17 |
| 126 | 7 | 111.57 | 1.94 |
| 144 | 8 | 158.82 | 0.16 |
| 162 | 9 | 338.91 | 0 |

*4.1 Waveforms of current at different firing angles*

1) TCR current at 90 degree
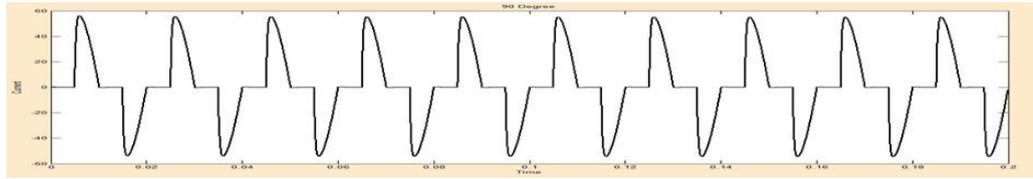


Fig. 6. Current through TCR at 90 degree

2) TCR current at 162 degree
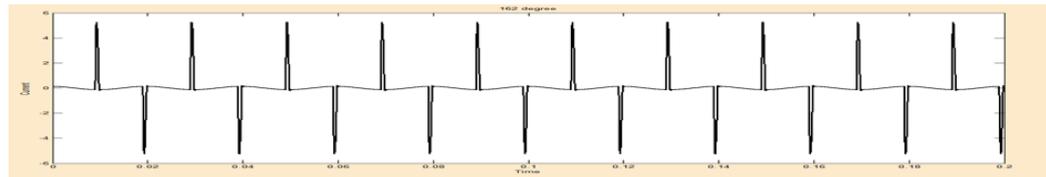


Fig. 7. Current through TCR at 90 degree

*4.2 FFT (Fast Fourier Transform) analysis of current waveform at firing angle of 162 degree*
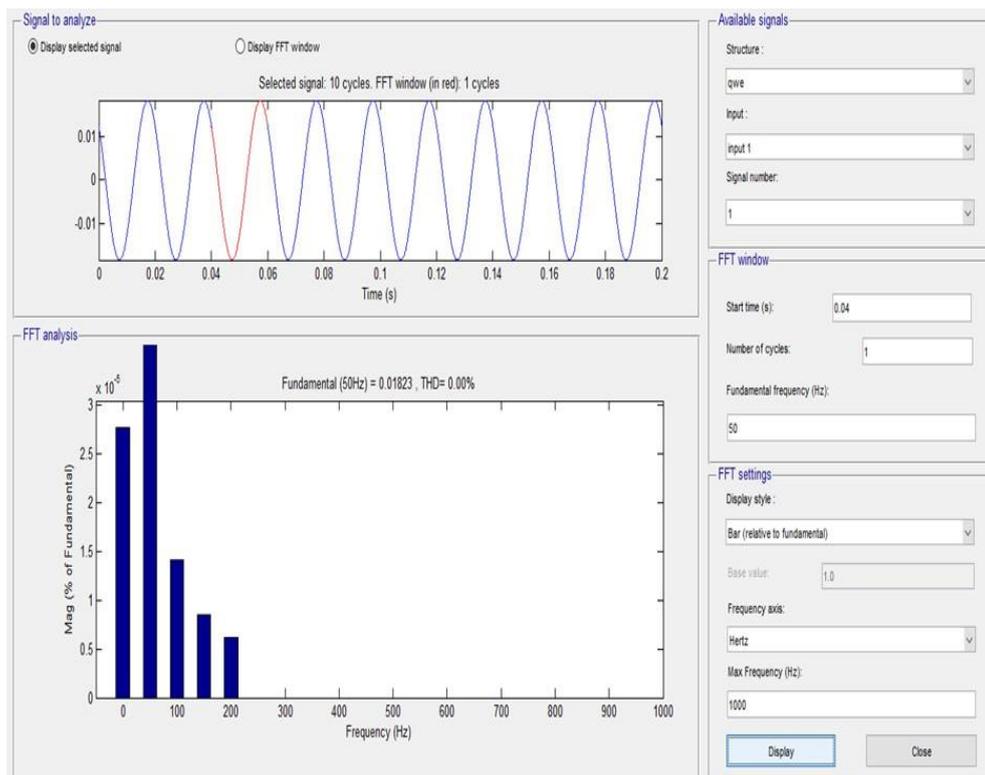


Fig. 8. FFT analysis of current waveform at firing angle of 162 degree with filter circuit

## 5.  Mathematical modeling of FC-TCR

Here the device consists of fixed capacitor and variable reactor. Hence as far as modelling is concerned more importance is given to TCR (Thyristor controlled reactor).

To derive the r.m.s of the fundamental component of the TCR current, it is assumed that:

$$V_c = \sqrt{2}Vc \sin(\omega t) \tag{3.1}$$

Where $V_C$ is the r.m.s value of the capacitor voltage.

$$V_c = L \cdot \frac{di}{dt} \qquad \text{3.2}$$

The instantaneous TCR current is:

$$I = \frac{\sqrt{2}V_c}{\omega L} \int_a^t \sin(\omega t) \qquad \text{3.3}$$

$$= \frac{\sqrt{2}V_c}{\omega L}(-\cos(\omega t) - \cos(\alpha)) \qquad \text{3.4}$$

The amplitude of the fundamental component for even functions is:

$$a_n = \frac{4}{\pi} \int_0^\pi f(t) \cdot \cos(\omega t)\, d(\omega t) \qquad \text{3.5}$$

Since the TCR current is an even function as shown in Fig. 2, the amplitude of the fundamental component of TCR current is:

$$a_n = \frac{4}{\pi} \frac{\sqrt{2}V_c}{\omega L} \int_0^\pi (-\cos(\omega t) - \cos(\alpha)) \cdot \cos(\omega t)\, d(\omega t) \qquad \textit{3.6}$$

Therefore, the r.m.s value of the fundamental component is:

$$I_{eff} = \frac{V_c}{\omega \cdot L \cdot \pi}(2\pi - 2\alpha + \sin(2\alpha)) \qquad \text{3.7}$$

Effective value of inductance is given by:-

$$L_{eff} = \frac{V_c}{\omega L1} \qquad \text{3.8}$$

Where $L_1 = \dfrac{\omega L}{(2\pi - 2\alpha + \sin(2\alpha))}$ $\qquad$ 3.9

Effective susceptance of TCR is given by:-

$$B_{TCR} = B_L \frac{(2\pi - 2\alpha + \sin(2\alpha))}{\pi} \qquad \text{3.10}$$

Effective susceptance of FC-TCR is given by

$$Bsvc = B_L \frac{(2\pi - 2\alpha + \sin(2\alpha))}{\pi} + B_C \qquad \text{3.11}$$

Where, Bc=Capacitive susceptance

Hence a formula showing relationship between susceptance and firing angle has been derived.

## 6. Conclusion

The simulation of short transmission line has been made for open loop. Also medium transmission line has been simulated along with filtering circuits. Close loop simulation of device has been provided. Shunt passive filters which provide the dual function of filtering as well as reactive power compensation has also been realised. In close loop the problem of harmonics had arise. Which was solved by the filter circuit connected parallel with FC-TCR.

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# Image Mining: Procedure and Categorization Methods

Dulari Bhatt[a*]

[a]*Gandhinagar Institute of Technology, Motibhoyan, Gandhinagar, India*

**Abstract**

Image Classification is an important task in the field of computer vision. Image classification refers to the labelling of images into one of predefined categories. Classification includes image pre-processing, image segmentation, feature extraction and image classification. Some classification techniques have been developed for image classification. In this survey various methods for categorization of images are considered such as Artificial Neural Network, Support Vector Machine and Decision Tree.

*Keywords*: Image classification, Artificial Neural Network, Support Vector Machine and Decision Tree.

## 1. Introduction

Image mining deals with the extraction of implicit knowledge, image data relationship, or other patterns not explicitly stored in the image databases. It utilizes methods from computer vision, image processing, image retrieval, data mining, machine learning, database, and artificial intelligence. Rule mining has been implemented to huge image databases [1]. It is an interdisciplinary endeavour that essentially draws upon expertise in computer vision, image processing, image retrieval, data mining, machine learning, database, and artificial intelligence [2]. Advances in image acquisition and storage technology have led to tremendous growth in significantly large and detailed image databases [3]. A large number of image data such as satellite images, medical images are generated every day. These images, if analyzed, can reveal useful information to the human users. Image mining systems that can automatically extract semantically meaningful information (knowledge) from image data are increasingly in demand. The main obstacle to rapid progress in image mining research is the lack of understanding of the research issues involved in image mining. In this paper, fig. 1 shows basic steps for image classification. In next section we define different image Classification techniques with its advantages and disadvantages.

```
┌─────────────────────────────────────────┐
│        Preprocessing of the image        │
└─────────────────────────────────────────┘
                    │
                    ▼
┌─────────────────────────────────────────┐
│  Image segmentation and Feature extraction │
└─────────────────────────────────────────┘
                    │
                    ▼
┌─────────────────────────────────────────┐
│           Image classification            │
│         • Supervised mode                 │
└─────────────────────────────────────────┘
                    │
                    ▼
┌─────────────────────────────────────────┐
│             Post-processing               │
└─────────────────────────────────────────┘
                    │
                    ▼
┌─────────────────────────────────────────┐
│           Accuracy assessment             │
└─────────────────────────────────────────┘
```
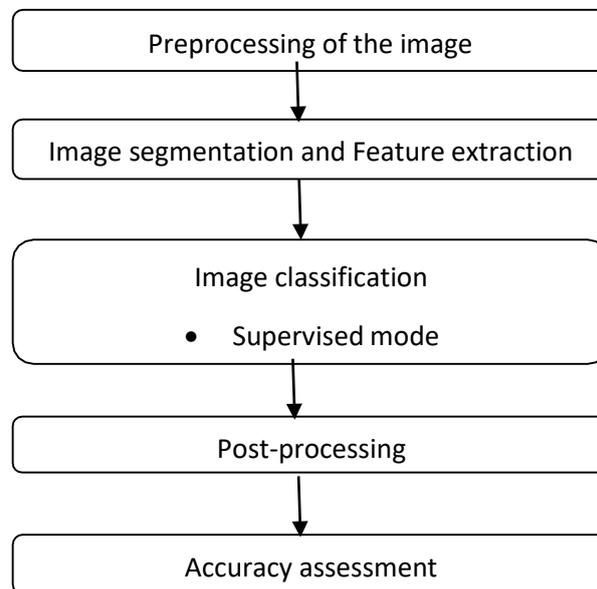
Fig. 1. Steps for Image Classification

### 1.1 Image Preprocessing

The task of image preprocessing is to enhance the image and to reduce speckle without destroying the important features of ultrasound images for diagnosis. It also includes atmospheric correction, image transformation, main component analysis etc.

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**\*Dulari Bhatt**
*Email address:* Dulari.bhatt@git.org.in

*1.2 Image segmentation and Feature extraction*

Image segmentation divides the image into non-overlapping regions, and it separates the objects from the background. The boundaries of the lesions are delineated for feature extraction. Some image segmentation techniques such as texture analysis, edge detection and thresholding methods can be used on image.

Here is the list of features which are generally extracted from images [4]:

- DCT coefficients of average colour in rectangular grid
- CIE L*a*b* colour of two dominant colour clusters
- Histogram of local edge statistics
- Haar transform of quantised HSV colour histogram
- Average CIE L*a*b* colour
- Three central moments of CIE L*a*b* colour distribution
- Co-occurrence matrix of four Sobel edge directions
- Magnitude of the 16 x 16 FFT of Sobel edge image
- Histogram of four Sobel edge directions
- Histogram of relative brightness of neighbouring pixels

*1.3 Image Classification*

Selected features which are extracted using feature extraction method can be used to classify the suspicious regions into different categories. Many machine learning techniques such as support vector machine (SVM), Decision Tree (DT) and artificial neural network (ANN) have been used for classification.

## 2. Image Classification Techniques

Here are some methods for Image classification [5]

*2.1 Artificial Neural network*

Artificial Neural Network is a type of artificial intelligence that imitates some functions of the person mind. It has a normal tendency for storing experiential knowledge. An ANN consists of a sequence of layers, each layer consists of a set of neurones. All neurones of every layer are linked by weighted connections to all neurones on the preceding and succeeding layers. It uses Stochastic approach. Performance and accuracy depends upon the threshold selection and fuzzy integral.

Advantages

- It is a non-parametric classifier.
- It is an universal functional approximator with arbitrary accuracy.
- It is a data driven self adaptive technique.
- It efficiently handles noisy inputs.

Disadvantages

- It is semantically poor.
- The training of ANN is time taking.
- Difficult in choosing the type network architecture.

*2.2 Decision tree*

DT calculates class membership by repeatedly partitioning a dataset into uniform subsets Hierarchical classifier permits the acceptations and rejection of class labels at each intermediary stage. This method consists of 3 parts: Partitioning the nodes, find the terminal nodes and allocation of class label to terminal nodes.

Advantages

- Does not require an extensive design and training.
- Provides hierarchical associations between input variables to forecast class membership and provides a set of rules n are easy to interpret.

- Simple and computational efficiency is good.

Disadvantages

5. The usage of hyperplane decision boundaries parallel to the feature axes may restrict their use in which classes are clearly distinguishable.
6. Becomes complex calculation when various values are undecided and/or when various outcomes are correlated.

*2.3 Support Vector Machine*

Good separation is achieved by the hyper plane that has the largest distance to the nearest training data point of any class (functional margin), generally larger the margin lower the generalization error of the classifier. SVM can handle more input data very efficiently. Performance and accuracy depends upon the hyperplane selection and kernel parameter.

Advantages

- It gains flexibility in the choice of the form of the threshold.
- It provides a good generalization capability.
- The problem of over fitting is eliminated.
- Reduction in computational complexity.
- Simple to manage decision rule complexity and Error frequency

Disadvantages

- Result transparency is low.
- Training is time consuming.
- Structure of algorithm is difficult to understand
- Determination of optimal parameters is not easy when there is nonlinearly separable training data.

## 3. Conclusion

This paper provides a brief knowledge about the basic steps for image classification and different classification methods. Approaches for image classification can be categories as supervised and unsupervised. This survey provides basic knowledge about the advantages and disadvantages of various classification methods.

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# Feasibility Study of Waste Material in Sub grade of Road

Darshan Panchal[a*], Dainik Patel[a], Keyur Patel[a], Manthan Patel[a]

*[a]Gandhinagar Institute of Technology, Gandhinagar, India*

**Abstract**

Stabilization is the process in which various methods employed and improving the properties of a soil to enhance its engineering performance and used for a variety of engineering works. In soil stabilization is the major problem for civil engineers, either for construction of road and also for increasing the strength or stability of soil and reduces the construction cost. In this project, we are trying to stabilize the soil by ground granulated blast furnace slag (GGBS) which is byproduct of the steel industry. The main objective of this project is to investigate the effect of GGBS on the engineering property (optimum moisture content and maximum dry density, plastic limit, liquid limit etc.) of the soil. GGBS are added from 0% to 10% by dry weight of soil, first of all check the all soil property at 0% (no GGBS) and then compare after addition of GGBS 5% and 10%.The investigation showed that the engineering properties improved with the addition of GGBS. The maximum dry density increased and optimum moisture content decreased with increasing GGBS content and at 10% we got the maximum value of dry density.

*Keywords*: soil stabilization, GGBS, engineering property

## 1. Introduction

### 1.1 General

Roads are primary mean of transportation. These provide human access to different places. Various types of roads are constructed in a country to fulfill needs. e.g. motorways are constructed to provide fast and safe access between important cities. Highways are to connect two or more cities. Rural areas have different type of road to connect farm lands with the city.

There are different types of roads constructed within a city e.g. boulevard, main road, street etc and each type has its own importance and requirement Roads provide access to the outside world or the store around the corner. Roads take farm produce to market and children to school. Roads are the conduit of life's activities. Roads make a crucial contribution to economic development and growth and bring important social benefits.

They are of vital importance in order to make a nation grow and develop. In addition, providing access to employment, social, health and education services makes a road network crucial in fighting against poverty. Roads open up more areas and stimulate economic and social development. For those reasons, road infrastructure is the most important of all public assets.

### 1.2 Purpose

- To stabilize the soil very efficiently.
- To increase the service life, increase the economy of the construction with using the cheaper material as a replacement of the cement, and to reduce the cement consumption.

### 1.3 Scope

- Stabilization of soil using Ground Granulated Blast Furnace Slag (G.G.B.S) in subgrade of flexible pavement
- Selecting effective and economical method of soil stabilization for the stability and durability of the flexible pavement.

### 1.4 Objectives

The main objectives of the project is to utilize the industrial waste i.e. G.G.B.S as a soil stabilizer material to improve the engineering properties of soil to make it a capable sub grade construction of road pavement.

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*Darshan Panchal

*Email address:* 160120109044@git.org.in

## 2. About GGBS

*2.1 Introduction*

Ground-granulated blast-furnace slag (GGBS or GGBFS) is obtained by quenching molten iron slag (a by-product of iron and steel-making) from a blast furnace in water or steam, to produce a glassy, granular product that is then dried and ground into a fine powder. Ground-granulated blast furnace slag is highly cementitious and high in CSH (calcium silicate hydrates) which is a strength enhancing compound which increases the strength, durability and appearance of the concrete.

*2.2 Production*

The chemical composition of a slag varies considerably depending on the composition of the raw materials in the iron production process. Silicate and aluminates impurities from the ore and coke are combined in the blast furnace with a flux which lowers the viscosity of the slag. In the case of pig iron production the flux consists mostly of a mixture of limestone and forsterite or in some cases dolomite. In the blast furnace the slag floats on top of the iron and is decanted for separation. Slow cooling of slag melts results in an unreactive crystalline material consisting of an assemblage of Ca-Al-Mg silicates. To obtain a good slag reactivity or hydraulicity, the slag melt needs to be rapidly cooled or quenched below 800 °C in order to prevent the crystallization of merwinite and melilite. To cool and fragment the slag a granulation process can be applied in which molten slag is subjected to jet streams of water or air under pressure. Alternatively, in the pelletization process the liquid slag is partially cooled with water and subsequently projected into the air by a rotating drum. In order to obtain a suitable reactivity, the obtained fragments are ground to reach the same fineness as Portland cement

*2.3 Composition*

The main components of blast furnace slag are CaO (30-50%), $SiO_2$ (28-38%), $Al_2O_3$ (8-24%), and MgO (1-18%). In general increasing the CaO content of the slag results in raised slag basicity and an increase in compressive strength. The MgO and $Al_2O_3$ content show the same trend up to respectively 10-12% and 14%, beyond which no further improvement can be obtained. Several compositional ratios or so-called hydraulic indices have been used to correlate slag composition with hydraulic activity; the latter being mostly expressed as the binder strength. The glass content of slags suitable for blending with Portland cement typically varies between 90-100% and depends on the cooling method and the temperature at which cooling is initiated. The glass structure of the quenched glass largely depends on the proportions of network-forming elements such as Si and Al over network-modifiers such as Ca, Mg and to a lesser extent Al. Increased amounts of network-modifiers lead to higher degrees of network depolymerisation and reactivity.

## 3. Soil stabilization

Soil stabilization process considers physical and chemical method used to make a soil suitable for its required purpose. Soil stabilization is like one type of process to improve the strength of soil by using additives in order to use as a base or sub base course and carry the expected traffic and pavement loads.

*3.1 Types of stabilization*

- Mechanical stabilization
- Cement stabilization
- Lime stabilization
- Bitumen or tar stabilization
- Chemical stabilization
- Geosynthetic stabilization

*3.2 Types of cement stabilized materials*

- Soil cement
- Cement bound granular material
- Lean concrete

## 4. Experimental program

*4.1 General*

We are trying to stabilize the soil by ground granulated blast furnace slag (GGBS) which is by-product of the steel industry. The main objective of this project is to investigate the effect of GGBS on the engineering property (optimum moisture content

and maximum dry density, plastic limit, liquid limit etc.) of the soil. GGBS are added from 0% to 10% by dry weight of soil, first of all check the all soil property at 0% (no GGBS) and then compare after addition of GGBS 5% and 10%.

*4.2 Standard proctor test*

*4.2.1 For OMC (%)*

Table 1. Optimum Moisture Content

| GGBS (%) | Optimum Moisture Content (%) |
|:---:|:---:|
| 0 | 14 |
| 5 | 13.87 |
| 10 | 13.60 |
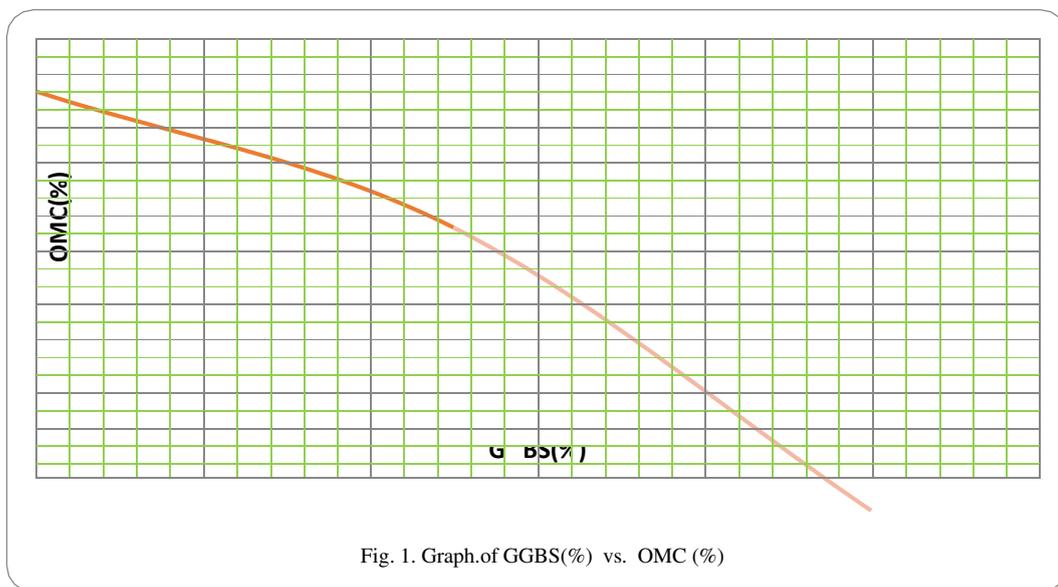


Fig. 1. Graph.of GGBS(%)  vs.  OMC (%)

*4.2.2 For Maximum Dry Density(gm/cc)*



Fig. 2. Graph.of GGBS(%)  vs.  MDD (%)

Table 2. Maximum Dry Density

| GGBS (%) | MDD(gm/cm3) |
|----------|-------------|
| 0 | 1.70 |
| 5 | 1.718 |
| 10 | 1.725 |

*4.3 Liquid limit test*

Table 3. Liquid Limit Test

| GGBS (%) | LIQUID LIMIT (%) |
|----------|------------------|
| 0 | 33.65 |
| 5 | 29.1 |
| 10 | 28.05 |



Fig. 3. Graph.of GGBS(%)  vs.  Liquid limit (%)

*4.4 Plastic limit test*

    *4.4.1.    For plastic limit (%)*

Table 4. Plastic Limit

| GGBS (%) | Plastic limit (%) |
|----------|-------------------|
| 0 | 21.12 |
| 5 | 18.75 |
| 10 | 17.59 |



Fig. 4. Graph.of  GGBS(%)   vs.  Plastic limit (%)

*4.4.2 For Plasticity index*

Table 5. Plasticity Index

| GGBS(%) | PLASTICITY INDEX (%) |
|---------|----------------------|
| 0 | 12.38 |
| 5 | 10.88 |
| 10 | 10.21 |
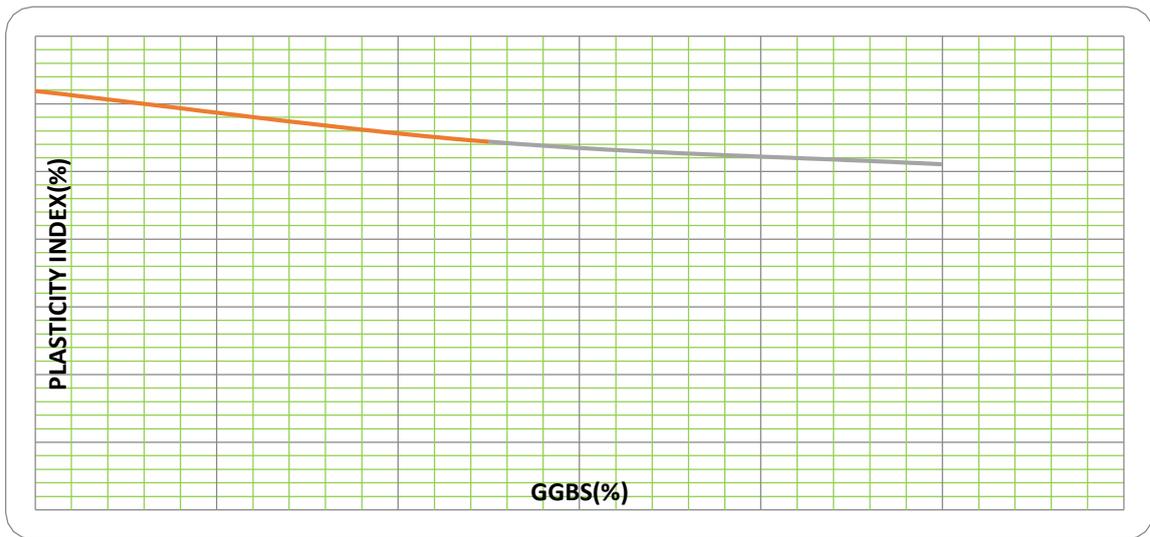
Fig. 5. Graph of GGBS (%)  vs.  Plasticity index

*4.5  California bearing ratio test (Unsoaked)*

Table 6. California Bearing Ratio

| GGBS (%) | C.B.R (%) |
|----------|-----------|
| 0 | 4.29 |
| 5 | 4.72 |
| 10 | 5.295 |
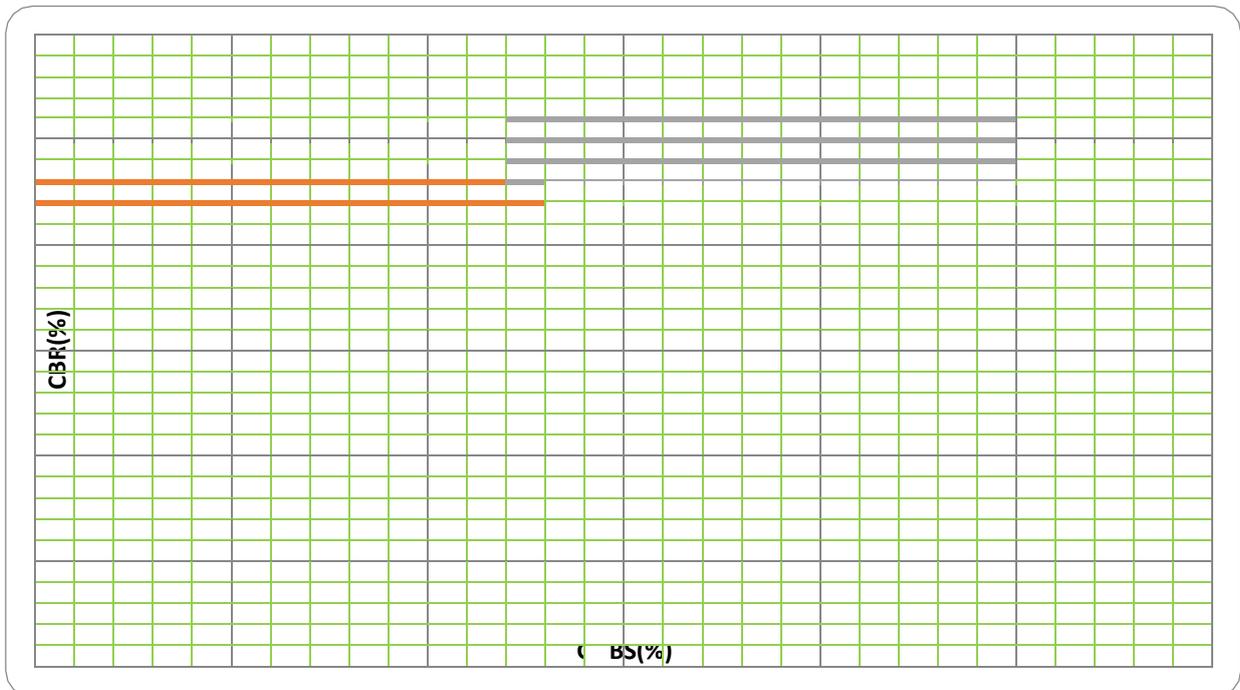


Fig. 6. Graph of GGBS (%)  vs.  CBR (%)

*4.6  Unconfined compression test*

Table 7. Unconfined Compressive Strength

| GGBS (%) | Unconfined compressive strength (kg/cm2) |
|---|---|
| 0 | 1.46 |
| 5 | 1.54 |
| 10 | 1.796 |



Fig. 7. Graph of GGBS (%)  vs.  UCS (kg/cm2)

**5. Conclusion**

By the analysis of result the following conclusions may be drawn:

- With the increases of GGBS percentage OMC goes on decreasing while MDD goes on increasing, hence compactibility of soil increases and making the soil more dense and hard.
- With the increases of GGBS percentage liquid limit, plastic limit, and plasticity index decreases which makes the soil less plastic and hence plasticity index reduces.
- C.B.R value for unsoaked increases with increases in percentage of GGBS that show the densification of soil takes place.
- With the increases of GGBS percentage compressive strength increases that means arrangement of soil particles are very closely, which reduce the voids.

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# Cloud Migration Technologies and Implementation

Madhuri Chopade[a*]

*[a]Assistant Professor, Gandhinagar Institute of Technology, Gandhinagar, Gujarat, India*

**Abstract**

Cloud migration is that the method of part or utterly deploying Associate in an organization's digital assets, services, Information Technology resources or applications to the cloud. The migrated assets square measure accessible behind the cloud's firewall. Cloud migration is additionally called business method outsourcing (BPO), which can entail migrating a complete structure infrastructure, wherever computing, storage, code and platform services square measure transferred to the cloud for access. Many organizations now not question the worth proposition related to cloud computing. However the speech has changed— from "Should we tend to bang?" to "How ought to we tend to do it to urge the foremost value?" Intel needs to assist you alter delivery of your cloud services so your business will notice the total advantages of cloud computing currently, whereas birthing the groundwork to maneuver to a additional elastic hybrid model at constant time. The aim of this guide is to assist you're taking the primary step—building a personal cloud on an extremely virtualized foundation.

*Keywords:* Cloud Computing, Migration, Virtualization.

## 1. Introduction

Cloud migration generally involves moving knowledge or alternative business parts between cloud environments that is thought as cloud-to-cloud migration. The method of transitioning to a different cloud provider is referred to as cloud service migration. In any case, productive migration to a service provider's atmosphere might need the utilization of middleware, like a cloud integration tool, to bridge any gaps between the vendor's and also the customer's (or alternative vendor's) technologies.

Transitioning to the cloud or between cloud environments presents the same old IT problems, however the issues square measure combined by having knowledge keep and managed remotely, by external organizations and infrequently in multiple locations. Among these problems square measure special concerns for privacy, interoperability, knowledge and application movableness , knowledge integrity, business continuity, and security.

Regardless of structure size, one among the concerns is whether or not the workloads; targeted for cloud migration have been virtualized. In some cases, it's a lot of easier to maneuver workloads to the cloud if on-premises servers have already been virtualized. In fact, some suppliers can permit a corporation to port virtual machines on to the cloud. If on-premises servers haven't been virtualized, a migration to the cloud is probably going still attainable, however the method might involve a lot of work.

### 1.1 Virtualization Technologies

- User State Virtualization: There's forever a risk inherent in business-critical information being hold on end-user machines. If a machine is lost, taken or broken, the value in lost information and productivity usually way exceeds the worth of the machine itself. Through user state virtualization (USV) technologies, like Roaming Profiles and Folder Redirection, you'll be able to make sure that all user information is hold on firmly on centralized servers wherever you'll be able to back it up and defend it on an everyday basis. USV conjointly offers your users the convenience of having the ability to access their information from any digital computer. Their personal settings and information also are seamlessly offered on any new machine or in any new location.
- Application Virtualization: Deploying, managing and maintaining line-of-business applications will be one in every of the foremost expensive and long aspects of shopper computing. However Microsoft Application Virtualization (App-V) permits you to virtualized applications, as well. This helps you package, deploy and maintain applications during a centralized and efficient means. App-V lets your users access any approved application from any approved device.
- Combined with USV, App-V permits you to deliver a seamless end-user expertise, whereas streamlining software package maintenance and licensing practices.

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*Madhuri Chopade

*Email address:* madhuri.chopade@git.org.in

- OS Virtualization: Just as you'll virtualize a whole server surroundings, you'll conjointly deliver an entire desktop computing expertise. mistreatment Virtual Desktop Infrastructure (VDI) and Remote Desktop Services session virtualization, you'll provide your users anyplace access to a personalized, on-demand desktop computing surroundings, complete with their own applications and information. When you add RemoteFX, introduced with Windows Server 2008 R2 SP1, VDI becomes a full-fidelity expertise. RemoteFX provides you a 3D virtual adapter, intelligent codecs and therefore the ability to airt USB devices inside VMs. There are solutions like Microsoft Enterprise Desktop Virtualization, or MED-V, that uses virtualization technology to assist mitigate application-compatibility problems on the desktop, removing barriers to OS upgrades.

## 2. Benefits of Cloud Virtualization

### 2.1 Reduce Infrastructure Cost

Resource Migration into the cloud—particularly public cloud computing, wherever a hosting company provides shared or dedicated hardware—delivers a major bottom-line reduction in cost. In different words, you don't ought to obtain the maximum amount computing hardware. You ought not to power, manage or maintain it on-premises. After you examine the full value relative to computing power delivered, virtualization offers vital value advantages as a results of shared resources and elastic quantifiability. These value savings are often a boon to your budget, significantly in tough economic conditions.

### 2.2 Elastic Scalability

When conducting capability coming up with and analysis, we regularly style IT infrastructure for the "worst case"—laying out design capable of handling the best attainable load underneath the worst attainable conditions. For instance, you would possibly style your internet infrastructure to be capable of handling your on-line retail traffic and dealings load throughout the end-of-year season. Does one actually need to manage and maintain servers sufficient to serve that capability all year round?

Migrating those temporary workloads to the cloud permits you to get pleasure from the elastic measurability of virtualization. You'll be able to add extra capability whenever you would like it, and simply and cleanly recall it once you don't. The bulk of cloud answer suppliers charge on a pay-for-use basis, thus this will additionally deliver a big profit to your bottom line by reducing your prices throughout lower-utilization times.



Fig. 1. Cloud Migration

### 2.3 Redundancy and Reliability

You have to confirm your technology systems meet the wants of your users. That's your primary mission. Your advanced systems can, at some purpose, encounter instability. Whether or not your hardware fails, your network affiliation drops or your data center goes down in severe weather, there'll be problems.

Virtualization offers you a further layer of flexibility to quickly answer these challenges. Vital business systems are self-contained among their virtualized surroundings, therefore you'll simply replicate them to multiple physical locations or

migrate them to new hardware any time. This provides you improved responsibility by eliminating failure points. It conjointly enhances your disaster recovery designing efforts.

### 2.4 Reduce your Data Center Cost

There are some workloads you'll want to maintain and run in your own data center. Whether you prefer to maintain exclusive possession of your data or implement custom solutions, or because the cost/benefit analysis simply tips in favour of keeping it in-house, there are good reasons to continue to operate and manage your own applications and servers.

Fortunately, doing so doesn't necessarily deprive you of the benefits of the cloud. You can still adopt a cloud-like architecture in your own data center. This concept is known as a "private cloud." There are a number of different ways you can leverage virtualization technology and private cloud architecture to help realize the most value from your infrastructure investment.

## 3. Steps to implementation of Cloud Virtualization

### 3.1 Implementation of Virtualization

Virtualization is that the foundation for Associate in agile, ascendable cloud—and the primary sensible step—for building cloud infrastructure. Virtualization abstracts and isolates the underlying hardware as virtual machines (VMs) in their own runtime setting and with multiple VMs for computing, storage, and networking resources in an exceedingly single hosting setting. These virtualized resources square measure crucial for managing information, moving it into and out of the cloud, and running applications with high utilization and high availableness. The hypervisor is a virtual operational platform that executes the guest software for Associate in nursing application. Host servers square measure designed to run multiple VMs sharing multiple instances of guest operational systems.

### 3.2 Select Your Cloud Management Platform

With enhanced virtualization infrastructure, you furthermore may would like bigger management capabilities, a technical challenge which will be achieved in parallel to your transition to a cloud setting. At this juncture you'll be able to decide to:

- Use a virtualization management platform which will even be used or extended simply for the cloud.
- Augment existing tools with associate degree enlarged set of cloud management capabilities on high of your existing virtualization management platform.
- Add a brand new cloud management platform (CMP) which will run the cloud and your existing virtualization setting.

A cloud management platform is integrated package that delivers service quality, security, and accessibility for workloads running in cloud environments. CMP offerings vary wide in terms of platform maturity, design quality, and capabilities. At minimum, it ought to provide:

- Direct user access to the system
- Self-service capabilities and interfaces
- Workflow engine
- Automated provisioning
- Metering and chargeback practicality

### 3.3 Automate Workflows and Other System Capabilities

Automation is a key capability of elastic, high-performing cloud environments. By eliminating or minimizing manual processes and requiring minimal human control points, you can optimize and manage resources faster, deliver services, manage service life cycle, and respond to changing conditions. In a cloud environment, automated workflows integrate across heterogeneous and disparate systems that manage provisioning, scaling, VM configuration, identity and access controls, network resources, workflow monitoring, patching, and backup. More advanced automation capabilities can include release management, load balancing, firewalls, and management of more complex VMs.

### 3.4 Orchestrate Services End to End

Orchestration software system provides the machine-controlled intelligence that dynamically arranges, coordinates, and manages the weather of your cloud surroundings. Orchestration of end-to-end services permits the flexibility, economy of scale, and on-demand delivery for virtualized resources and provides the benefit and convenience users expect once they access the cloud.

Orchestration has 2 main jobs: positioning service requests with on the market resources and observation the health of the physical and virtualized surroundings. These functions alter your cloud to scale up or down supported demand at specified performance levels. To accomplish this, orchestration manages across totally different systems to:

- Connect and modify workflows to deliver a such that service.
- Manage configuration, capacity, metering, and chargeback.
- Track and report on cloud performance and accessibility.
- Monitor and manage power, together with energy consumption and cooling necessities.
- Monitor security threats and adherence to security policies, together with access, authorization, and identity management.
- Take effective actions and build changes supported feedback from watching tools.
- Predict potential problems so that they is addressed before they become major problems.

## 4. Conclusion

As cloud computing is advance technology, to move data from two different cloud we need migration technology. There are so many migration technology available but in this paper we have implemented cloud using os virtualization. In future we want to implement cloud migration using virtualization.

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# Analysis of Data Leakage Prevention

Vaibhavi Ghariya[a*], Pooja Shah[a]

[a]*Asst. Professor, Information Technology Department, Gandhinagar Institute of Technology, Moti Bhoyan,Gujarat, India*

**Abstract**

A record conveyance model focusing on information spillage counteraction. Contemplating the blame likelihood which is the likelihood of the client having spilled records, this model can choose a document designation plan with the least cover between got record sets of clients, as the outcome the model can discover spillage sources with high likelihood. With the goal that measures can be taken for data security further. The recreation tests uncover that the model can recognize malignant clients and identify the hole source successfully.

*Keywords*: Data Leakage Detection , Cloud, Homomorphic Encryption , Distributor , Agent

## 1. Introduction

Now-a-days data leakage is common across industries, academic and government offices. For the business purpose or research purpose the data must be shared among the different enterprises or agents. Once data is given to the agents, it should not reach to the unauthorized person. If somebody among the agents leaks the data, it may lead to great loss. To avoid this loss it is necessary to detect the leakage and stop doing business with that agent. Currently, techniques based on watermarking are used to detect the guilt of agent, but it has to modify the data which is not allowed in some cases. The Prevenzione focuses on the novel method of preventing your sensitive data by providing a secure platform and detecting the guilty who has leaked the data.

## 2. Objective and Scope of System

A data failure is the unintentional release of secure information to an unauthorized environment. The goal is to estimate the likelihood that the leaked data came from the agents as opposed to other sources. Not only to we want to estimate the likelihood the agents leaked data, but we would also like to find out if one of them was more likely to be the leaker. Algorithms are designed to know the source of the leaker.

Prevenzione that is to be developed provides the distributors and the agents with all the secured data management, Data Prevention and Data Leakage Detection to agents. The Prevenzione is supposed to have the following features.

- The System will be able to manage the data among distributors and agents.
- The System will view the data to the respective user.
- The System will provide secure platform to users.
- The System is capable of doing Guilty Person Analysis.

## 3. Existing System

Several systems are there which aims at providing security to data plus the whole system but though they fail at providing data security to its highest level and many loopholes were found in the existing system. Watermarks were initially used in images, video or audio data whose digital representation includes considerable redundancy. These techniques were used for handling data leakage detection. But the drawback of this technique is that- it requires some modification of data. Also in some cases the watermarks can be destroyed if the data recipient is malicious. Hence there is need to propose efficient technique to find data leakage.

## 4. Homomorphic Encryption

Homomorphic Encryptions basically perform to calculate complex mathematical operations to encrypted data without compromising the encryption, which allows computation on ciphertexts which generate the encrypted result. When decrypted, its match the result of process as if they had been performed on the plaintext. Cloud Computing platforms can perform tough computations on homomorphically encrypted data without ever having access to the unencrypted data. It can also be used to securely chain together different services without exposing sensitive data. It can also be used to create other secure systems such as secure voting systems, collision-resistant hash functions, and private information retrieval schemes.

*Vaibhavi Ghariya
*Email address:* vaibhavi.ghariya@git.org.in

*4.1 Experimental Analysis*

In the proposed system, we develop Elgamal algothim for finding guilty agents. For this purpose different data allocation strategies are used. We are using "Fake records" (used with the data to generate different hash value) which are not real but appear as real records in order to find the guilty agent. Here these Fake objects acts as a watermarks like in watermarking technique. It improves over the limitations of watermarking technique as it does not require any modification of original data. If it turns out an agent was given one or more fake objects that were leaked, then the distributor can be more confident that agent was guilty. Also in proposed system, we have implemented e-mail filtering technique in which unauthorized users will be unable to see and download the contents of the e-mails which is send by guilty agent. So Distributors sensitive data remains secure.

In figure 1 we can see design of eclipse IDE. As should be obvious the first content document ElGamal.txt has some ordinary content record. We compile this record utilizing apache ant, the outcome [figure 1] we get unique content document is changed over to figure content and the aftereffect of the figure content is currently changed over to plain content.
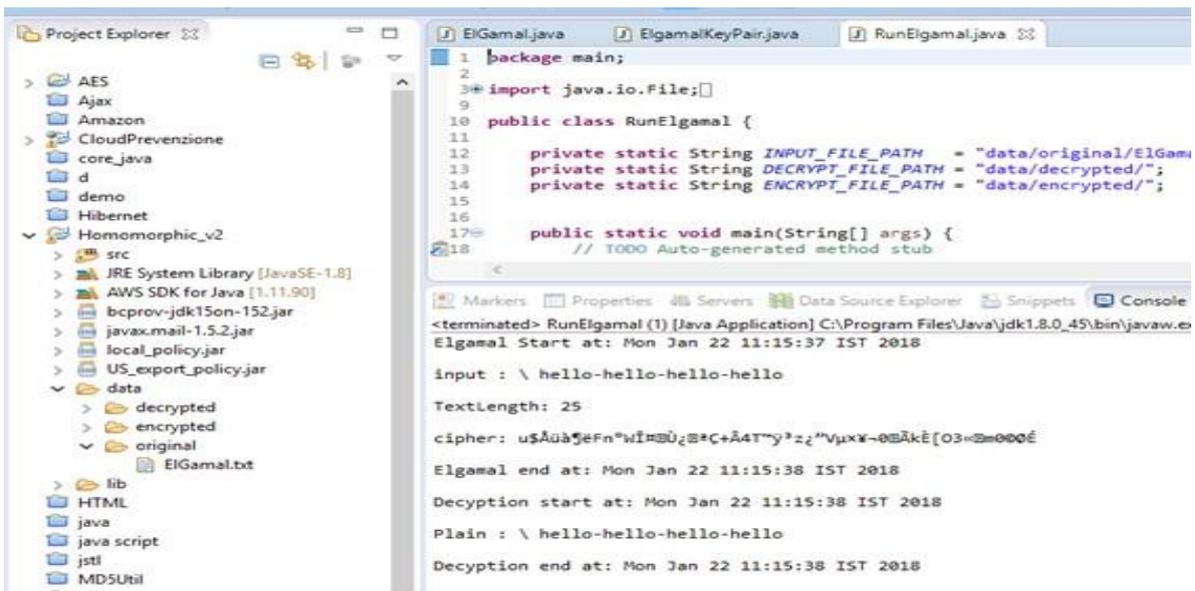


Fig. 1. Elgamal Data Encryption/Decryption

Security is of prime concern while carrying out this online system. This system has implemented proper security measures such as creating secure space between client machine and server and proper access rights control is been implemented, So that the system will provide a secure environment to each system user on terminal to make work easy as well as return required information in easiest way.

In figure 2 we can see that it's generate before and after has value for the cipher text. So, when distributor send the sensitive data to agent, that time it's generate the hash value and other side agent modified or some change in that sensitive data, that time it's change the has value. In Elgamal Encryption it's depend on the data hash value as we consider for securing the sensitive data in a region.



Fig. 2. Elgamal Fake Object (Hash Value)

**5. Prevenzione System**

Prevenzione system is providing secure region where distributor and the other agent can share their sensitive data. This system is on the cloud platform with secure region. In this system the distributor will upload the data in cloud and then our algo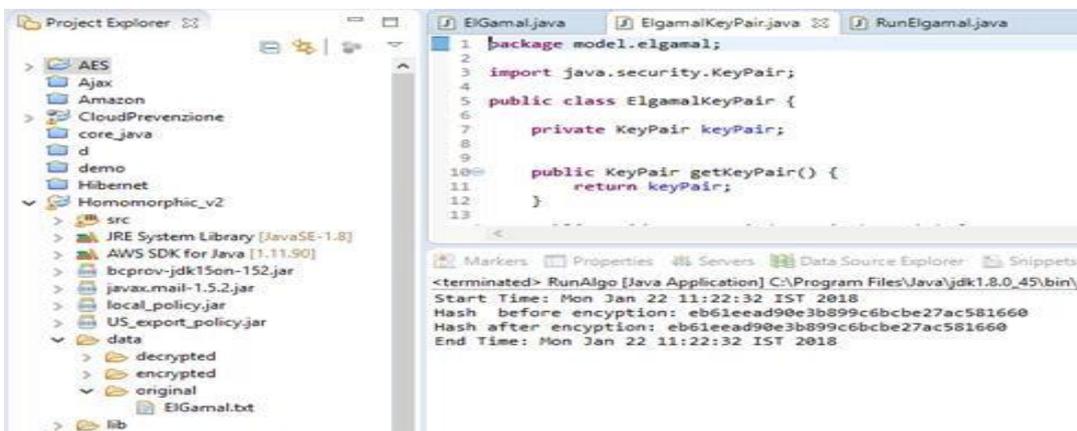rithm applied on that data for security. And the other side agent can be show data and download that data too, but if the data is modified or change in that data and transfer to other region, so that will be notifying by the distributor. And for the security reason we have expand our algorithm with the help of it generate the fake hash value and it will attach with the original data.

*5.1 Distributor Module*

Distributor will add the agent list according to his requirements and share the data to his agents. The data will be uploaded by the distributor and after that data can be shared and downloaded. The data will be sending in the encrypted form and stored in cloud platform.

**At Distributor's side**

- The distributor (which will act as an admin in the system) will enter into the system by means of login.
- Then the distributor can upload the files which can be shared or downloaded.
- Distributor can view all the files uploaded.
- Distributor can share his data to his respective agents.
- Distributor get notify if the data is modified and send to other region.

*5.2 Agent Module*

Agent can view the data provided by the distributors and share the data. The encrypted data can be retained in its original form by means of key provided by the distributor. The data will be downloaded from cloud platform.

**At Agent's side**
- Agent can enter the system by means of login or registration (if not registered)
- Agent can view the received files from the distributor.
- Agent can share the file.

**6. Conclusion**

This application will provide a secure environment for data sharing by means of various encryption techniques. This will ensure Data Prevention and Data Leakage Prevention and also provide a relief to various sectors where data sharing take place.

**7. Future work**

Our future work includes the investigation of agent if the data is leaked from the trusted source. So we are planning to go for DLD (Data Leakage Detection) in further enhancements.

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# Anonymizing Sensitive Based Features using Hadoop MapReduce

Pooja Shah[a*], Vaibhavi Ghariya[b]

*[a]Asst. Professor, Information Technology Department, Gandhinagar Institute of Technology, Moti Bhoyan, Gujarat, India*

**Abstract**

Storing big set of private records at local database results in internal attacks with local storage problems and storing records in cloud without anonymization results in external attacks, which both results in privacy breach. To offer privacy, previously proposed Personal Anonymization technique uses two attributes: Sensitive Disclosure Flag (SDF) and Sensitive Weight (SW) which are set on the basis of required privacy. Frequency Distribution Block (FDB) and Quasi-Identifier Distribution Block (QIDB) are used for anonymization. Our proposed approach is the extension of previous work, first each patient IDs in the medical record is changed using Permute method and then the records are generalized to provide anonymity and finally original and anonymized records are saved in cloud which removes the big data storage problem at local system. This work is implemented on Hadoop Map-Reduce Framework. Only data owner can view the records by fetching from cloud using Inverse Permute method and the anonymized records are made available for the researchers to understand the patterns for a particular disease.

*Keywords*: Personal Anonymization, Map-Reduce, Big Data.

## 1. Introduction

Big data[1] is different from past data warehousing efforts because it performs analytics on almost any type of data file or format, including images, videos, and data gathered from social media. The privacy of data is a huge concern which increases in the context of Big Data. Cloud computing has become a viable, mainstream solution for big data processing, storage and distribution, but moving large amounts of data in and out of the cloud presents a privacy challenge for organizations. There is great public fear regarding the inappropriate use of personal data on cloud, particularly through linking of data from multiple sources but, Personal information present in different organizations will research for understanding patterns there by achieving betterment of the community, for example personal health details of different patients are present in different hospitals and this information can be used by researchers to understand the patterns for a particular disease and hence improve the identification of the diagnosis.

Table 1. Patient Published Data

| ID | Age | Zipcode | Disease |
|----|-----|---------|---------|
| 1 | 26 | 586171 | Gastric Ulcer |
| 2 | 28 | 586176 | Stomach Cancer |
| 3 | 32 | 586362 | Flu |
| 4 | 36 | 586175 | Heart Disease |
| 5 | 42 | 586178 | Heart Disease |
| 6 | 46 | 586177 | Stomach Cancer |

Now-a-days with the trend of Big data usually all hospitals go with public cloud for storing the huge health data records. However, numerous hospitals are still hesitant to take advantage of cloud due to privacy and security concerns. Medical privacy or health privacy is the practice of keeping information about a patient confidential. This involves both conversational discretion on the part of health care providers, and the security of medical records. The medical data records present in hospital contains detailed information regarding the patient like name, address, DOB, zip code, symptoms and disease. Usually to preserve the individual privacy the hospital admin removes the details including name and address which are considered personal from the huge personal health records before it is given to cloud, however this raw health records contain details like zip, DOB that can be linked with other external publicly available data bases for re- identification of sensitive value. For example consider the details of the Patient Published by the hospital in Table 1, which does not contain details regarding name, address and other personal information. The attacker can use the publicly available external data base shown in Table 2 and join these details with Table 1 thereby revealing personal details.

*Pooja Shah
Email address:* pooja.shah@git.org.in

The entire details regarding sensitive information i.e. disease and the identity of the individual are of great concern because the individuals are not ready to share their sensitive information. The join operation on both Table 1 and Table 2 gives the value Rahul from zip code 589171 and age 26 is having Gastric ulcer. This type of discloser is called Record Level Disclosure. Attributes present in Published Patient Data that can be linked to external publicly available data bases like ZIP, DOB are called Quasi-Identifier (Q) attributes.

Table 2. External Voters Data Base

| Name | Age | Zipcode |
|------|-----|---------|
| Rahul | 26 | 586171 |
| Shiva | 28 | 586176 |
| Sita | 32 | 586362 |
| Jeet | 36 | 586175 |
| Sachin | 42 | 586178 |
| Mani | 46 | 586177 |

However, Data owners of personal health records have to publish the data for significant human benefits as the records are analyzed and mined by research centers. But in storing the data on cloud, the data privacy is at the high risk of disclosure because of the failure of some traditional privacy protection measures on cloud which results in severe social reputation impairment to data owners. Hence, data privacy issues need to be addressed before the data sets are analyzed or shared on cloud. Most widely adopted method for data privacy preservation is Data anonymization which refers hiding identity which preserves privacy of an individual while certain aggregate information is exposed to data users for diverse analysis and mining. Under this modification of data is done in such a way that the resultant table has duplicated records there by restricting the disclosure and this process is called generalization [3,4]. Once the Table is generalized various methods were used to check the property of duplication and distribution. To measure this Samarati and Sweeney [5,6] introduced k-anonymity. A Table satisfies k-anonymity if every record in the table is indistinguishable from at least k-1 other records with respect to every set of quasi-identifier attributes.

Table 3. 2 -Anonymus Table

| Zipcode | Age | Disease |
|---------|-----|---------|
| 586*** | [20-30] | Gastric ulcer |
| 586*** | [20-30] | Stomach Cancer |
| 586*** | [30-40] | Flu |
| 586*** | [30-40] | Flu |
| 589*** | [40-50] | Flu |
| 586*** | [40-50] | Heart Disease |

Table 3 shows a 2-anonymous generalization for Table 1. Let us assume that the attacker uses the publicly available data base and finds that Rahul's zip code is 586171 and his age is 26 and wants to know the disease of Rahul, the attacker observes the anonymized Table 3 from which attacker understands that 586171 and 26 has been generalized to 586*** and age [20-30] which cannot be linked with voters database record and hence the disease cannot be inferred. But still there is drawback with k-anonymity. Consider, if the attacker tries to infer Sita's disease who is related to group 3 but since the entire group contains the same sensitive attribute the attacker infers that her disease is Flu. This leakage of sensitive value leads to Attribute Level Disclosure. This happens if all the diseases indicated in a group are related to the same disease.

Major disclosures of health records take place at record level and attribute level. To avoid this various anonymity techniques have been proposed, but each of them have several drawbacks. Author [2] uses SW-SDF Based Personal Privacy with QIDB-Anonymization on Medical Data which overcomes the disadvantages of various anonymization techniques. The core of this scheme is two additional flags with the original table. Sensitive Disclosure Flag (SDF) determines whether record owner sensitive information is to be disclosed or not. The second flag is Sensitive Weigh (SW) which indicates how much sensitive the attribute is. SDF is dependent on SW. Frequency Distribution Block (FDB) and Quasi Identifier Distribution Block (QIDB) which is used in anonymization.

The rest of the paper is organized as follows. In section 2, the prior works on privacy preserving techniques are illustrated. The proposed scheme is defined in Section 3. Section 4 presents results and analysis. Section 5 concludes the paper.

## 2. Related Work

Initial anonymization algorithm was called k-anonymity [5,6] but the drawback of this approach is that it is prone to record level disclosure. To overcome this disadvantage l-diversity [7] was proposed. Disadvantage is that it is prone to Skewness and Back ground Knowledge Attack. t-closeness [8] is used to overcome the disadvantages of l-diversity but it has larger information loss.

To overcome this, author in [9] had indicated a method called personalized privacy preservation which takes in to account record owners privacy requirement. In [9] the record owner can indicate his privacy by indicating in terms of a guarding node. The drawback of this method is that it may require several iterations based on the guarding node, sensitive attribute is also generalized which has larger information loss. The most important drawback is that distribution of sensitive attribute has not been taken in to account while anonymization.

Author in [2] proposes a novel privacy preserving technique that over comes the disadvantages of [9] and other anonymization techniques. The disadvantage of SW-SDF based anonymization proposed in [2] is that, it doesn't provide data security on database in local system from external attacks and also local database doesn't support processing a large set of health records. Further storing the original records as well as anonoymized records in local database increases the local storage. The proposed work overcomes these disadvantages, once the original data records are sent for processing, local system contains only IDs and name of the patients which removes the burden of data storage in local database. Along with the remaining fields of health records, permutated values of each IDs are saved in cloud. These permuted IDs secures the health records from the external linking attacks. For processing the large set of health records proposed work is implemented on hadoop framework. Then the records anonymized data and partial-anonymized data (those who want to reveal) are stored in cloud and made available to researchers.

## 3. Proposed Work

The main motivation of the proposed approach is to make personalized anonymization of the large scale health records depending on the fact that, few patients are ready to reveal their sensitive data and some patients are not ready to reveal. For processing large scale of data, Hadoop MapReduce framework is considered for implementing. Basically, MapReduce on cloud has two levels of parallelization i.e., job level and task level. Job level parallelization means that multiple MapReduce jobs can be executed simultaneously to make full use of cloud infrastructure resources. Combined with cloud, MapReduce becomes more powerful and elastic as cloud can over infrastructure resources on demand, e.g., Amazon Elastic MapReduce service [10]. Task level parallelization refers to that multiple mapper or reducer tasks in a MapReduce job are executed simultaneously over data split. The proposed SW-SDF scheme provides personal privacy anonymization by separating anonymized data and partial-anonymized data. Both datasets are stored in public cloud and made available to researchers.

The proposed work of SW-SDF Based Personal Privacy with QIDB Anonymization using Hadoop framework is divided mainly into four modules as shown in figure 1. They are Admin Module, Mapper and Anonymizer Module, MapBased Reducer Module and Cloud Database Module
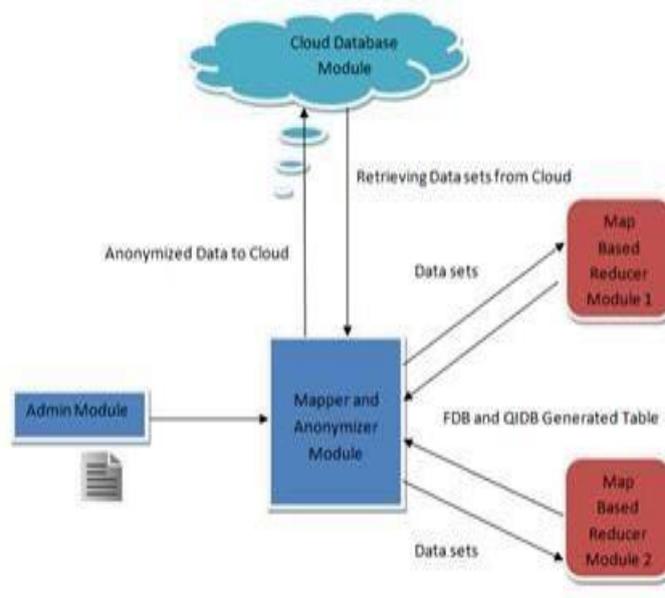


Fig. 1. SW-SDF Based Personal Privacy with QIDB Anonymization using Hadoop framework

*3.1 Admin Module*

In this module hospital admin, adds two flags with the original dataset. Sensitive Disclosure Flag SDF which is obtained from the individual patient when they are providing their data. The flag SDF=0 means that the patient is not ready to disclose his sensitive at-tribute whereas SDF=1 doesn't mind revealing his sensitivity. SW is set by the admin based on the prior knowledge of sensitive attribute. The value of SW=0 is used when the sensitive attribute is a common disease like Flu and SW=1 for sensitive attribute like Cancer which is not common. The SDF and SW are taken from [2]. In proposed scheme each IDs in the health record is changed using permute method as shown in Table 5 so that hackers cannot link the patient details. The modified dataset shown in Table 4 is sent to next Mapper and Anonymizer Module and these records are saved in cloud without SW and SDF column. Admin keeps only original IDs and Name in hospital local database. To obtain a original records admin uses a inverse Permute method as shown in Table 6 to retrieve a original record. This removes the burden of storing the large dataset at local system.

Table 4. Modified Dataset Table with SW and SDF values

| ID | Age | Zipcode | Disease | SW | SDF |
|----|-----|---------|---------|----|----|
| 1 | 24 | 584170 | Flu | 0 | 1 |
| 3 | 34 | 584171 | Flu | 0 | 1 |
| 8 | 39 | 560017 | Stomach Cancer | 1 | 1 |
| 27 | 35 | 584173 | Heart Disease | 1 | 0 |
| 124 | 36 | 584171 | Flu | 0 | 1 |
| 725 | 36 | 584175 | Stomach Cancer | 1 | 0 |
| 5046 | 25 | 560018 | Stomach Cancer | 1 | 0 |

*3.2 Mapper and Anonymizer Module*

Authors of [2] have not considered large set of health records, as a result the local sys-tem becomes slow when it processes large datasets.

Table 5. pseudocode: Genarating Permute ID

```
For each, n
Do
permute id,x = n!+n-1
end
```

Table 6. pseudocode: Genarating Inverse Permute ID

```
Original ID, n
for (i=1,i++) until x= 1
do
Flour(x/i)=x
When x=1 corresponding
i=n
end
```

The proposed scheme is implemented on Hadoop framework. Mapper and Anonymizer module is master of Hadoop framework, the Mapper partitions the dataset among the number of Reducers and sends to the Map-Based Reducer Module. The result from the different MapBased Reducer Module is FDB generated Table 8 and QIDB generated Table 9. These two tables are combined and final anonymization is done by running SW-SDF anonymization algorithm, taken from [2]. SDF-SW provides personal privacy anonymization by separating anonymized and partial anonymized data. There are totally four threshold attributes to be considered for SW-SDF anonymization algorithm.

i)    $Th_n$ minimum number of records in T.
ii)   $Th_{ittr}$ maximum number of iterations that must be performed. ittr it indicates the amount of generalization.
iii)  $Th_{supp}$ minimum number of sensitive values for suppression.
iv)   $Th_{acc}$ minimum number of sensitive values for disclosure.

If SW is greater than $Th_n$ then calculate the difference between QIDB and FDB Probability. The value (QIDB +/- Thacc) should be approximately equal to the difference value. If value is less then FDB probability, disclose the data else suppress data. The detailed SW-SDF anonymization algorithm is described in Table 7. In paper [2] disclosing the data meant providing no generalization hence even if the data is sensitive there is no personal privacy provided. But in proposed scheme disclosed data is generalized with basic Anonymity and it is called partial anonymized data and the suppressed data is the anonymized data which is generalized with higher Anonymity, shown in Table 11 and 12 respectively. The anonymized and partial anonymized set of data with permuted IDs is given to Cloud Database module where they are stored in cloud server.

*3.3 MapBased Reducer Module*

This module is the slave of Hadoop framework. The partitioned datasets from Mapper and Anonymizer module is processed at each MapBased Reducer modules to generate Frequency Distribution Block (FDB) and QuasiIdentifier Distribution Block (QIDB). FDB and QIDB are taken from [2]. FDB contains distribution of every disease with respect to original private data. For every record with SW=1 and SDF=0 QIDB is created. This module first counts the total number of rows in the datasets table and selects the unique Disease example like Gastric Ulcer, Stomach Cancer, flu, Heart Diseases etc. At each MapBased Reducers FDB probability is calculated and all the resultant probability is added into the FDB table. After generating FDB table, QIDB table is generated only for sensitive diseases with SW=1.

$$FDB\ probability = \frac{Number\ of\ Count\ on\ Each\ Disease}{Total\ Number\ of\ Count} \qquad …(1)$$

The result from the different MapBased Reducer Module is FDB generated table QIDB generated table are shown in Table 7 and Table 8 which is given to the Mapper and Anonymizer Module for further processing.

Table 7. FDB Generated Table

| Disease | FDB Probability |
|---|---|
| Flu | 0.4 |
| Stomach Cancer | 0.4 |
| Heart Disease | 0.2 |

Table 8. QIDB Generated Table

| Disease | QIDB Probability |
|---|---|
| Flu | 0 |
| Stomach Cancer | 0.5 |
| Heart Disease | 0.5 |

$$QIDB\ probability = \frac{Number\ of\ Count\ Satisfying\ SW=1,SDF=0}{Total\ Number\ of\ Count\ of\ Sensitive\ Disease} \qquad …(2)$$

*3.4 Cloud Database Module*

In paper [2] all storage was in local system which increases the chances of privacy loss if any attacks happens at local system and further any crash of local system might result in complete data loss. So, in the proposed scheme Cloud Database module is added which is implemented on Amazon S3 public cloud. This module stores the original health record with permuted IDs as shown in Table 9 which is only available to the Admin and also stores the anonymized and partial anonymized records as shown in Table 10 and Table 11 respectively which are available for the researchers. Admin's local database has only original IDs and patient names. Whenever Admin wants to retrieve the entire health record he uses the inverse permute algorithm to link the original IDs from the local database with the permuted IDs from the cloud.

Table 9. Modified Dataset Table with permuted ID's

| ID | Age | Zip code | Disease |
|---|---|---|---|
| 1 | 24 | 584170 | Flu |
| 3 | 34 | 584171 | Flu |
| 8 | 39 | 560017 | Stomach Cancer |
| 27 | 35 | 584173 | Heart Disease |
| 124 | 36 | 584171 | Flu |
| 725 | 36 | 584175 | Stomach Cancer |
| 5046 | 25 | 560018 | Stomach Cancer |

**4. Result and Analysis**

Our proposed scheme achieves the complete privacy for each individual patient by implementing personal data anonymization. The data records which are needed to be sup-pressed are generalized with more anonymity i.e two columns are generalized as shown in Table 11 and data records which needed to be disclosed are generalized with less anonymity i.e. one column is generalized as shown in Table 10 These two tables are made available for researchers and as only anonymized data are present in cloud and published in public, there is no possible way of external linkage attack. Patient original IDs and name are only present in local database. The permuted IDs with all other details are stored in cloud as shown in Table 9. The admin can inverse-permute the IDs using the original IDs to get the complete records when needed. So, the local database is free from large storage of data as well as internal attack.

Table 10. Partial Anonymized data

| Age | Zip code | Disease | Records |
|-----|----------|---------|---------|
| 24 | 584*** | Flu | 1 |
| 34 | 584*** | Flu | 1 |
| 36 | 584*** | Flu | 2 |
| 39 | 560*** | Stomach | 2 |
| 28 | 584*** | Cancer | 1 |
|    |        | Heart Disease | |

Table 11. Anonymized data

| Age | Zip code | Disease | Records |
|-----|----------|---------|---------|
| [30-40] | 584*** | Heart Disease | 1 |
| [20-30] | 560*** | Stomach | 1 |
| [30-40] | 584*** | Cancer | 1 |
|         |        | Stomach | |
|         |        | Cancer | |

## 5. Conclusions

In working with cloud and Big data, Personalized privacy is an important research direction and SW-SDF is a better option for personalized Privacy. SW indicates the sensitivity of records which has to be given privacy and SDF gives the individual view of revealing or suppressing data. Even though when the disease is common but patient wants privacy, the records are generalized with basic anonymity. For the sensitive diseases, the records are generalized with more anonymity. As the private database contains only patient IDs and name it removes the burden of storage and IDs in cloud are stored in permuted form which overcomes record linkage and attribute linkage, in turn giving complete individual privacy. The anonymized records are made available for the researchers to understand the patterns for a particular disease.

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# Bandwidth utilization scheme for MIMO Co-operative Networks with 3G/4G Networks

Vardhman Pillai[a*], Shriram Iyer[a]

*[a]Asst. Professor, Institute of Computer Technology, Ganpat University, Gujarat, India*

**Abstract**

Cooperative systems administration is known to have noteworthy potential in expanding system limit and transmission unwavering quality. Presently in a day's impromptu systems, most works are constrained to the fundamental three-hub hand-off plan and single-antenna wire frameworks. These two constraints are interconnected and both are because of a restricted hypothetical comprehension of the ideal power designation structure in MIMO Cooperative Networks (MIMO-CN). We additionally measure the execution increase because of helpful transfer and build up an association between agreeable hand-off and unadulterated hand-off. In this postulation, proposed philosophy has been introduced. This proposed framework is executed in Matlab 2013a. It will show to us some influenced parameters are Network Capacity, offloading movement, covered cell with one zone to another region we utilized here in calculation DR calculations and Reduce Overhead Signaling. The intermittent scope of macrocell causes the expanded enrollment flagging overhead in the femtocell and macrocell organize where the thick femtocellls covered with a macrocell are divided into little Tracking Areas (TAs). After examination another approach known as Delay Registration (DR) calculation is proposed for overhead diminishment with the cost of giving up the activity offloading capacity of the femtocell and macrocell in such case.

*Keywords*: Famtocell, Macrocell, DR Algorithm,MIMO-CN,DF-DT System.

## 1. Introduction

Cooperative correspondence is like the hand-off channel model to some degree yet varies fundamentally in that every remote client is expected to both transmit information and additionally go about as a cooperative operator for another client. At the end of the day, cooperative flagging conventions ought to be planned so clients can help different clients while as yet having the capacity to send their own particular information [1]. Collaboration prompts intriguing tradeoffs in code rates and transmits control. On account of energy, it might appear that more power is required on the grounds that, in cooperative mode, every client is transmitting for both itself and an accomplice. In any case, the point to be made is that the pickup in assorted variety from participation enables the clients to decrease their transmit controls and keep up a similar execution. Notwithstanding this exchange, one trust in a net decrease of transmits control, given everything else being consistent. In cooperative correspondence, every client transmits the two its own bits and in addition some data for its accomplice, so it might give the idea that every client requires more bandwidth. Then again the phantom effectiveness of every client enhances in light of the fact that, because of collaboration assorted variety, the channel code rates can be expanded. Accordingly, in non-cooperative correspondence clients send specifically to a typical goal, without rehashing for each other. In cooperative communications, autonomous ways between the client and the base station are created by means of the hand-off channel. The transfer channel can be thought of as a helper channel to the immediate channel between the source and goal. A key part of the cooperative correspondence process is the preparing of the flag got from the source hub done by the hand-off. These distinctive handling plans result in various cooperative communications conventions. The preparing at the hand-off contrasts as indicated by the utilized convention. Cooperative communications conventions can be for the most part arranged into intensify and forward and interpret and forward transferring plans.

## 2. System Analysis and Problem Outcomes

Consider a multi-source and multi-hand-off system with M source hubs and N transfer hubs as appeared in Fig.1. [8]. Here it is accepted that, immediate transmission isn't conceivable and one source has just a single accomplice to help for data transmission, i.e. single hand-off choice. The convention utilized by hand-off is interpret and forward. (DF). In this technique, each source hub is associated with one hand-off. The channels from source hubs to transfers and the channels from transfers to goal are unidirectional.

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*Vardhman Pillai

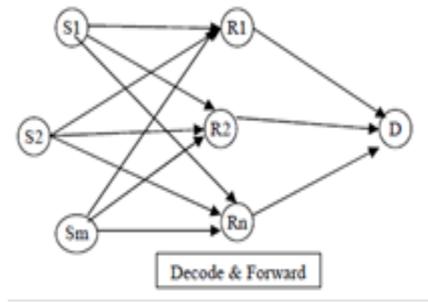*Email address:* vardhmanpillai@gmail.com

Fig. 1. Wireless networks and M Sources and N Relays

The sources are assigned to relays in such a way to minimize the total power consumption in the network. The problem of power minimization can be stated state mathematically as follows:

$$min\left(\sum_{i=1}^{M} P_{s,i} + \sum_{j=1}^{N} P_{r,j}\right)$$

$$\text{s.t.} \quad P_{s,i} > 0, \quad P_{r,j} > 0$$

$$\sum_{i=1}^{M} P_{s,i} \le P_{s,max}$$

$$\sum_{j=1}^{N} P_{r,j} \le P_{r,max}$$

## 3. Related Work

Above all else, for the hand-off choice, control framework is created, in which transmission control for each source with each transfer is ascertained [8]. At that point introduce the components in the transmission control network, which can be communicated as demonstrated as follows.

$$\begin{bmatrix} P_{1,1} & \cdots & P_{1,N} \\ \vdots & \ddots & \vdots \\ P_{M,1} & \cdots & P_{M,N} \end{bmatrix} \dots [1]$$

This calculation can be utilized to choose suitable hand-off hub in the cooperative condition with a specific end goal to limit the transmission energy of source-hand-off sets and in addition the transmission energy of the entire system. The stream diagram of calculation is appeared in fig 2. Set of source hubs is meant by S and set of transfer hubs are signified by R individually. P1 means the underlying transfer distribution, P2 indicates the middle of the road hand-off portion and P3 signifies last hand-off designation. The calculation comprises of three stages: Initial stage, Intermediate stage and last stage. The transfer designation in Initial stage is known as introductory hand-off allotment, (Fig.2) which is meant by P1. In this stage, for one source the transfer is being chosen such that the source-hand-off combine has least power utilization. Along these lines transfer choice is done until the point when all the source hubs have been assigned. The hand-off designation in Intermediate stage is known as Intermediate hand-off distribution, (Fig.2) which is signified by P2. In this stage, trade of hand-off is done M times for the power diminishment. From P1 the most extreme power expending pair (I, j) is chosen. At that point another source and hand-off combine (y, z) from beginning stage, which can swap the transfer to get the greatest power sparing, is being found. On the off chance that the source and hand-off combine (y, z) is found, erase past sets from P1, and include new matches in P2 and P1 individually. Rehash this procedure until the point when P1 is vacant. The transfer portion in Final stage is known as Final hand-off distribution, (Fig.2) which is signified by P3. Last stage utilizes a stage comprising of a check to distinguish whether the aggregate power utilization because of source-transfer allotment in Intermediate Phase

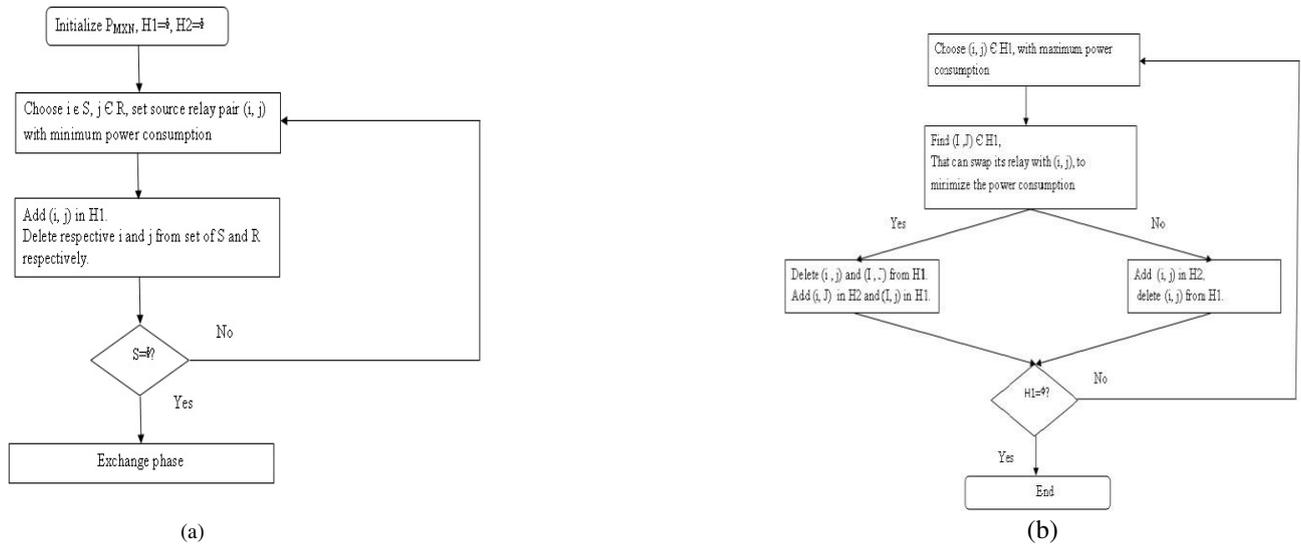(a)                                                                                                     (b)

Fig. 2. (a) Greedy Phase, (b) Exchange Phase

Is lesser than the corresponding power consumed in the Initial phase or not. And then relay selection is done based on the initial relay allocation or intermediate relay allocation which has lesser power consumption.

## 4. Simulations Results

Reproduction of this calculation is performed in recreation instrument MATLAB. In DF condition, expecting that the power assignment is as of now done; we consider 5 sources and 5 transfers for the reenactment reason, which can be changed according to necessity later on. From the recreation of the calculation it has been discovered that, it functions admirably in DF-DT framework. In DF-DT framework, Direct Transmission from source hub to goal is conceivable notwithstanding the transferred transmission. In the Second stage when a most extreme power expending pair (I, j) in P1 swaps its transfer with other combine (y,z) shaping pair (I, z), at that point source y stays without hand-off. In this way, now it can either made match with the transfer j which is left by the source I, or it can co-work with the rest of the transfers in the system, or can even decide on coordinate transmission. The impediment with calculation is that if there should be an occurrence of DF framework, where no immediate transmission is conceivable, the moderate stage designation tends to expand the aggregate power transmission. This is on account of, when match (I, j) i.e most extreme power devouring pair in P1, swaps its hand-off with (y, z) shaping (I, z), at that point the source y is compelled to make combine with j attributable to the way that there is no immediate transmission conceivable and different transfers are involved by various sources. This can build the aggregate power utilization of the source y transmission to the goal by means of hand-off j. So as to conquer this confinement of the first and second stage, we propose a last stage which wipes out the likelihood of increment in control utilization in the middle of the road stage. Table 1 demonstrates the source-hand-off combine and their relating power utilization and aggregate power in Initial Phase. Add up to control in First Phase is the aggregate transmission energy of the system.

Table 1. First Phase relay allocation

| Source | Relay | Power Consumption |
|--------|-------|-------------------|
| 2 | 5 | 1.0714 |
| 1 | 2 | 2.9262 |
| 3 | 1 | 3.8096 |
| 4 | 3 | 14.5613 |
| 5 | 4 | 28.7848 |
| Total Power in initial Phase=51.1532 | | |

Table 2. Second Phase relay allocation

| Source | Relay | Power Consumption |
|--------|-------|-------------------|
| 2 | 5 | 1.0714 |
| 5 | 1 | 18.9708 |
| 4 | 3 | 14.5613 |
| 3 | 2 | 16.4064 |
| 1 | 4 | 4.2566 |
| Total power in intermediate stage=55.2664 | | |

Table 2 demonstrates the source-hand-off match and their relating power utilization and aggregate power in second Phase. Add up to control in First Phase is the aggregate transmission energy of the system. As observed from Table 1 the greatest power devouring source-transfer match is 5-4 in P1 expending 28.7848 unit control. In Second stage as show in Table 2, source 5 trades it transfer with source 3 influencing pair to source hand-off 5-1 devouring 18.9708 unit control which is not as much as pervious combine 5-4. Be that as it may, however we prevailing with regards to decreasing force utilization of source 5, second stage has unwittingly expanded power utilization of source 3 from 3.8096 to 16.4064 units which in turns builds the aggregate transmission energy of the system from 51.1532 to 55.2664 units. In Fig.3, the code is keep running for 5 continuous circumstances with a specific end goal to see the impact of energy level of first Phase and second Phase; and the relating comes about have been appeared as Bar-chart. The cautious perception (Fig 3) of the diagram demonstrates that at first in the principal, third, fourth and fifth run the power in first Phase is successfully diminished yet in second run, it neglects to do as such. The explanation behind this is, second stage's endeavor to limit the power utilization of greatest power expending source hand-off match by hand-off trade, has expanded the general power utilization of the system. Subsequently Final hand-off determination isn't made based on P2, yet it is made based on P1 i.e introductory transfer distribution in beginning stage. From fig.4 we watch that the power utilization in definite stage never surpasses that in the second Phase.
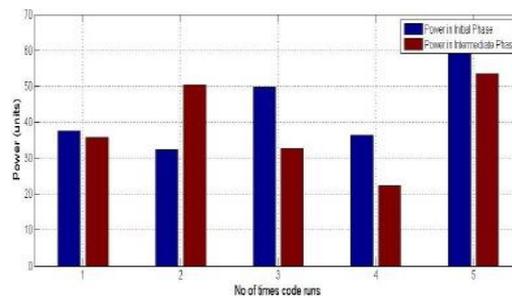
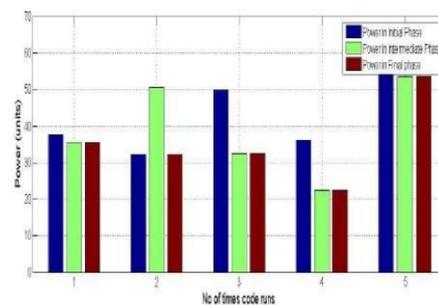

Fig. 3. Power consumption in First phase and Second phase



Fig. 4. Power consumption in final phase

## 5. Final Investigations

We propose another arrangement for negligible exertion region organization in the femtocell and macrocell netowrek. It declines the phone reselection from the macrocell to femtocell, however keeps the most sensible femtocell data available at the Mobile Station which is used to trigger the handover to femtocell for development offloading when call arrives. It lessens the flagging cost incurred significant injury in the meantime securing the development offload capacity of the femtocell, however requires no any adjustment on the present system. The execution examination between our outcome and another approach named as DR calculation is directed with together the examination and recreation. The examination shows that our proposition better DR figuring in the cost diminish with the considerable adaptability to the differing Mobile Stations (MS) lead in high movability. Our last outcome is approving against the reproduction tests. They can be used for the execution evaluation on other multitier portable systems other than the femtocell/macrocell systems.

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# Using Optical Flow Handling Occlusion

## Shriram Iyer[a*], Vardhman Pillai[a]
*[a]Assistant Professor, Institute of Computer Technology, Ganpat University, India*

**Abstract**

In video surveillance systems major performance decline is Occlusion. Occlusion should be detected very precisely by all automatic software system. Also automatic system continuously monitors the scene. When two objects are overlap, rear object will be hidden behind the front object. The hidden part of the rear object is called a occluded part the object. Human bodies are overlapped when they are walking in the scene. Illumination can be the reason for the occlusion because object identified by the intensity value of particle which belong to the object. Occlusion is not directly detected problem. Pixel of the occluded is detected which belong to the part of the same. Purpose of detection of Occlusion is mainly for the set occluded part in the image and gets the original image. Exquisite resampling and Optical flow are used for the improve the performance of the algorithm. Included phase in the algorithm is such like prediction, importance sampling and resampling. Optical flow is used for the finding important particle which can give both intensity and the direction of the particle.

*Keywords*: Occlusion, Particle Filter, Optical Flow

## 1. Introduction

Image processing is used for different operations for digital phase and doing operations on the image, for getting good result it will detect helpful data from it. We are providing the video, frames as input and the output will be concerned characteristics of image. The image processing system contains as two dimensional signals treated as image for live methods of signal dispensation will be apply to them. Nowadays, it is one of the best increasing technologies, with its applications in a variety of branches of a business. Frames are detected, recognized by using Visual surveillance system with image processing. This type of structure is largely used in applications such as safety for major construction forces areas which can be detected and monitored travel in cities creatures. Analysis of video has been done by the recording of the video.

The occlusion is one of the main problems of reduced performance in video surveillance systems. Every mechanized discovery systems must precisely control occlusion. Two object is moving in the environment they overlapping each other due to that reason rear object will not be detected. It is called Occlusion. It has three types' self-occlusion, inter-object occlusion, and background occlusion. Due to occlusion different parts such like animal, tree, vehicles will be overlapped in a scene.

Particle filter is based on Monte Carlo theorem. It estimates state by posterior probability, commonly used in pattern recognition and object tracking, such as [1]. Improved from [2], this paper proposed an adaptive particle filters tracking algorithm scheme with exquisite resampling.

## 2. Particle Filter

In this Section, We will illustrate proposed algorithm the detail. Figure [1] is show the flow chart of the system of particle filter Optical Flow. It has three basic step. 1. Prediction 2. Weight calculation and sampling
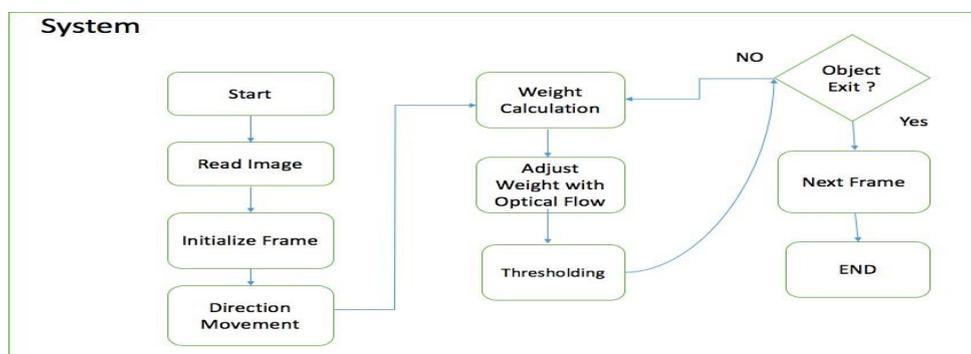


Fig. 1. System

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*Shriram Iyer
*Email address:* shriramiyer@gmail.com

*2.1 Particle Filter*

Tracking objects in video involves the modeling of non-linear and non-Gaussian systems. One solution can be employed by using a probabilistic framework which formulates tracking as interference. [3] They are sequential Monte Carlo methods based on point mass representations of probability densities, which are applied to any state model [4]. Particle Filter is a hypothesis tracker, which approximates the filtered posterior distribution by a set of weighted particles. It weights particles based on a likelihood score and then propagates these particles according to a motion.

Weight of each particle should be changed depending on observation for current frame. The basic Particle Filter algorithm consists of 2 steps: Sequential importance sampling (SIS) and Selection step. In SIS step it uses Sequential Monte Carlo Simulation. For each particle at time t, transition priors are sampled. For each particle we then evaluate and normalize the importance weights. In selection steps (Resampling), we multiply or discard particles with respect to high or low importance weights to obtain a predefined number of particles. This selection step is what allows us to track moving objects efficiently. [4]

*2.2 Prediction*

The first stage of particle filter is prediction stage. When object disappears, instead of randomly spreading particles, we radially spread particles from where object disappeared because of the assumption that the object will not move faraway immediately. If the object is temporarily occluded, the way we spread particles research the target more efficiently than searching globally. While in long-term occlusion, we have already spread particles globally and this can avoid missing the object. [6] Then, use the motion vector obtained from optical flow to adjust the diffusion range. A high standard deviation of the motion vector indicates the object moves drastically, hence we need to enlarge the diffusion range as Figure 2(a). A low standard deviation indicates moving consistency, so the diffusion range could be shrunk, as Figure. 2(b).[7]
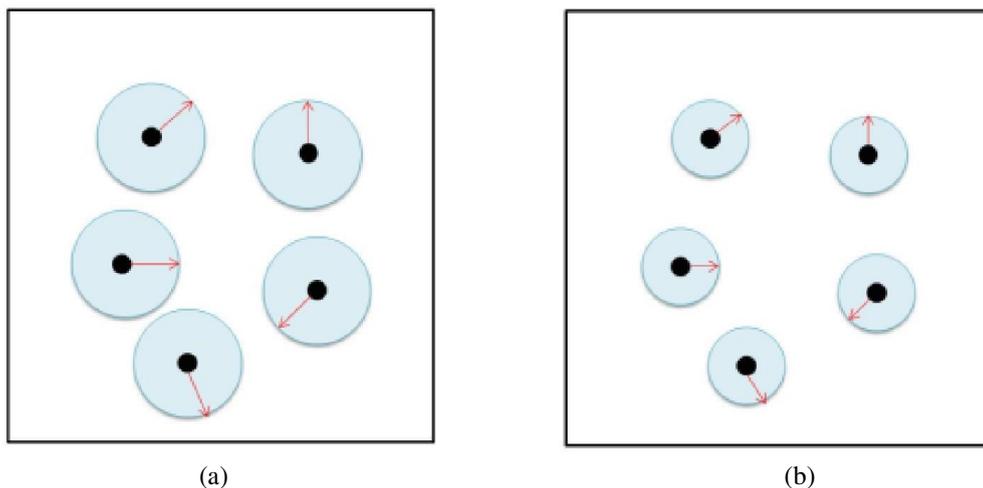


|   (a)   |   (b)   |
|---------|---------|
| Fig. 2. (a) High deviation for diffusion | Fig. 2. (b) Low deviation for range |

We can also predict the moving direction by motion vector. It is reasonable that the object moves toward the same direction according to the last few seconds, as a result, we spread the particles toward the same direction if moving direction has consistency. [6]

*2.3 Optical Flow*

Motion estimation is demanding field among researchers to compute independent estimation of motion at each pixel in most of general. Motion estimation generally known as optical or optic flow. Motion is very important part in image sequences. Motion estimation is the process of determining motion vectors that describe the transformation from one 2-D image to another. Optical flow or optic flow is the pattern of apparent motion of objects, edges and surface in a visual scene caused by the relative motion between an observer (an eye or a camera) and the scene. Particle Filter – this particle system implementation, the weighting system will have two modes that can be activated at a time that is convenient for the tracking system. The first mode will take the final output of the Lucas Kanade tracker and use those as inputs to the particle system measurements. The particle system is still going through all of the previously described steps which consist of: 1. The next frame predicts the constant velocity motion 2. Model
Weight each particle based on its distance from the Lucas Kanade targeting output using the current frame. 3. The Gaussian random distribution for speed base. 4. Resample the particles based on the weight. 5. Repeat step first until complete. [11]

*2.4 Sampling*

Objective of this phase is find weight for each particle and also save important and discarded less important particle from. Color histogram of the target model is used as feature to determine the weights. It is called importance sampling. RGB histogram space used 8, 8, 8 bins also derived weights of the target model. Always centre pixel of the object is important compare to boundary pixel.[6]

After obtaining the original weights by calculating their Bhattacharyya coefficients, we take two steps to refine them. Optical flow [8] is the apparent motion of brightness patterns in the image. Ideally, it would be the same as the motion field. Calculating the average of motion vector [9] obtained from optical flow, we can predict a new centre from the last centre. Promoting the weights of particles around the centre which optical predicts is the first step.

The second step is to set a threshold. Low-weight particles decrease accuracy, to avoid it, we hope to eliminate those less important. A suitable measure of degeneracy of the algorithm is the effective sample size Neff introduced in [1]. Using to obtain the effective samples, choose the lowest weight in those samples to set the threshold. The weight which is lower than the threshold is set to be zero.

When all the weights are small and set to zeros, means all the particles in the whole frame are not similar to the target, in other words, there exists no object. [1]

Elimination of the small weight particle and give the importance to the higher value weight particle. This objective of this phase. Prediction is also depend on the high value pixel. Disadvantage of Resampling algorithm has represented in the fig.N = number of particles [6]

Ci represents the cumulative sum of weights. Ui is a sequence of random variable which is uniformly distributed in the interval [0, 1]. We view Ui as a threshold, the CDF crossing over it is considered the more important one. As shown in, Because C2, C4 and C5 cross the threshold U2, U4 and U5. U2, U4, U5 are saved for the use of next prediction. From the figure we can found that particle 2 weight lesser than particle 1. Particle 4 weight is lesser than particle 3. Estimation accuracy will be decreased due to this fault. From using the resampling, problem will be solved. [10]
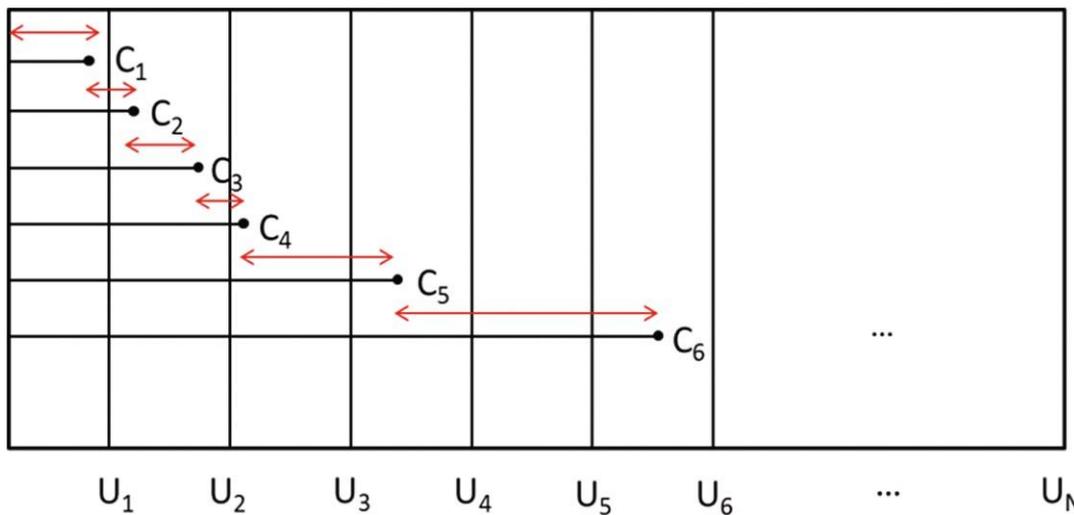


Fig. 3. Algorithm of resampling

Find out the particle which has high weight in that interval. C1, C3 eligible candidate to be saved. From this pdf can be very accurate.

We generate the dynamic state space equation which given below: [6]
Where vk and wk are nonzero mean Gaussian random variables,

x0 = 1, $\alpha$ = 0.5, $\beta$ = 25, $\gamma$ = 8, sample numbers = 100, Time step = 50 s.

$$x_{k+1} = \alpha x_k + \beta \frac{x_k}{1+x_k^2} + \gamma \cos(1.2\, k) + v_k \quad [6]$$

$$y_k = \frac{x_k^2}{20} + w_k \quad k = 1,2 \ldots..$$

Table 1. Comparison of Particle filter and Optical Flow

|  |  | Mean error | Accuracy |
|---|---|---|---|
| Experiment 1 | Particle Filter | 30.89 | 96.07 % |
|  | Using Optical Flow | 19.97 | 97.38 % |
| Experiment 2 | Particle Filter | 47.54 | 42.60 % |
|  | Using Optical Flow | 24.52 | 96.69 % |
| Experiment 3 | Particle Filter | 56 | 67.5 % |
|  | Using Optical Flow | 38.4 | 99 % |

## 3. Conclusion

Particle filter is mainly based on estimation of posterior probability. It is also useful for pattern recognition and object tracking. Using adaptive particle for object tracking scheme along with exquisite resampling, we can improve prediction and resampling.

Refinement of particle weights are done by Optical Flow, using the dynamic state model for motion information. From that we can easily find out the future flow of the object. Proposed algorithm is improved and enhanced the image, from the comparison table we can easily derive.

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# A Survey on Low Latency, Energy Efficient MAC Protocols for Wireless Sensor Network

Raxit Jani[a*]

*[a]Assistant Professor, Gandhinagar Institute of Technology, Gandhinagar, India*

**Abstract**

Wireless sensor networks consist of sensor nodes that are battery operated. Communication among the nodes involves various layers out of which MAC layer is one of them. Main goal of MAC layer protocols is to avoid collision. To achieve this it implements carrier sensing mechanism. In sensor networks most of the time no traffic is present on the network, but when any event occurs all the nodes must transmit the data to the sink node. In such a scenario lot of energy is wasted in idle listening. For solving the problem of idle listening various MAC layer protocols have been developed specially for wireless sensor network. In this paper we carry out a survey on a few of the MAC layer protocols for wireless sensor network. These protocols try to solve the problem of idle listening and thereby increases the lifetime of the network.

*Keywords*: Medium access control, Request to send (RTS), Clear to send (CTS), Network Allocation Vector (NAV), Timeout MAC, Pattern MAC, Routing enhanced MAC.

## 1. Introduction

Wireless sensor networks are a type of special purpose networks. They are widely used for various applications such as environmental monitoring, health care applications, military applications, security applications, whether forecasting, real time tracking, fire detection[1] and so on. There are large number of sensor nodes which are responsible for sensing the information from the surroundings and transmitting the sensed information to the sink. The sensor nodes are generally deployed in an adhoc manner. Each node has one or more sensors, embedded processors and low-power radios, and is normally battery operated. These sensor nodes have limitations in their computation capabilities, memory and bandwidth. Efforts are being carried out to develop power saving schemes for wireless sensor networks which include power saving hardware design, power saving topology design, power efficient MAC layer protocols and network layer routing protocols[2].

Communication among the sensor nodes involves several layers like the communication in most other networks. One of those layers is Medium Access Control (MAC) layer. Most important task of MAC layer protocols is to avoid collision. Some of the MAC layer protocols developed for wireless voice and data communication are Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA) and IEEE 802.11. In order to avoid collision, these protocols try to sense the medium. If no communication is going on, then the medium is considered to be idle and communication can be done. But if the medium is not idle then the source waits for a random amount of time and after that again tries to sense the medium.

In wireless sensor networks, the nodes are battery operated. In order to increase the lifetime of the network, it is necessary to conserve the energy of the sensor nodes in the network. Following attributes need to be considered for designing a good MAC protocol for wireless sensor network: energy efficiency, scalability, latency, throughput, fairness and bandwidth utilization. We must try to minimize the energy consumption of the sensor nodes to increase lifetime of the network.

Following are the sources of energy waste:
- *Collision:* when two or more packets collide with each other it results in discarding of all those packets as they cannot be accepted as the actual data. Retransmissions of those packets involve energy consumption.
- *Overhearing:* a node picks up packets that are destined for other nodes. Energy is consumed for processing the packets of other nodes.
- *Control packet overhead:* Sending and receiving of control packets also consumes energy.
- *Idle listing:* listening the medium to find whether any traffic is flowing over the medium or not.[3]

In wireless sensor networks, most of the time sensor nodes are idle and when some event occurs they immediately start their sensing activity. Many measurements have shown that idle listening consumes 50-100% of energy required for receiving. Therefore, the existing MAC protocols require some modification in order to reduce the waste of energy from the above mentioned sources. MAC protocols for wireless sensor networks can be broadly categorized into two parts:

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*Raxit Jani
*Email address:* raxit.jani@git.org.in

- Fixed duty cycle MAC protocols,
- Adaptive duty cycle MAC protocols.

In this paper we present a survey on few of the MAC layer protocols designed for wireless sensor network.

## 2. Fixed Duty Cycle Protocols

### 2.1 SMAC protocol

In a sensor network all the sensor nodes sense the information for one particular application. SMAC protocol considers that fairness is not important as long as application level performance is not degraded. It allows the nodes to sleep periodically when there is no traffic. As a result it tries to conserve energy by solving the problem of idle listening. SMAC design consists of three main components: (i) periodic listen and sleep, (ii) collision and overhearing avoidance and (iii) message passing.

### 2.1.1 Periodic listen and sleep

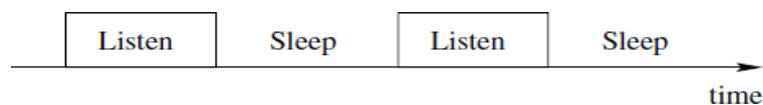The basic scheme for the first phase is shown in Figure 1.



Fig. 1. Periodic listen and sleep

Each node in the sensor network goes to sleep for some time and then wakes up to listen to another node. When the node is in sleep state, it turns off its radio to conserve energy. Nodes broadcast its sleep wakeup schedule in a SYNC packet to their neighbouring nodes. If a node receives a SYNC packet of its neighbouring node then instead of broadcasting its own schedule it follows the schedule of its neighbouring node. If a node receives the schedule from two of its neighbouring nodes then it follows both the schedules. For maintaining synchronization among the nodes, they need to periodically update each other their schedules to prevent long-time clock drift.

### 2.1.2 Collision and overhearing avoidance

The main task of MAC protocol is to avoid collision. SMAC avoids collision with the help of contention mechanism using RTS (Request To Send) and CTS (Clear To Send) packets. It applies virtual carrier sense by using a variable called network allocation vector (NAV). NAV records the value indicating the duration for the transmission which is included inside the packet. When a node wants to send the data, it first checks the value of NAV, if that value is not zero the node assumes that the medium is busy and if the value is zero then node can send its data. The mechanism for collision avoidance is shown in Figure 2.
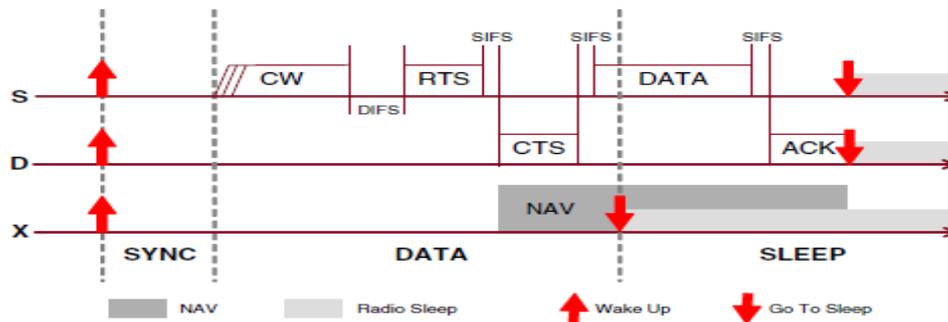


Fig. 2. SMAC typical duty cycle [3]

To avoid overhearing SMAC allows the nodes to sleep if they hear an RTS or a CTS packet. All the immediate neighbours of both the sender and the receiver should sleep after they hear RTS or CTS packet until the current transmission is over.

### 2.1.3 Message Passing

A single long message is divided into many small fragments and then transmitted in burst. The sender waits for an ACK from the receiver. If ACK fails to reach the sender then it extends the transmission time and re-transmits the current fragment immediately.

Limitations of SMAC protocol

- While it saves energy, latency is increased due to periodic sleep of each node.
- If the duty cycle is designed for high traffic loads, it results in energy wastage if the traffic load is very low.
- If the duty cycle is designed for low traffic loads, it results in low throughput under high traffic loads.

## 3. Adaptive Duty Cycle Protocols

### 3.1 T-MAC (Timeout MAC) protocol

T-MAC protocol reduces the idle listening by transmitting all the messages in bursts of variable lengths and sleeping between the bursts. Similar to SMAC, T-MAC also makes use of RTS, CTS, Data and ACK mechanism for enabling communication between the nodes. A node will keep listening as long as it is in the active period. An active period ends when no activation event has occurred for a time TA. A node exchanges its schedule with its neighbouring nodes by broadcasting SYNC packet. When a node wakes up and overhears the RTS or CTS of its neighbouring node then it goes back to sleep. A problem observed in this case is the early sleeping problem. A node may miss other RTS and CTS packet while sleeping and disturb some communication when it wakes up. Solution to this problem is future request to send. The basic idea is to let another node know that we still have a message for it. The working of this mechanism is shown in Figure 3.
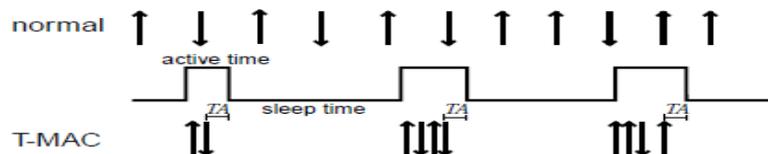

Fig. 3. Basic T-MAC protocol scheme [2]

Limitations of T-MAC protocol

1. In order to conserve energy, nodes go to sleep rather early, which results in increased latency and lower throughput.
2. It groups the communication during small periods of activity.

### 3.2 PMAC (Patten MAC) protocol

In this protocol patterns are generated and based on these patterns a sensor node can put itself into a long sleep for several time frames when there is no traffic in the network.  If there is any activity in the neighborhood, a node will know this through the patterns and will wake up when required. This protocol is able to achieve a better throughput at high loads and conserve more energy at light loads than SMAC. PMAC tries to save more power than SMAC and TMAC, without compromising on the throughput. The working of the protocol consists of three main tasks: (i) pattern generation (ii) pattern exchange (iii) schedule generation.
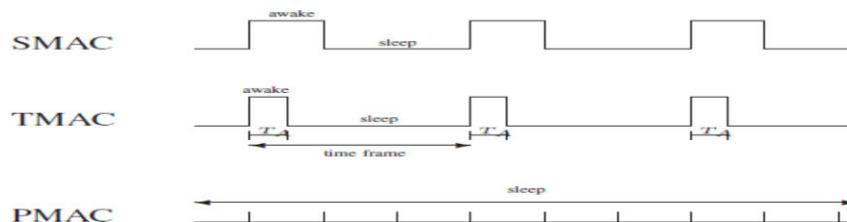

Fig. 4. Comparison of operational cycle of SMAC, TMAC and PMAC [4]

Figure 4 shows the comparison of operation cycle of SMAC, TMAC and PMAC. A sleep-wakeup pattern is a string of bits indicating the tentative sleep-wakeup plan for a sensor node over several slot times. Bit 1 in the string indicates that the node intends to stay awake during a slot time, while 0 indicates that the node intends to sleep. A sleep-wakeup schedule for a sensor node is a string of bits indicating the actual sleep-wakeup itinerary which the node will follow. Bit 1 in the string indicates that the node will stay awake during a slot time, while 0 indicates that the node will remain asleep. In PMAC, the *schedule* for a node is derived from its own *pattern* and, the patterns of its neighbouring nodes. Therefore, patterns do affect the sleep and wakeup times of a node, and thus the protocol's performance.

### 3.3 RMAC (Routing enhanced MAC) protocol

RMAC is a  new duty cycle MAC protocol that  exploits cross-layer routing information to solve the problems faced by SMAC and TMAC protocols. RMAC can deliver a data packet *multiple* hops in a single operational cycle. During the SLEEP period

in RMAC, a relaying node for a data packet goes to sleep first and then intelligently wake up when its upstream node has the data packet ready to transmit to it. RMAC can also efficiently handle traffic contention by moving the contention traffic quickly away from the contention area. RMAC sends a small control frame along the data forwarding path to allow all nodes along the path learn when to be awake in order to receive the data packet from the immediate upstream node and forward it to the immediate downstream node. Figure 5 shows an overview of the operation of RMAC.
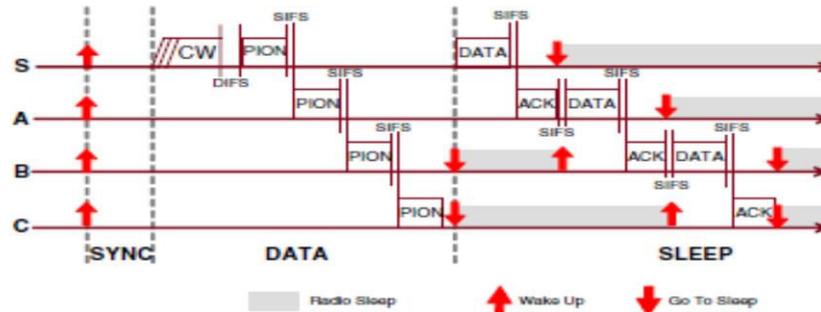


Fig. 5. RMAC Overview

An operational cycle of a sensor node in RMAC can be divided into three stages: SYNC, DATA, and SLEEP. SYNC period synchronizes the clocks on sensor nodes with the required precision. When a data packet is to be sent to a destination node that is multiple hops away, a control frame is sent during the DATA period to initiate the communication with the downstream nodes. RMAC uses a series of control frames, named PIONs (Pioneer frames), across multiple hops. A PION is used to request communication, like an RTS frame, and to confirm a request, like a CTS frame. During a SLEEP period, nodes go to sleep except for those that have communication tasks, as set up by the PIONs. PION includes all fields as in an RTS, such as current node's address, the next-hop address, and the duration of the transmission. PION also includes some cross-layer information: the final destination address of the current flow and the number of hops the PION has traveled. This final destination address is passed down by the networking layer. All data frames are transmitted in the SLEEP period. RMAC also uses NAV at each node for virtual carrier sense in order to avoid collision.

Limitations of RMAC protocol

- The PION mechanism increases the complexity in packet handling, which may have some negative effects in a real implementation of RMAC on a sensor network platform.

## 4. Conclusion

Sensor nodes are battery operated and also have less computation capability. The carrier sensing mechanism used by the MAC layer protocols waste a lot of energy in idle listening. Therefore, new MAC layer protocols have been developed which allows the sensor nodes to periodically sleep and wakeup when some event occurs. SMAC protocol conserves energy but increases the latency. SMAC protocol follows fixed duty cycle therefore it is not suitable for variable traffic load. TMAC protocol results in early sleeping problem. In RMAC protocol, PION packet increases the complexity of packet handling.

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# Rubberized Concrete (Experimental Study On Concrete)

Harshil Panchal[a*]

*aStudent, Gandhinagar Institute of Technology, Gandhinagar, India*

**Abstract**

Waste rubber tyres nowadays is a big headache for the authorities. The rubber tyres are non-biodegradable due to which their disposal is not possible and also it is polluting solution. Many ways are invented for the disposal for waste rubber tyre. One of that attempts has done in construction technology. From last two decades this research on use of waste rubber tyre has been started. It is a big advantage for concrete that by the use of the chipped rubber the properties like flexibility, lightweight, elasticity, energy absorption, sound and heat insulating property are adopted. In this study the concrete utilizing waster tire rubber has been investigated. Recycled waste tire rubber has been used in this study to replace the coarse aggregate by weight using different percentages. And the properties like compressive strength, split tensile strength are compared between the rubberized concrete and the normal concrete. The rubber percentage will be replaced by 0%, 10%, 20%, 30% in the concrete mix of grade M20 and M25.

## 1. Project Definition

In this modern world, the use of tires is extensively high. Also, to recycle the rubber waste is very much impossible and dangerous to environment, as it produces dangerous poisonous fumes which adversely affect the environment. So, the environment engineers are concerned regarding the rubber waste. As the waste becomes on increasing, different companies try to use tire in building construction. The clever use of rubber waste can result into low cost buildings and effective disposal of rubber waste. It is estimated that 11% of tires are exported and 27% are sent to landfilling or dumped. The 4% of the tire waste are used in construction. So, this problem deals with identifying the problem and then giving suitable solutions to overcome them and to reduce the rubber waste.

### 1.1  Use of waste tyre

Rubber wastes is used in floor mats, belts, gaskets, shoe sales, dock bumper, seal, muffler hangers, shims and washers. It is also used as a fire ingredient in cement kilns and brick kiln. Also, some tyres are used as a boat bumper, highway crash barriers. However, by burning tyres in environment it is harmful to the nature so the use of rubber is banned by government.

It has been observed that the rubber concrete is used when toughness is more desirable than strength. It can be used as bridge barriers and road foundation. The desirable properties which can be used for future investigations on rubber concrete. In this project an attempt has been made to identify the various properties of rubber concrete.

### 1.2  Purpose

The purpose of this project is to reduce the rubber waste produced. Reduced rubber wastes will also stop the environment from degradation.

### 1.3  Scope

The scope of this project is to analyze the different properties of traditional concrete and rubber concrete. Tests on the concrete will be carried out on both the traditional and rubber concrete and the results will be compared thoroughly.

### 1.4  Objective

The objective is to find properties of rubber concrete and analyze its properties. The properties like compressive strength, tensile strength and split tensile strength are studied, also the comparison is shown by graphical manner to understand it better. The objective of this project is to find the solution of rubber waste and to find a way to use the rubber effectively to benefit the society.

*Harshil Panchal
*Email address:* 140120106055@git.org.in

## 2. Concrete Terminologies

- **Concrete grade:** Concrete grades are denoted by M10, M20, and M30 according to their compressive strength. The "M" denotes Mix design of **concrete** followed by the compressive strength number in N/mm2.
- **Compressive strength:** Compressive strength is the capacity of a material or structure to withstand loads tending to reduce size
- **Split tensile strength:** A measure of the ability of material to resist a force that tends to pull it apart.

*2.1 Concrete properties*

Hardened Concrete Properties Compression test according to IS: 516(1959) is carried out on these cubes. The specimens were loaded at a constant strain rate until failure. The compressive strength is decreased with an increase in the percentage of the tyre rubber chips. The results of compressive strength of cubes for 7 days and 28 days are as follows.

*2.2 Durability*

Since rubber waste concrete has lower compressive strength than reference concrete it is expected that is behaviour under fast mechanical degradation actions could also be lower. s. According to them the use of a 10% replacement is feasible for regions without harsh environmental conditions.

*2.3 Density*

The general density reduction was to be expected due to the low specific gravity of the rubber aggregates with respect to that of the natural aggregates. The reduction in density can be a desirable feature in a number of application, including architectural application such as nailing concrete, false facades, stone backing and interior construction as well as precast concrete, light weight hollow and solid blocks, slabs etc.

*2.4 Effect of texture of rubber particle surface*

Various studies show that the rougher the rubber particles used in concrete mixtures the better the bonding they develop with the surrounding matrix and, therefore, the higher the compressive strength of rubcrete concrete may be obtained by improving the bond between rubber particles and the surrounding cement paste

*2.5 Methodology*

For preparation the recycled chipped rubber concrete specimens, fine aggregates were replaced by waste materials of chipped rubber in several percentages (0%, 10%, 20%, and 30%) in separate concrete mixes. The sand used is cleaned from all inorganic impurities and the sand, which passed through 2.36 mm sieve and retained on 150micron had been used. For each mix, cubes of 150 X 150 X150 mm, cylinders of 150 mm diameter by 300 mm height, and small beams of 100X 100 X 500 mm were prepared. All specimens were fabricated and then cured in water for 28 days in accordance with Indian Standard 10262. After 24 hours of casting cubes, beams and cylinders were taken out from the mould and then submerged in water tank for curing.
After the curing the cubes will be pass through the following test:

- COMPRESSIVE STRENGTH OF CONCRETE
- SPLIT TENSILE STRENGTH

*2.6 COMPRESSIVE STRENGTH VALUES*

After the casting of cubes of M20 and M25 grades the compressive strength are taken at 7 days and 28 days for 0% , 10%, 20% and 30% of chipped rubber. The readings are shown below in tabular form, as the work is done by hand mixing there is slight deviation in readings as shown the table.

Table 1. Compressive Strength Values

| GRADE OF CONCRETE | RUBBER (%) | 7 days(KN/mm$^2$) | | | Avg | 28 days(KN/mm$^2$) | | | Avg |
|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | | 1 | 2 | 3 | |
| M20 | 0 | 13.7 | 13.08 | 15.02 | 14.1 | 18.5 | 22.1 | 20.82 | 20.62 |
| M25 | 0 | 15.6 | 18.5 | 17.2 | 17 | 24 | 27.5 | 26.8 | 26.02 |
| M20 | 10 | 8.5 | 10.2 | 12.4 | 10.15 | 14.54 | 15.24 | 15.60 | 15.77 |
| M25 | 10 | 11.85 | 12.64 | 12.12 | 12.24 | 16.24 | 18.58 | 23.38 | 19.87 |

| M20 | 20 | 8.73 | 5.01 | 8.64 | 7.75 | 14.39 | 11.54 | 12.65 | 12.98 |
| M25 | 20 | 7.29 | 10 | 10.3 | 9.35 | 18.65 | 16.84 | 17.82 | 16.34 |
| M20 | 30 | 4.25 | 3.84 | 7.68 | 5.64 | 9.51 | 11.95 | 10.24 | 10.51 |
| M25 | 30 | 5.59 | 5.87 | 7.92 | 6.8 | 14.64 | 12.94 | 13.55 | 13.32 |

## 3. Graphs regarding compression strength
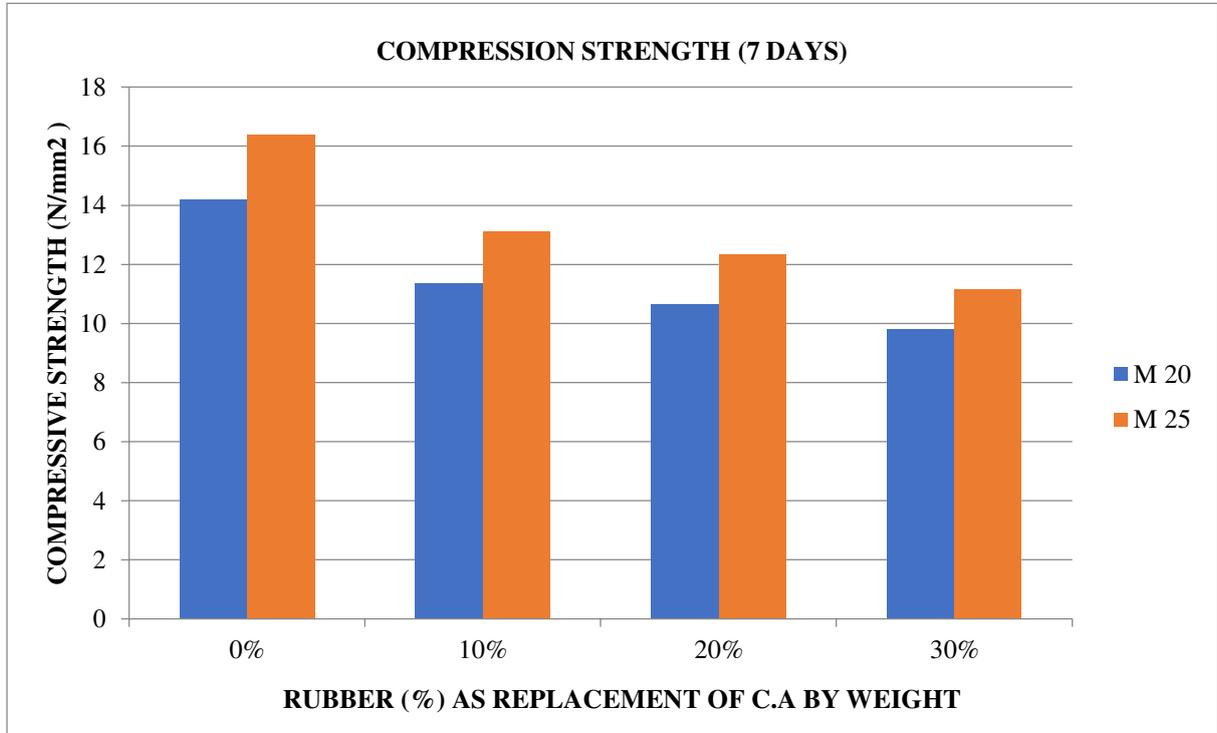


Graph 1. Comparison Strength (7 Days)
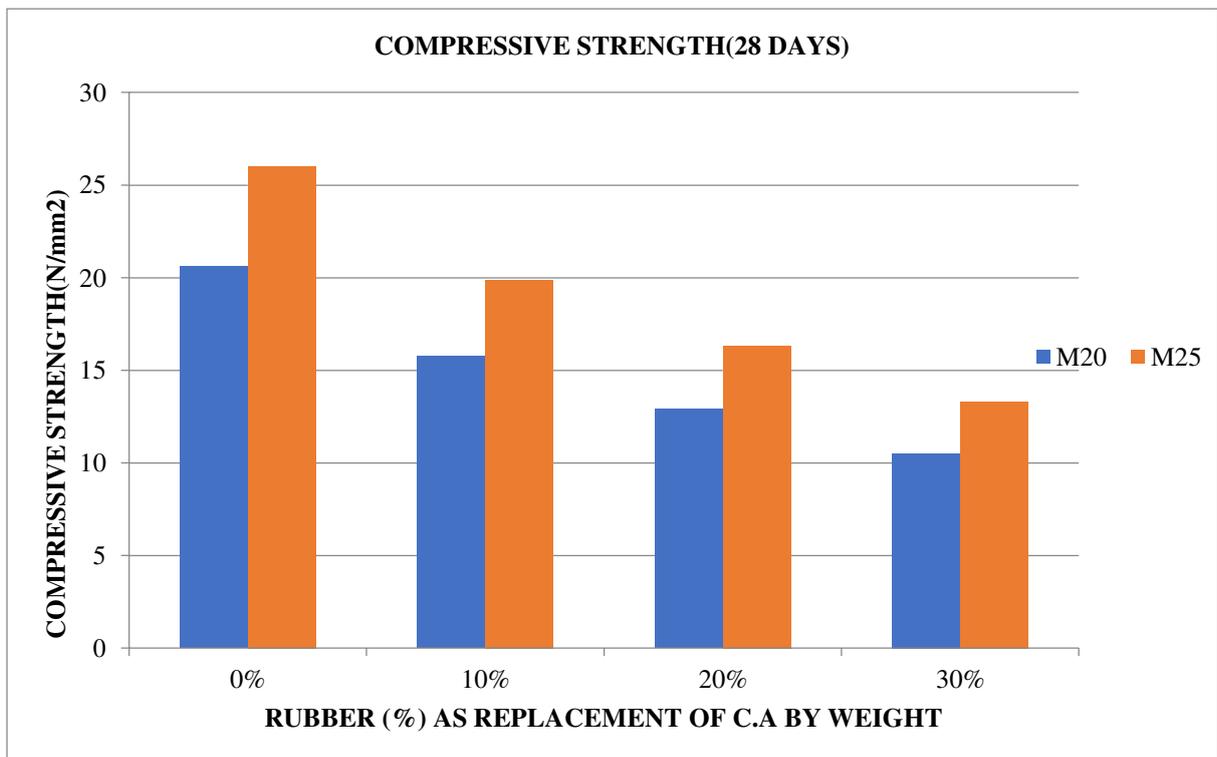


Graph 2. Comparison Strength (28 Days)

71

## 4. SPLIT TENSILE STRENGTH

With casting of the cubes, the cylinders are also casted of standard size simultaneously. The split tensile strength is taken at 7 days and 28 days for the 0% of chipped rubber. The readings are as shown in table below.

Table 2. Split Tensile Strength Data

| GRADE OF CONCRETE | RUBBER (%) | 7 days(KN/mm$^2$) | 28 days(KN/mm$^2$) |
|---|---|---|---|
| M20 | 0 | 1.17 | 1.93 |
| M25 | 0 | 1.411 | 2.44 |
| M20 | 10 | 1.035 | 1.77 |
| M25 | 10 | 1.24 | 2.226 |
| M20 | 20 | 0.88 | 1.53 |
| M25 | 20 | 1.065 | 1.94 |
| M20 | 30 | 0.676 | 1.28 |
| M25 | 30 | 0.816 | 1.625 |

Graphs Regarding Tensile Strength
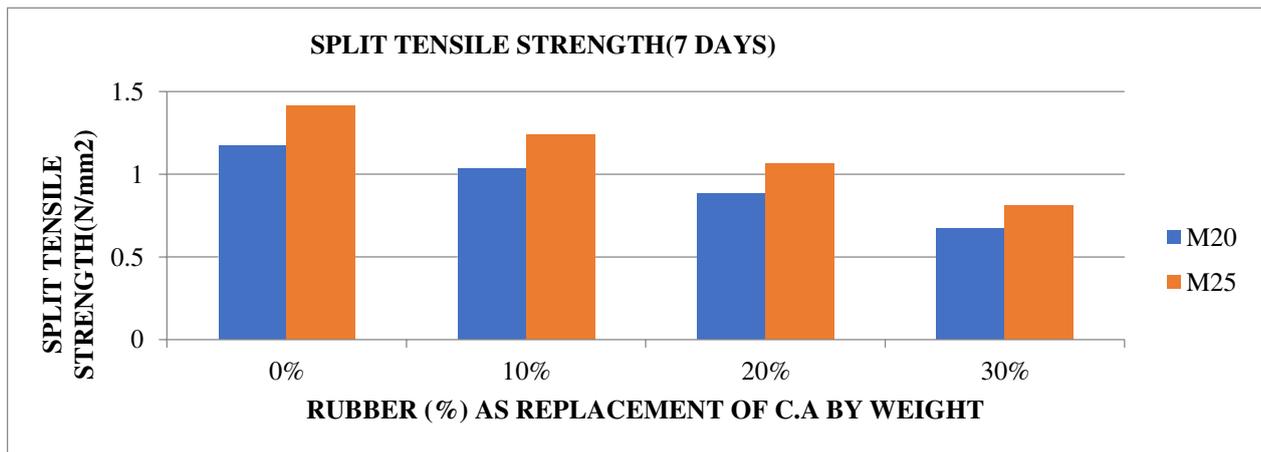


Graph 3. Split Tensile Strength (7 Days)
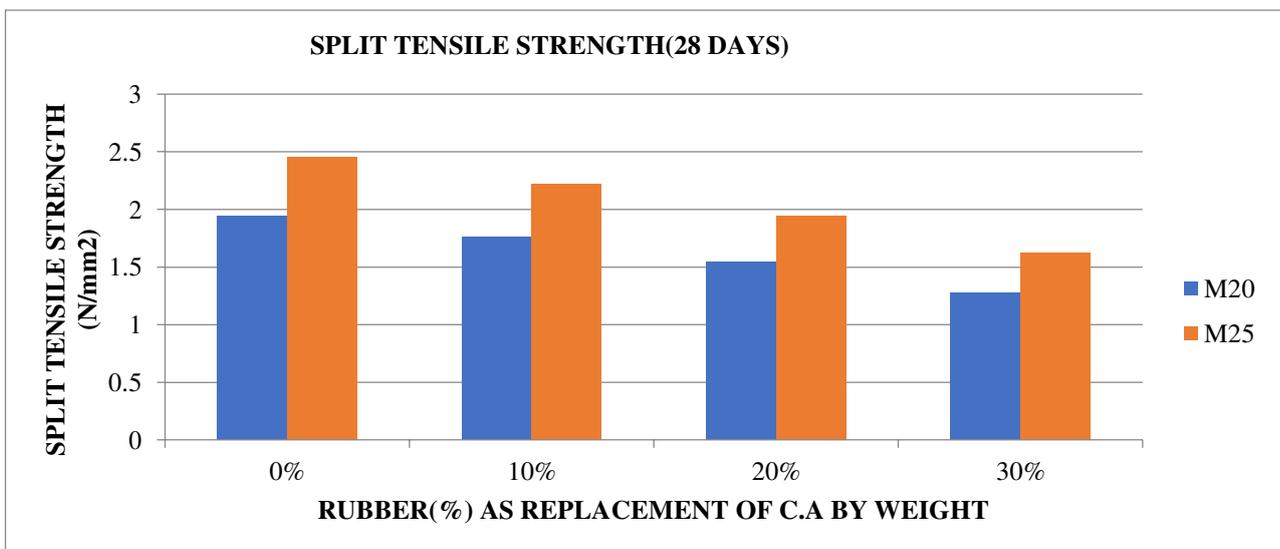


Graph 4. Split Tensile Strength (28 Days)

## 5. Conclusion of the project

After performing these experiments of compressive strength and split tensile strength we got the estimated strength of the cube casted at 0% chipped rubber content. After adding 10%, 20% and 30% rubber the compressive strength and split tensile strength decreases thoroughly. Rubber concrete is more expensive than the normal concrete. The rubber concrete is used in the following:

- Rubcrete is used because of light unit weight is used as architectural purposes.
- It is recommended to use silica fume to increase the compressive strength of concrete.
- It is recommended to use rubber concrete in small structure like road curbs and partition walls.
- By using waste rubber, the waste rubber has been utilized properly.

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# Survey of Web Document Clustering Algorithms

Ankit Patel[a*]

[a]*Assistant Professor, L. D. Engineering College, Ahmedabad, Gujarat, India*

**Abstract**

Unsupervised grouping of patterns remains a challenging problem, especially because this task should be performed without rich a priori information, and sometimes even without knowing the number of categories. The process of finding relevant information on the web is overwhelming. Users of Web search engines are thus often forced to sift through the long ordered list of document "snippets" returned by the engines. This fact has lead to the need to organize a large set of documents into categories through clustering. Clustering is useful technique in the field of textual data mining. To cluster web documents, all of which have the same name entities, we attempted to use existing clustering algorithms such as K-means and spectral clustering. Unexpectedly, it turned out that these algorithms are not effective to cluster web documents.

*Key words:* data analysis, clustering algorithms, classification, web document clustering.

## 1. Introduction

A considerably large portion of information present on the World Wide Web (WWW) today is in the form of unstructured or semi-structured text data bases. The WWW instantaneously delivers huge number of these documents in response to a user query. According to our intensive investigation, we found that clustering such web pages is more complicated because (1) the number of clusters is larger than two or three clusters as in general clustering problems and (2) clusters in the data set have extremely skewed distributions of cluster sizes. The following are the key requirements for Web document clustering methods: [10]

1. Relevance: The method ought to produce clusters that group documents relevant to the user's query separately from irrelevant ones.
2. Browsable Summaries: The user needs to determine at a glance whether a cluster's contents are of interest. Sifting through ranked lists is not replaced with sifting through clusters. Therefore, the method has to provide concise and accurate descriptions of the clusters.
3. Overlap: Since documents have multiple topics, it is important to avoid confining each document to only one cluster.
4. Snippet-tolerance: The method ought to produce high quality clusters even when it only has access to the snippets returned by the search engines, as most users are unwilling to wait while the system downloads the original documents off the Web.
5. Speed: The clustering method ought to be able to cluster up to one thousand snippets in a few seconds. For the impatient user, each second counts.
6. Incrementality: To save time, the method should start to process each snippet as soon as it is received over the Web.

## 2. Analysis on categories of Web Document Clustering [4-6]

### 2.1 Text based Clustering

The text-based web document clustering approaches characterize each document according to its content, i.e. the words (or sometimes phrases) contained in it. The basic idea is that if two documents contain many common words then it is likely that the two documents are very similar. The text-based approaches can be further classified according to the clustering method used into the following categories: flat/partitional, hierarchical, graph- based, neural network-based and probabilistic. Furthermore, according to the way a clustering algorithm handles uncertainty in terms of cluster overlapping. An algorithm can be either crisp (or hard), which considers non-overlapping partitions, fuzzy (or soft), with which a document can be classified to more than one cluster.

### 2.2 Partitional Clustering

The partitional or non-hierarchical document clustering approaches attempt a flat partitioning of a collection of documents into a predefined number of disjoint clusters. The most known class of partitional clustering algorithms are the k-means algorithm and its variants.

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*Ankit Patel
*Email address:* acpatelit@gmail.com

K-means algorithms are O(nkT ), where T is the number of iterations, which is considered more or less a good bound. However, a major disadvantage of kmeans is that it assumes spherical cluster structure and cannot be applied in domains where cluster structures are non-spherical. A variant of k-means that allows overlapping of clusters is known as Fuzzy C-means (FCM). Instead of having binary membership of objects to their respective clusters, FCM allows for varying degrees of object memberships. Due to the random choice of cluster seeds these algorithms exhibit, they are considered non-deterministic as opposed to hierarchical clustering approaches.

*2.3 Hierarchical Clustering*

Hierarchical techniques produce a nested sequence of partitions, clusters at an intermediate level encompass all the clusters below them in the hierarchy. The result of a hierarchical clustering algorithm can be viewed as a tree, called a dendogram. The dendrogram is a useful representation when considering retrieval from a clustered set of documents, since it indicates the paths that the retrieval precess may follow. Depending on the direction of building the hierarchy, the following two kinds of hierarchical clustering are possible: Agglomerative and Divisive. The agglomerative approach is the most commonly used in hierarchical clustering.

**Agglomerative Hierarchical Clustering (AHC)**: This method starts with the set of objects as individual clusters, then at each step merges the most two similar clusters. This process is repeated until a minimal number of clusters have been reached, or, if a complete hierarchy is required then the process continues until only one cluster is left. This method is very simple but needs to specify how to compute the distance between two clusters. Three commonly used methods for computing this distance are listed below:

**Single Linkage Method:** The similarity between a pair of clusters is the maximum of the similarities between all pairs of documents such that one document is in one cluster and the other document is in other cluster. This method is also called "nearest neighbour" clustering method. The main drawback of this approach is that it can lead to the phenomenon of chaining in which a chain of similar documents lead to disparate documents being grouped into the same clusters

**Complete Linkage Method:** The similarity between a pair of clusters is calculated as the minimum of the similarities between all pairs of documents. This method is also called "furthest neighbour" clustering method. In this technique, the similarity between two clusters is the worst-case similarity between any pair of documents in the two clusters. Complete-linkage clustering can also avoid chaining because it avoids the placement of any pair of very disparate points in the same cluster. However, like groupaverage clustering, it is computationally more expensive than the single-linkage method. The complete linkage clustering method requires O(n2) space and O(n3) time.

**Average Linkage Method:** This method produces clusters such that each document in a cluster has greater average similarity with the other documents in the cluster than with the documents in any other cluster. This method takes into account all possible pairs of distances between the objects in the clusters and is considered more reliable and robust to outliers. This method is also known as UPGMA (Unweighted PairGroup Method using Arithmetic averages). Clearly, the average linkage clustering process is somewhat slower than single-linkage clustering, because we need to determine the average similarity between a large number of pairs in order to determine group-wise similarity. On the other hand, it is much more robust in terms of clustering quality, because it does not exhibit the chaining behavior of single linkage clustering.

*2.4 Divisive Hierarchical Clustering*

These methods work from top to bottom, starting with the whole data set as one cluster, and at each step split a cluster until only singleton clusters of individual objects remain. One method is to find the two sub-clusters using k-means, resulting in a hybrid technique called bisecting k-means. Another method based on statistical approach is used by the ITERATE algorithm, however, it does not necessarily split the cluster into only two clusters, the cluster could be split up to many subclusters according to a cohesion measure of the resulting sub-partition.

*2.5 Graph based Clustering*

Graph based algorithms rely on graph partitioning, that is, they identify the clusters by cutting edges from the graph such that the edge-cut, i.e. the sum of the weights of the edges that are cut, is minimized.. Each node represents a document and there exists an edge between two nodes if the document similarity between documents in different clusters. The basic idea is that the weights of the edges in the same cluster will be greater than the weights of the edges across clusters. Hence, the resulting cluster will contain highly related documents. The different graph based algorithms may differ in the way they produce the graph and in the graph partitioning algorithm that they use corresponding to either of the nodes is among the k most similar documents of the document corresponding to the other node. The resulting k-nearest neighbor graph is sparse and captures the neighborhood of each document. The advantages of these approaches are that can capture the structure of the data and that they work effectively in high dimensional spaces. The disadvantage is that the graph must fit the memory

*2.6 Neural Network based Clustering*

The Kohonen's Self-Organizing feature Maps (SOM) is a widely used unsupervised neural network model. Another approach proposed in the literature is the hierarchical feature map model, which is based on a hierarchical organization of more than one self-organizing feature maps. The aim of this approach is to overcome the limitations imposed by the 2-dimensional output grid of the SOM model, by arranging a number of SOMs in a hierarchy, such that for each unit on one level of the hierarchy a 2-dimensional self-organizing map is added to the next level. Neural networks are usually useful in environments where there is a lot of noise, and when dealing with data with complex internal structure and frequent changes. The advantage of this approach is the ability to give high quality results without having high computational complexity. The disadvantages are the difficulty to explain the results and the fact that the 2- dimensional output grid may restrict the mirroring and result in loss of information.

*2.7 Fuzzy Clustering*

All the aforementioned approaches produce clusters in such a way that each document is assigned to one and only one cluster. Fuzzy clustering approaches, on the other hand, are non-exclusive, in the sense that each document can belong to more than one clusters. The most widely used fuzzy clustering algorithm is Fuzzy c- means, a variation of the partitional k-means algorithm. Another fuzzy approach, that tries to overcome the fact that fuzzy c- means doesn't take into account the distribution of the document vectors in each cluster, is the Fuzzy Clustering and Fuzzy Merging algorithm (FCFM). The FCFM uses Gaussian weighted feature vectors to represent the cluster prototypes.

*2.8 Probabilistic Clustering*

Another way of dealing with uncertainty is to use probabilistic clustering algorithms. These algorithms use statistical models to calculate the similarity between the data instead of some predefined measures. Two widely used probabilistic algorithms are Expectation Maximization (EM) and Auto Class. The output of the probabilistic algorithms is the set of distribution function parameter values and the probability of membership of each document to each cluster.

**3. Algorithm used in Web Document Clustering**

*3.1 Suffix Tree Clustering (STC)*

Suffix Tree Clustering (STC) is a linear time clustering algorithm that is based on identifying the phrases that are common to groups of documents. A phrase in our context is an ordered sequence of one or more words. We define a base cluster to be a set of documents that share a common phrase. STC has three logical steps

Step 1 - Document "Cleaning"

In this step, the string of text representing each document is transformed using a light stemming algorith. Sentence boundaries (identified via punctuation and HTML tags) are marked and non-word tokens (such as numbers, HTML tags and most punctuation) are stripped.

Step 2 - Identifying Base Clusters

The identification of base clusters can be viewed as the creation of an inverted index of phrases for our document collection. This is done efficiently using a data structure called a suffix tree. This structure can be constructed in time linear with the size of the collection and can be constructed incrementally as the documents are being read. Each node of the suffix tree represents a group of documents and a phrase that is common to all of them. Therefore, each node represents a base cluster. Furthermore, all possible base clusters (containing 2 or more documents) appear as nodes in our suffix tree. Each base cluster is assigned a score that is a function of the number of documents it contains, and the words that make up its phrase.

Step 3 - Combining Base Clusters

Documents may share more than one phrase. As a result, the document sets of distinct base clusters may overlap and may even be identical. To avoid the proliferation of nearly identical clusters, the third step of the algorithm merges base clusters with a high overlap in their document sets (phrases are not considered in this step.The final clusters are scored and sorted based on the scores of their base clusters and their overlap.

*3.2 K-Means*

This section describes the original kmeans clustering algorithm[3]. One of the most popular clustering methods is k-means clustering algorithm. K-means clustering is a method of cluster analysis which aims to partition n observations into k clusters

in which each observation belongs to the cluster with the nearest mean. First select k initial centers based on desired number of clusters. The user can specify k parameter value. Each data point is assigned to nearest centroid and the set of points assigned to the centroid is called a cluster. Each cluster centroid is updated based on the points assigned to the cluster. The process will be repeated until the centroids remain the same or no point changes clusters.[11]
In this algorithm mostly Euclidean distance is used to find distance between data points and centroids.

The main drawback of K-means algorithm is the quality of the clustering results highly depends on random selection of the initial centroids

Step: 1. Arbitrarily choose k-data items from D as initial centroids;

Step: 2. Repeat assigns each item di to the cluster which has the closest centroid, calculate new mean for each cluster; until convergence criteria are met.

*3.3 Semantic Hierarchical Online Clustering (SHOC)*

The Semantic Online Hierarchical Clustering [5] is a web search results clustering algorithm that was originally designed to process queries in Chinese. Although it is based on a variation of the Vector Space Model called Latent Semantic Indexing (LSI) and uses phrases in the process of clustering, it is much different from its predecessors. To overcome the STC's low quality phrases problem, An algorithm is proposed that uses a data structure called suffix array to identify complete phrases and their frequencies in O(n) time, n being the total length of all processed documents. The SHOC algorithm works in three main phases: complete phrase discovery phase, base cluster discovery phase and cluster merging phase.[5]

**Weak points of SHOC**

Table 1. Weak points of SHOC

| Algorithm | Time Complexity | Advantages | Disadvantages |
|---|---|---|---|
| Agglomerative Hierarchical Clustering (AHC) | Single link and group average: O(n2)<br><br>Complete link: O(n3) | -Simple. | -Slow when applied to large document collections.<br><br>-Sensitive to halting criterion.<br>-Poor performance in domains with many outliers. |
| K – means | O(nkt) (k:initial clusters, t: iterations) | -Efficient and simple.<br><br>-Suitable for large datasets. | -Very sensitive to input parameters. |
| Suffix Tree Clustering (STC) | O(n) | - Incremental<br><br>-Uses phrases to provide concise and meaningful description of groups. | -Snippets usually introduce noise.<br>-Snippets may not be a good description of a web page. |
| Semantic Online Hierarchical Clustering (SHOC) | O($n$) | -Uses Latent Semantic Indexing (LSI) and phrases in the process of clustering.<br><br>-Uses suffix array to identify complete phrases.<br>-Uses suffix array to identify complete phrases.<br>-Allows overlapping clusters. | -Provides only vague comments on the values of thresholds of the algorithm and the method which is used to label the resulting clusters. |

| | | -Provides a method of ordering documents within clusters. | |
|---|---|---|---|
| Lingo | O(n) | -Readable cluster labels.<br><br>-Overlapping clusters.<br><br>-Cluster accuracy. | -Unable to generate a hierarchical structure of clusters.<br>-The implementation of lingo is fairly computationally expensive. |

One of the drawbacks of SHOC is that Zhang and Dong provide only vague comments on the values of thresholds of their algorithm and the method which is used to label the resulting clusters. It also shows that in many cases the Singular Value Decomposition produces unintuitive, sometimes even close to "random", continuous clusters. The reason for this lies probably the fact that the SVD is performed on document snippets rather than the full texts as it was in its original applications.

*3.4 The Description-Comes-First Approach (LINGO)*

The Lingo algorithm combines common phrase discovery and latent semantic indexing techniques to separate search results into meaningful groups. It looks for meaningful phrases to use as cluster labels and then assigns documents to the labels to form groups.

In the Lingo description-comes- first approach, careful selection of label candidates is crucial. The algorithm must ensure that labels are significantly different while covering most of the topics in the input snippets. To find such candidates, we use the vector space model (VSM) and singular value decomposition (SVD), the latter being the fundamental mathematical construct underlying the latent semantic indexing (LSI) technique.[1]

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# Survey to Augment Cluster-Head selection in Wireless Sensor Networks with the Use of Hybrid Meta heuristic algorithms

Prakash Patel[a*]

*[a]Gandhinagar Institute of Technology, Motibhoyan, Gandhinagar, India*

**Abstract**

Hybrid metaheuristics has end up protruding value of the discipline concerning optimization (inWSN) after the researcher. The excellent effects discovered because of deep real-life and classical optimization problems are arrived through hybrid Meta -heuristic optimizing algorithms. This composition critiques a countless popular hybridization processes then classifies to them among view concerning one of a kind qualities. Specifically as because of low-level hybrids of different metaheuristics, a unified categorize based on a common region template is depicted. Which helps in conformity with mix the distinct homes of a singular soloist in accordance with enhance the effectivity then utility about the hybrid algorithm. In this land survey about hybrid metaheuristics because cluster adviser selection we grant an overview of incomplete regarding the strong then representative developments between the subject on wi-fi sensor networks.

*Keywords*: Wireless Sensor Networks, Hybridization, Optimization, Meta-heuristics, Cluster Head, Energy efficiency, Network Life time.

## 1. Introduction

Wireless sensor networks WSN [1] is a wide research point having its applications in military, Warfield monitoring, industry and natural observing. In the wireless sensor network, the sensor nodes are deployed consistently or randomly to gather the information from the resources and send it to the sink. In the WSN, the new routing protocols have been composed which enhances the energy awareness [2, 3].

WSN consist of Sensor nodes which senses the data and convey the data to the sink. Cluster is a group of sensor nodes. Network lifetime is one of the main problem in WSN. In order to increase the lifetime we need to increase the maximum data delivery with minimum energy ingesting. In clustering process the sensing node will transfer the data to the Cluster Head (CH) and then to Base Station (Sink). Cluster Head (CH) [4] is responsible for receiving the data from the sensing source nodes and conveying the same data to the sink. CH is having more energy when compared with other nodes. The cluster head selection plays a major role in the energy ingestion of network.

The major strategies & properties of the Metaheuristic algorithms are interestingly taken from nature and social behaviors, and biological or physical and chemical aspects which they direct the search process. These metaheuristic algorithms will investigate the search process in an effective way in order to find the prime solutions for nay NP Hard problems. Metaheuristic techniques are estimated techniques and there is no scientific confirmation that the optimum solution obtained is the global one. The Metaheuristic algorithms are designed to find the optimal solution which simulates the natural portents such as finding the fitness value, immune system, swarm intelligence, annealing, social culture and music improvisation [5-15].

## 2. Hybrid metaheuristics [16-20]

Hybridization of metaheuristics includes a couple of real issues that might be specified as design and application. The previous class is worried about the hybrid algorithm itself, including issues, such as functionality and architecture of each algorithm.

### 2.1 Classification of Hybrid Metaheuristics

Here several classifications of hybrid meta-heuristics are specified based on the classification from Raidl[20], which syndicates various meta-heuristics. We primarily classify the hybrid meta-heuristic algorithms into four categories: they are we start with point of what we hybridized, the level of hybridization, the order of execution, and the control strategy.

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*Prakash Patel
*Email address:* prakash.patel@git.org.in

**What we Hybridize?**

we start with point of *what we crossbreed, i.e* we will combine (i) various meta-heuristic strategies, (ii) metaheuristic algorithms with other specific algorithms, or (iii) meta-heuristics with other algorithms like operations research (OR) and Artificial Intelligence (AI), and this model was further classified into the combination of exact technique and with other heuristic/soft-computing methods like neural networks and fuzzy logic.

**Level of Hybridization**

Based on the forte of the individual algorithm, we need to find at which level hybridization is possible. (i) High level combination with weak coupling. Where the algorithms retain their identities and coordinate over a moderately all characterized interface; there is no intermediate, solid relationship of the inside workings of the optimization algorithms. On the other hand, (ii) Low-level combinations with strong coupling. Where the algorithms strongly depends on the individual components of each algorithm.
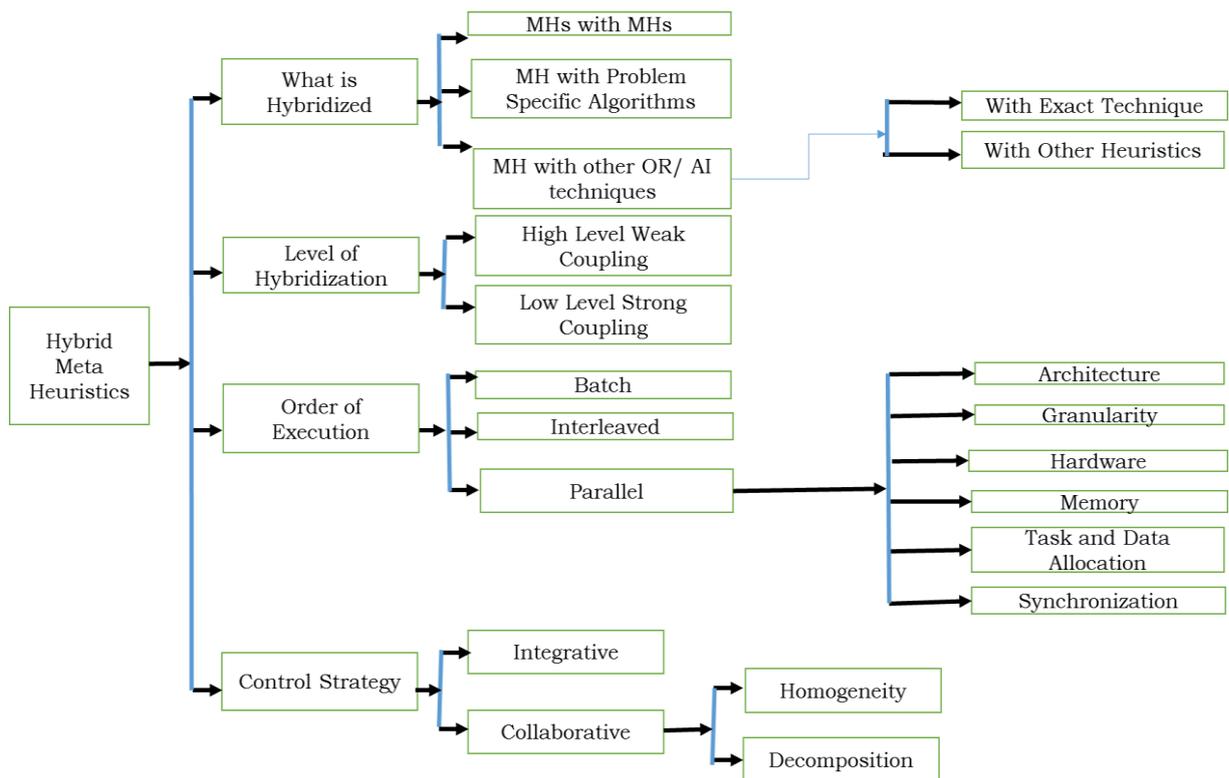


Fig. 1. A summarized classification of hybrid metaheuristics (MHs).

**Order of Execution**

In the most straightforward case, the batch completing, the individual algorithms are performed consecutively, and the outcomes of the primary algorithm are utilized as contribution for the second. More advanced approaches apply the individual algorithms in an inter-leaved or even parallel way, and data is transferred easily and often as possible, as a rule bi-directionally.Parallel metaheuristics are a critical investigation region without anyone else and free groupings of crossover parallel methodologies have been proposed. They further classify the parallel order of completing based on (a) design, (b) granularity of parallelization, (c) the hardware (homogeneous or heterogeneous), (d) the memory (shared or distributed), (e) task and data allocation (static or dynamic), and (f) whether the parallel processes run asynchronously or are synchronized.

**Control Strategy**

We classify the amalgam meta-heuristic algorithms based on their control stratagem, which can be either integrative or collaborative. In integrative methodologies, one calculation is viewed as a subordinate, embedded segment of another algorithm. This approach is amazingly famous in research. In collaborative methodologies, algorithms exchanges the data, but not a part of the each algorithm. We can further classify the models as sameness and space decomposition.

*2.2 Disadvantages and Challenges of Hybrid Algorithms*

Even though hybrid algorithms gives great and effective solutions and improving the search capability of the developed hybrid algorithms, few drawbacks for these hybridization may exist, they are specified below as subsections [21].

*2.2.1 Naming Convention*

The Amalgamation of hybrid procedures usually leads in conformity with a naming problem. Few on the researchers specifies one of a kind abbreviated names to theirs mongrelized algorithms. For instance GAAPI algorithm [22] is an abbreviated phrase because Hybrid Ant colony-Genetic Algorithm, who is a mystifying after specification according to dense regarding the researchers. Another instance like, HPSO-BFGS; who is PSO-broyden-fletcher-goldfarb-shanno [23] is also clumsy or mystifying to many after win those situations mention the names so easy as PSO-ACO Particle community optimization-ant colony optimization [24].

*2.2.2 Complexity of Hybrid Algorithm*

The algorithmic specification about joining algorithms of a individual structure will increases the complexity over hybrid algorithm. Due according to extra intricate structure, hybrid systems have half arrest after remain commonly used by using researchers. For example Hybrid Taguchi-Genetic algorithm [25] was once greater famous and have extra citations. Durability, it is strong in imitation of observe up to expectation the algorithm arrive among the integrative kind over hybrid algorithm, which hold less byzantine taxonomy/architecture.

*2.2.3 Computational Speed*

In most on the research works, hybrid systems appear after enhance the effects with the aid of improving the meeting pace then accuracy. The graphs are generated together with honor according to the number regarding iterations between that fusion algorithms. Which capacity so the quicker conjunction does no longer low the proper convergence dimension due to the fact the mongrelized algorithms typically have more wide variety concerning iterations. Thus, care should stay done now cracking results out of hybrid algorithms.

**3. Cluster head selection using hybrid meta heuristics**

1.　　A Innovative cluster-head selection algorithm based on hybrid hereditary optimization for wireless sensor networks.
2.　　Hybrid (Bee-simulated annealing) optimization technique for cluster head selection.
3.　　Firefly and ABC hybrid algorithm for cluster head selection.
4.　　HSA and PSO hybrid algorithm for cluster Head selection.
5.　　AOLEACH and SFLA hybrid algorithm for cluster head selection.

*3.1 A Novel Cluster-head Selection Algorithm Based on Hybrid Genetic Optimization for Wireless Sensor Networks [26].*

This hybrid Genetic Algorithm along Neural Networks model is old after selects the brush brain (CH) within wireless sensor networks. Here we turn to advantage neuron in harmony with depict the sensor node and builds neural regulation because of WSN. The neural communal law display contains iii perspectives: Sensor node neuron model, Sensor node rule manikin and Sensor node connectivity model. Through instruction the shape concerning lot algorithm because wireless sensor networks, this concept shows a weighted common about fascicle chump steadfastness algorithm into argue regarding an greater Genomic Optimization who makes the node weights straightforwardly identified with the decision making forecasts.

The Algorithm comprises of twain phases: singlehanded mum or dad advancement then populace development. The initial population is wooded within the phase of single-parent improvement by way of utilizing gene pool, at to that amount factor the algorithm tax in accordance with the according further growth process, at lengthy closing the excellent arrangement choice keep resulted from and deposited in the population. The simulation results illustrates as the current procedure has excessive Convergence speed or good world looking out capacity. Which is after correctly balance the public strength consumption, then in conformity with enhance the network being cycle, assurance the similarity attribute and deliver a particular proposed association in mock of the usage concerning the neural systems.

These days, between the sections about the entire progression the genes busy along genetic leader are because the most part out of the individual itself. The attribute stage on the unaccompanied decides the skill ability of the algorithm [27]. On the far away deathtrap so the strength concerning all people is poor, the algorithm enactment will lie influenced. With a specific give up goal in conformity with overcome this shortcomings, here we varieties n points, builds n*n mold concerning the gene pool, receives geared up because the genetic operators .This method drastically enhances the productiveness on the algorithm [28].

*3.2 Hybrid (bee-simulated annealing) optimization technique for cluster head selection*

The Bee algorithm-Simulated Hardening Weighted Minimum Spanning Tree (BASA-WMST) algorithm [29,30], who hybridizes the Bee algorithm and the Simulated Annealing algorithms. The BASA-WMST algorithm sustains outside from regional minima seemed via Bee algorithm and chooses superior CHs through framing ideal clusters. Clustering is successful by separating arbitrarily geared up sensors in almost ideal interest identifying clusters along CH. Edge weights amongst nodes and objective characteristic are each computed. The initial values and solutions become initial meals supply between the latter BASA algorithm.

The algorithm begins together with search space, as is populated by way of employee bees positioned randomly at earliest food supply location. The fitness price for each bee was once calculated yet beneficial fitness bee choice continue the process. Those along lower health cost is changed in accordance with onlookers. Stability A bunch adviser (CH) do expand then minimize the nodes similarly a CH perform stand circled within a cluster.The technique is iterated till quit standards are take place in accord with or agreement alternate of health does not raise by way of extra than 0.001 within last 10iterations. At the factor so the connotation has no alternate the score could remain struck between neighborhood minima. SA is begun in imitation of rate outdoors of nearby minima.

*3.3 Firefly and ABC hybrid algorithm for cluster head selection*

The hybrid procedure takes the competencies concerning firefly algorithm or ABC algorithm [31], On explanation concerning firefly algorithm, forward node dying spherical is a whole lot more when in difference along ABC algorithm so network lifestyles and power effectively is more than ABC algorithm except losing some node. On account of ABC algorithm, final node dies advanced now in disparity with firefly algorithm, as offers easy energy utilization all through the linkage. Henceforth, the planned hybrid algorithm increases the existence era about the network by using cumulative the stellar Node Dead age yet Last Node Dead time. Steps involved in hybrid model is as follows:

  I.    Provide initial values for the ABC and Firefly algorithms.
  II.   Deploy the nodes in random manner in the given network area.
  III.  Initially, the value of the dead node to zero and we will check the energy of each node
  IV.   The Firefly algorithm implemented till the first node dies and after that network is configured to ABC algorithm.

*3.4 HSA and PSO hybrid algorithm for cluster head selection*

The proposed hybrid HSA-PSO depends regarding the shared properties of the each PSO yet HSA algorithms [32]. HSA [33] can produce new solution then the constraints on HMCR then PAR are fetched in imitation of allow the answer after breakdown out from native optima and according to improve the global optimum prediction regarding the algorithm. Because concerning this motive HSA is converged with PSO after beat solution then exploitation in high dimensional issues. With the assist about PSO, such permits the particles to rate launch along certain country afterward to the next with the aid of updating function or speed to the finish of every round. The possible makeup about PSO [34] permits to petition into more than some location concerning the house certain together with higher searching efficiency at every location including the help of HSA. There are special points about interest concerning HSA as some distance namely searching efficiency (i) HS algorithm forces less scientific prerequisites then does not require initial cost settings concerning the desire Variables. (ii) As the HS tab usage stochastic broad quests, helpful data is eke pointless. (iii) The HS estimate produces as soon as once more vector, into the wake concerning thinking about the larger part about the cutting-edge vectors.

*3.5 AOLEACH and SFLA hybrid algorithm for cluster head selection*

The Hybrid mannequin (AOLEACH &SFLA) [35] selects absolute range about cluster heads in each spherical along no umbilical mediation. The suitable brush brain resolve algorithm ought to lie deliberate after an sum to that amount nodes are chosen as the lot heads in each bunch at the equal time, a node as is grudging greater voltage than the vile nodes is dealt with namely the fascicle head for as round. Initially first 250 rounds use the beginning equation beyond AOLEACH. After 250 rounds fascicle adviser choice utilizes the introduction equation beside SFLA algorithm. Permanency the SFLA setup phase then steady-state operation is comparable to AOLEACH setup yet steady-state section operation.

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# Use Case Point Effort Estimation Method Using the Case of University Attendance Management System Use Case Diagram

Anirudhdha M. Nayak[a*]

[a]*Gandhinagar Institute of Technology, Gujarat, India*

**Abstract**

Use case point (UCP) method has been proposed to estimate software development effort in early phase of software project and used in a lot of software organizations naturally; UCP is measured by counting the number of actors and transactions included in use case models. Several tools to support calculating UCP have been developed. However, they only extract actors and use cases and the complexity classification of them are conducted manually. In this paper I am using the case of university registration system to explain use case point effort estimation method.

*Keywords*: Use Case, Actor, Unadjusted Use Case Points, Technical Complexity Factor, Environment Complexity Factor.

## 1. Introduction

Effort estimation is a challenge in every software project. The Estimates will impact costs and expectations on schedule, functionality and quality. While expert estimates are widely used, they are difficult to analyze and the estimation quality depends on the experience of experts from similar projects. Alternatively, more formal estimation models can be used. Because of difficulties in estimating SLOC, FP or OP, and because modern systems are often developed using the Unified Modeling Language (UML), UML-based software sizing approaches are proposed. Examples are effort estimation methods based on use cases and software size estimation in terms of FP from various UML diagrams

## 2. Introduction of Use Case Diagram of University Attendance Management System

The use case diagram in this case consists of actors, such as student, faculties, admin and attendance verification system. The following describes the use cases:

- New Faculty registers with the system.
- New Student registers with the system.
- Existing students log on to the system and can browse the attendance catalog.
- An admin can select courses and student them to the enrollment cart.
- A faculty places a request for the assign attendance sheet.
- The system verifies the faculty subject.
- An administrator can view the verified subject that need approval for enrollment.
- An administrator approves the student and enrolls the student in the courses.
- The system notifies the student of enrollment via e-mail.
- The system notifies the faculty via e-mail.

## 3. The Use Case Points Estimation Method

The Use Case Points (UCP) method provides the ability to estimate the man-hours a software project requires from its use cases.

The UCP equation is composed of three variables:

- o   Unadjusted Use Case Points (UUCP).
- o   The Technical Complexity Factor (TCF).
- o   The Environment Complexity Factor (ECF).

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*Anirudhdha M. Nayak
*Email address:* anirudhdha.nayak@git.org.in

Each variable is defined and computed separately using weighted values, subjective values, and constraining constants.
The subjective values are determined by the development team based on their perception of the project's technical complexity and efficiency.

Additionally, when productivity is included as a coefficient that expresses time, the equation can be used to estimate the number of man-hours needed to complete a project. Here is the complete equation with a Productivity Factor (PF) included: UCP = UUCP * TCF * ECF * PF

The necessary steps to generate the estimate based on the UCP method are the following:

> o   Determine and compute the UUCPs.
> o   Determine and compute the TCFs.
> o   Determine and compute the ECFs.
> o   Determine the PF.
> o   Compute the estimated number of Hours

UUCPs are computed based on two computations:

1. The Unadjusted Use Case Weight (UUCW) based on the total number of activities (or steps) contained in all the use case scenarios.
2. The Unadjusted Actor Weight (UAW) based on the combined complexity of all the actors in all the use cases

*3.1 UUCW*

The UUCW is derived from the number of use cases in three categories: simple, average, and complex (see Table 1). Each use case is categorized by the number of steps its scenario contains, including alternative flows.
The UUCW is calculated by tallying the number of use cases in each category, multiplying each total by its specified weighting factor, and then adding the products.

Table 1. Use Case Categories

| Use Case Category | Description | Weight |
|---|---|---|
| Simple | Simple user interface. Touches only a single database entity. Its success scenario has three steps or less. Its implementation involves less than Five classes. | 5 |
| Average | More interface design. Touches two or more database entities. Between four and seven steps. Its implementation involves between five and 10 classes. | 10 |
| Complex | Complex user interface or processing. Touches three or more database entities. More than seven steps. Its implementation involves more than 10 classes. | 15 |

Table 2. Computing UUCW

| Use Case Category | Description | Weight | Number of Use Cases | Result |
|---|---|---|---|---|
| Simple | Simple user interface. Touches only a single database entity. Its success scenario has three steps or less. Its Implementation involves less than five classes. | 5 | 3 | 15 |
| Average | More interface design. Touches two or more database entities. Between four and seven steps. Its implementation involves between five and 10 classes. | 10 | 5 | 50 |
| Complex | Complex user interface or processing. Touches three or more database entities. More than seven steps. Its implementation involves more than 10 classes. | 15 | 2 | 30 |
| Total UUCW | | | | 95 |

*3.2     UAW*

In a similar manner, the Actor Types are classified as simple, average, or complex as shown in Table 3.
The UAW is calculated by totaling the number of actors in each category, multiplying each total by its specified factor, and then adding the products.

Table 3. Use Case Categories

| Actor Type | Description | Weight |
|---|---|---|
| Simple | The actor represents another system with a defined application programming interface. | 1 |
| Average | The actor represents another system interacting through a protocol, like Transmission Control Protocol/Internet Protocol | 2 |
| Complex | The actor is a person interacting via a graphical user interface. | 3 |

Table 4. Computing UAW

| Actor Type | Description | Weight | Number of Actors | Result |
|---|---|---|---|---|
| Simple | The actor represents another system with a defined application programming interface. | 1 | 1 | 1 |
| Average | The actor represents another system interacting through a protocol, like Transmission Control Protocol/Internet Protocol | 2 | 0 | 0 |
| Complex | The actor is a person interacting via a graphical user interface. | 3 | 3 | 9 |
| Total UAW | | | | 10 |

*3.3    TCFs*

Thirteen standard technical factors exist to estimate the impact on productivity that various technical issues have on a project Each factor is weighted according to its relative impact.

For each project, the technical factors are evaluated by the development team and assigned a perceived complexity value between zero and five. The perceived complexity factor is subjectively determined by the development team's perception of the project's complexity – concurrent applications, for example, require more skill and time than single-threaded applications. A perceived complexity of 0 means the technical factor is irrelevant for this project, 3 is average, and 5 is strong influence.

Two constants are computed with the Technical Total Factor to produce the TCF. The constants constrain the effect the TCF has on the UCP equation from a range of 0.60 (perceived complexities all zero) to a maximum of 1.30 (perceived complexities all five).

TCF values less than one reduce the UCP because any positive value multiplied by a positive fraction decreases in magnitude:

100 * 0.60 = 60 (a reduction of 40 percent).

TCF values greater than one increase the UCP because any positive value multiplied by a positive mixed number increases in magnitude: 100 * 1.30 = 130 (an increase of 30 percent).

Since the constants constrain the TCF from a range of 0.60 to 1.30, the TCF can impact the UCP equation from - 40 percent (.60) to a maximum of +30 percent (1.30).

For the mathematically astute, the complete formula to compute the TCF is:

$$TCF = C1 + C2 \cdot \sum_{i=1}^{13} W_i * F_1$$

where,
Constant 1 (C1) = 0.6
Constant 2 (C2) = .01
W = Weight
F = Perceived Complexity Factor

For the rest of us, a more digestible equation is:

TCF = 0.6 + (.01 * Technical Total Factor)

= 0.6 + (.01*26)

= 0.6 + 0.26

= 0.86

Table 5. Technical Complexity Factors

| Technical Factor | Description | Weight |
|---|---|---|
| T1 | Distributed System | 2 |
| T2 | Performance | 1 |
| T3 | End User Efficiency | 1 |
| T4 | Complex Internal Processing | 1 |
| T5 | Reusability | 1 |
| T6 | Easy to Install | 0.5 |
| T7 | Easy to Use | 0.5 |
| T8 | Portability | 2 |
| T9 | Easy to Change | 1 |
| T10 | Concurrency | 1 |
| T11 | Special Security Features | 1 |
| T12 | Provides Direct Access for Third Parties | 1 |
| T13 | Special User Training Facilities Are Required | 1 |

Table 6. Calculating the Technical Complexity Factors

| Technical Factor | Description | Weight | Perceived Complexity | Calculated Factor (Weight* Perceived Complexity) |
|---|---|---|---|---|
| T1 | Distributed System | 2 | 0 | 0 |
| T2 | Performance | 1 | 3 | 3 |
| T3 | End User Efficiency | 1 | 3 | 3 |
| T4 | Complex Internal Processing | 1 | 1 | 1 |
| T5 | Reusability | 1 | 4 | 4 |
| T6 | Easy to Install | 0.5 | 4 | 2 |
| T7 | Easy to Use | 0.5 | 4 | 2 |
| T8 | Portability | 2 | 2 | 4 |
| T9 | Easy to Change | 1 | 3 | 3 |
| T10 | Concurrency | 1 | 2 | 2 |
| T11 | Special Security Features | 1 | 1 | 1 |
| T12 | Provides Direct Access for Third Parties | 1 | 1 | 1 |
| T13 | Special User Training Facilities Are Required | 1 | 0 | 0 |
| Technical Total Factor | | | | 26 |

*3.4 ECF*

The ECF provides a concession for the development team's experience. More experienced teams will have a greater impact on the UCP computation than less experienced teams. The development team determines each factor's perceived impact based on its perception the factor has on the project's success. A value of 1 means the factor has a strong, negative impact for the project; 3 is average; and 5 means it has a strong, positive impact. A value of zero has no impact on the project's success. For example, team members with little or no motivation for the project will have a strong negative impact (1) on the project's success while team members with strong object-oriented experience will have a strong, positive impact (5) on the project's success.

To produce the final ECF, two constants are computed with the Environmental Total Factor. The constants, "based on interviews with experienced Objectors users at Objective Systems.

Constrain the impact the ECF has on the UCP equation from 0.425 (Part-Time Workers and Difficult Programming Language = 0, all other values = 5) to 1.4 (perceived impact all 0).

Therefore, the ECF can reduce the UCP by 57.5 percent and increase the UCP by 40 percent. The ECF has a greater potential impact on the UCP count than the TCF. The formal equation is:

ECF = C1+ C2
$$\sum_{i=1}^{8}$$
Wi * F1

where,
Constant 1 (C1) = 1.4
Constant 2 (C2) = -0.03
W = Weight
F = Perceived Impact
Informally, the equation works out to be:

ECF = 1.4 + (-0.03 * Environmental Total Factor)

$\qquad$ = 1.4 + (-0.03* 16)

$\qquad$ = 1.4- 0.48

$\qquad$ = 0.92

Table 7. Environmental Complexity Factors

| Environmental Factor | Description | Weight |
|---|---|---|
| E1 | Familiarity With UML* | 1.5 |
| E2 | Part-Time Workers | -1 |
| E3 | Analyst Capability | 0.5 |
| E4 | Application Experience | 0.5 |
| E5 | Object-Oriented Experience | 1 |
| E6 | Motivation | 1 |
| E7 | Difficult Programming Language | -1 |
| E8 | Stable Requirements | 2 |

Table 8. Calculating the Environmental Total Factor

| Environmental Factor | Description | Weight | Perceived Impact | Calculated Factor (Weight*Perceived Complexity) |
|---|---|---|---|---|
| E1 | Familiarity With UML* | 1.5 | 3 | 4.5 |
| E2 | Part-Time Workers | -1 | 2 | -2 |
| E3 | Analyst Capability | 0.5 | 2 | 1 |
| E4 | Application Experience | 0.5 | 3 | 1.5 |
| E5 | Object-Oriented Experience | 1 | 3 | 3 |
| E6 | Motivation | 1 | 3 | 3 |
| E7 | Difficult Programming Language | -1 | 2 | -2 |
| E8 | Stable Requirements | 2 | 4 | 8 |
| Environmental Total Factor | | | | 16 |

Calculating the UCP
As a reminder, the UCP equation is:

UCP = UUCP * TCF * ECF

$\qquad$ = 105* 0.86 * 0.92 = 83.076

*3.5 PF*

The Productivity Factor (PF) is a ratio of the number of man hours per use case point based on past projects. If no historical data has been collected, a figure between 15 and 30 is suggested by industry experts. A typical value is 20.

Estimated Hours
The total estimated number of hours for the project is determined by multiplying the UCP by the PF.
Total Estimate = UCP * PF

$$= 83.076 * 20$$

$$= 1661 \text{ hours for the project}$$

If no historical data has been collected, consider two possibilities:

1. Establish a baseline by computing the UCP for previously completed projects (as was done with the sample case study in this article).

2. Use a value between 15 and 30 depending on the development team's overall experience and past accomplishments (Do they normally finish on time? Under budget? etc.). If it is a brand-new team, use a value of 20 for the first project.

After the project completes, divide the number of actual hours it took to complete the project by the number of UCPs.
The product becomes the new PF.

## 4. Conclusion

An effort estimation method based on use cases has been adapted and tested on a large industrial system with incremental changes in use cases. Generally, predicting the size of a software system in SLOC or FP in early phases is as difficult as predicting the needed effort.

The method does not depend on any tools (although there are tools for the original UCP method), paradigms or programming languages, and can promote high quality use cases. The method is cheap, transparent and easy to understand. The method is also suitable when development is being outsourced.

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# A review on additive manufacturing process for close impeller

Akshar M. Chauhan[a*]

[a]*Mechanical Department, Gandhinagar Institute of Technology, Moti Bhoyan, Gujarat-382721, India*

**Abstract**

Additive manufacturing (AM) is a cyclic manufacturing process to create three-dimensional objects layer-by-layer directly from a 3D CAD model. It also enables the construction and manufacturing of a high stable light-weight structure as well as the industrial component that cannot be produced using any conventional system. The system starts by applying a thin layer of the powder material to the building platform. A powerful laser beam then fuses the powder at exactly the points defined by the computer-generated component design data. Once again the material is fused to bond with the layer below at the predefined points. Depending on the material used, components can be manufactured using metal 3D printing. In this work, the study of impeller an industrial component used different convectional processes and materials used.FE Analysis is carried out for enhancing the mechanical properties of close impeller for two different materials. And results of optimized parameters along with mechanical properties are used for the actual development of Impeller. The impeller is manufactured using direct metal laser sintering (DMLS) method an additive manufacturing processes.

*Keywords: Additive manufacturing, Finite Element Analysis, Mechanical properties, Materials, Metal 3D printer, DMLS, Close impeller.*

## 1. Introduction

Now a day's three are different advance manufacturing systems available in markets as well as in industries. Additive Manufacturing refers to a process by which digital 3D design data is used to build up a component in layer by layer depositing material. The term known as "3D printing" is increasingly used as a synonym for Additive Manufacturing. It can create more complex part geometric shape whit accurately. However, the latter is more accurate in that it describes a professional production technique that is clearly distinguished from conventional methods of material removal. Instead of milling a workpiece from the solid block while AM builds up components layer by layer using materials that are available in fine powder form. A range of different metals, plastics as well as composite materials may be used. There are different processes available in additive manufacturing like selective laser melting (SLM), selective laser sintering (SLS) Direct metal laser sintering (DMLS) as well as fused deposition modeling (FDM) for thermoplastic materials.

### 1.1 Principal of Additive Manufacturing Process

AM technologies fabricate models by fusing, sintering or polymerization of materials in predetermined layers with no needs of tools. AM makes possible the manufacture of complex geometries including internal part detail that is approximately not possible to manufacture using machining and molding processes, because the process does not require predetermined tool paths, draft angles and undercuts. In AM the layers of a model are formed by slicing CAD data with professional software. All AM system works upon the same principle, however, layer thickness depends upon parameters and machine start used and thickness of layer range from 10µm up to 200µm. Layers are visible on the part surface in AM operation, which



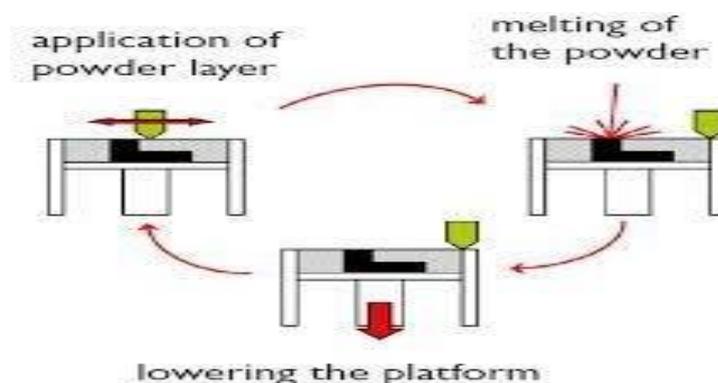Fig. 1.1. Additive Manufacturing Process

**\*Akshar M. Chauhan
*Email address:* 180120708002@git.org.in

controls the quality of the final product. The relation between the thickness of the layer and surface orientation is known as the staircase effect. Although thinner the layer is the longer the processing time and higher the part resolution. Two processes that meet this requirement are Selective Laser Melting (SLM), Direct Metal Laser Sintering (DMLS) for metallic parts and Selective Laser Sintering (SLS) for thermoplastics. Both processes are based on the principle of powder-bed fusion. Figure 1.1 showing the process of the additive manufacturing whit the use of powder application of layers and small fine powder melting as well as bond whit each other through the laser power system.

*1.2 Design for Additive Manufacturing*

Additive manufacturing (AM) gives us huge freedom to design parts differently, but we do need to be aware of some of the characteristics and limitations of the process, so that we create parts that can be built successfully. Modern design and build preparation software helps enormously to find an optimum design, orientation and support strategy so that we can produce consistent parts economically.

The feature article details of AM essentials:

- How to print parts efficiently and effectively including feature size, surface finish, overhangs, lateral holes and minimizing supports.
- Residual stress and distortion.
- Multi-scale structure design.
- Multi-material design.

## 2. Literature Review

**Timothy C. Allison*, J. Jeffrey Moore*, Aaron M. Rimpel*, Jason C. Wilkes*, Robert Pelton*, Karl Wygant*, [1]** "Manufacturing and testing experience with direct metal laser sintering for close centrifugal compressor impeller.", Here this paper survey on DMLS is an attractive option for test rig articles due to its design flexibility and reasonable turnaround times, and maybe attractive for production machinery since the process allows for one-piece parts with reduced stresses and potentially higher operating speeds. They have manufactured closed impeller designs constructed from Inconel 718, 17-4 PH Stainless Steel, and Titanium 6Al-4V and testing also. *Pumpturbo.tamu.edu, September 23-25, 2014, Houston, TX.*

**E. Hosseinia*, V.A. Popovich*, [2]** "A review of mechanical properties of additively manufactured Inconel 718.", Numerous studies have investigated different aspects of the mechanical behavior of additively manufactured (AM) Inconel 718. It has a wide range of applications in aircraft, gas turbines, turbocharger rotors. This paper has main observations are summarized as follows on Fatigue, Creep and Microstructure of Inconal 718.

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**J.T. Geating*, M.C. Wiese*, and M.F. Osborn*, [4]** "Design, fabrication, and qualification of a 3d printed metal quadruped body: combination hydraulic manifold, structure and mechanical interface." They have performed Fatigue Analysis to estimate the fatigue life of the manifold pipe with defects relative to the nominal wall thickness. After fabrication, they did a rigorous program involving post-processing, inspection, and destructive and non-destructive testing was performed to validate the design and manufacturing methods. Constructed using powder-bed direct laser metal sintering (DLMS). *Naval Research Laboratory, DC 20375, Solid Freeform Fabrication 2017.*

**Christoph Klahna*, Bastian Laurencekirk*, Mirko Meboldtb*, [5]** "Design Strategies for the Process of Additive Manufacturing." They have used Fused Deposition Modelling (FDM) in which a thermoplastic filament is extruded through a heated nozzle and placed on the previously build portion of the part. The mechanical properties of FDM parts are highly anisotropic and this should be respected in design. They have also mentioned about manufacturing-driven design strategy, it allows a substitution of manufacturing processes at a later stage of the product life cycle, while a function-driven design strategy increases the performance of a product. *Procedia CIRP 36 (2015) 230 – 235, Zurich, Switzerland.*

**L. Zhu, N. LI, P.R.N. Childs*, [6]** "Light-weighting in aerospace component and system design." Light weighting represents an effective way to achieve energy consumption reduction and performance enhancement. *Elsevier, Imperial College London, SW7 2AZ, United Kingdom. - 6 June 2018.*

**A.W. Gebisa*, H.G. Lemu, [7]** "Design for manufacturing to design for additive manufacturing: Analysis of implications for design optimality and product sustainability." Concerning the sustainability of products, the analysis shows that the

technology is on a promising progress with better achievements than conventional manufacturing techniques. *ELSEVIER B.V., Procedia manufacturing 13 (2017), faculty of science and technology, Stavanger, Norway.*

**Melissa Orme 1, \*, Ivan Madera 1, Michael Gschweitl 2 and Michael Ferrari. [8]** "Topology Optimization for Additive Manufacturing as an Enabler for Light Weight Flight Hardware." topology optimization exercise must be coupled to the Additive Manufacturing build direction, and steps are incorporated to integrate the AM constraints. *MDPI, Ruag Space, 8052 Zürich, Switzerland. 25 November 2018.*

**Sebastian Hällgrena, b\*, Lars Pejrydb\*, Jens Ekengrenb\*, [9]** "(Re)Design for Additive Manufacturing". It is shown that redesigning for AM can reduce mass but depending on part size and print speed, the part can become more expensive than the original design, creating a need to know the customer value of what the redesigned part provides, in this case, the value of reduced mass. *ELSEVIERa Saab Dynamics, Development, 69180 Karlskrona, Örebro, Sweden.*

**Hamed Seifia, AnoosheRezaeeJavana, ShanqingXua, Yang Zhaob, Yi Min Xiea,c\*, [10]** "Design optimization and additive manufacturing of nodes in grid shell structures" It is represented about the improved structural performance and design efficiency by using the transitional section method and the bi-directional evolutionary structural optimization (BESO) method. Laplacian smoothing algorithm is elective in reducing the stress concentration of structural nodes .*ELSEVIER, Melbourne, Victoria 3001, Australia, Shanghai 200092, China, Hangzhou 310027, China.*

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**VeronicaLivescu, CameronM.Knapp, GeorgeT. GrayIII, RamonM.Martinez, BenjaminM.Morrow, BinehG.Ndefru\*, [11]** "Additively Manufactured tantalum microstructures" Deposition speed and laser powder were important parameters to consider for obtaining porosity- freematerial. Stripe Widthhad themostsignificante ectongrain growth. ELSEVIER, material science and technology division, LosAlamos,NM 87545,

*2.1 Summary of the Entire Research survey*

- To study the close impeller in DMLS process and Additive materials gives the best performance.
- In this study paper to perform the Inconel 718 materials property analyzed on fatigues, creep in additive manufacturing.
- It has to carry out the additive manufacturing materials like Inconel 718, 17-4 PH Stainless Steel, and Titanium 6Al-4V for close impeller with used DMLS process.
- To study about the different factors of Additive manufacturing process such as bottom-up manufacturing factor, computer-aided manufacturing factor, distributed manufacturing factor, and eliminated manufacturing factor.
- Some research paper indicated different types of additive manufacturing process explained in brief like, SLM, SLS, DMLS, FDM, etc

*2.2 Objectives*

- To analyze the close impeller using a finite element method.
- To change the design parameters of the impeller to increase the efficiency. also find suitable materials for impeller.
- To manufacture of close impeller using AM Validate the results

**3. Process and Methods for Impeller Production**

Now a day's manufacturing point of view, a pump impeller classify into two categories like close and open. For that, it would be better for manufacturing according to the different shapes or types. There are most easiest pump impeller manufacturing process can be presented as follow.

- Sand casting method
- Machining
- Welding or some other joining

The sand casting method is the most popular and applicable methods among the impeller manufacture. Low cost and convenient in technological terms made this technology pervasive compare to other methods. Besides, it has some limitations which compel a manufacturer to select other methods as well. Afterword this technology will be investigated completely in case of direct and reverse engineering of impeller manufacturing.

Fig. 3.0.1. Impeller manufacturing via sand casting method

*3.1   Comparison Between Casting And Additive Design of Closed Impeller*
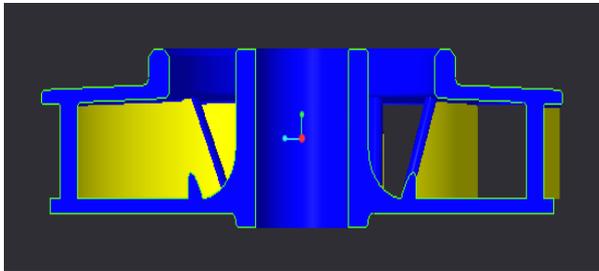


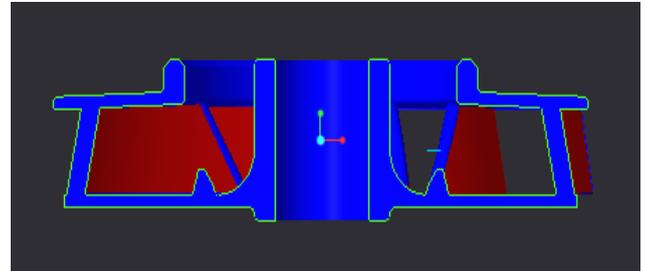Fig. 3.1.1. Design for Casting Process                Fig. 3.1.2. Design for AM Process

Generally closed impeller manufactured by different casting processes because of the inherent feature of this method which makes it possible to molding shapes, also as beneficial way with low cost and no need to very professional labor. Figure 3.1.1 showing a vane angle of 90'' which can easily be manufactured through casting process while it can change angle instated of 90'' there some limitation of the casting process. Although, figure 3.1.2 shows a vane angle of 80'' it can be manufactured by additive manufacturing process because of its more flexible to build also it can make very complex shapes through the AM. Compare to other methods, the cost of changing and improvement of the segment is too low and moreover over it saves more time and accelerates the speed of manufacturing procedure.

## 4. Analysis of Close Impeller

**1) CAD model**

   First Step to create a model in CAD software (Creo Parametric).
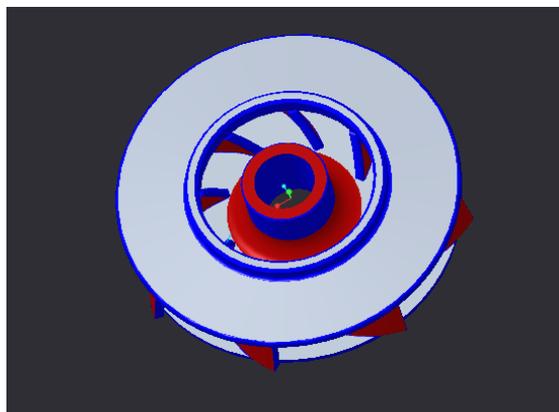


Fig. 4.1.1. 3D CAD model of close impeller

**2) Meshing model**

Solid mesh (Method Tetrahedron, Algorithm-Patch Independent) which is programmed generated.
Fine Meshing is applied.
Element Size: 1mm
No. of Nodes: - 458001
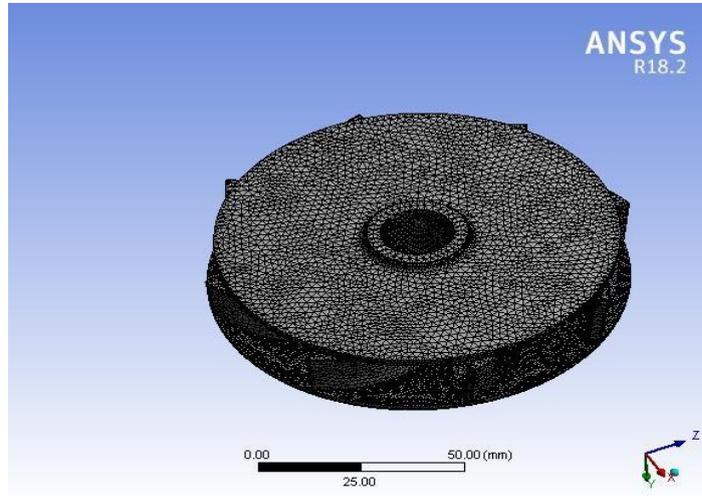No. of Elements: - 267610

Fig. 4.1.2. Mesh of pump impeller

**3) Material Properties of Stainless Steel 316L**

| Material used | Young Modulus (Gpa) | Yield Strength (Mpa) | Poisions Ratio | Density (Kg/m3) | Tensil ultimate strength (Mpa) |
|---|---|---|---|---|---|
| SS 316 L | 200 | 250 | 0.30 | 8000 | 460 |

**4) Boundary Condition Application on Close Impeller**

    a)    Fixed the Close Impeller on the main shaft of the motor.
    b)    Pressure is applied at the internal vane side 0.13MPa.
    c)    The impeller is rotating counter-clockwise at 2900 RPM speed.
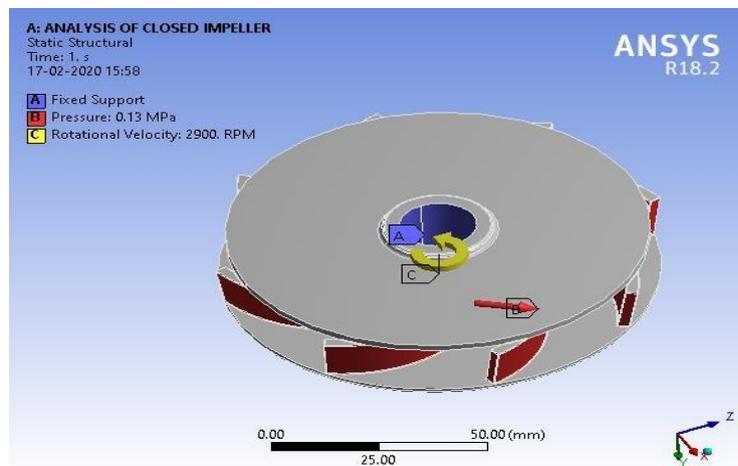
Fig. 4.1.3. Boundary Condition

**Results of Analysis**

**Equivalent Stress for static analysis**

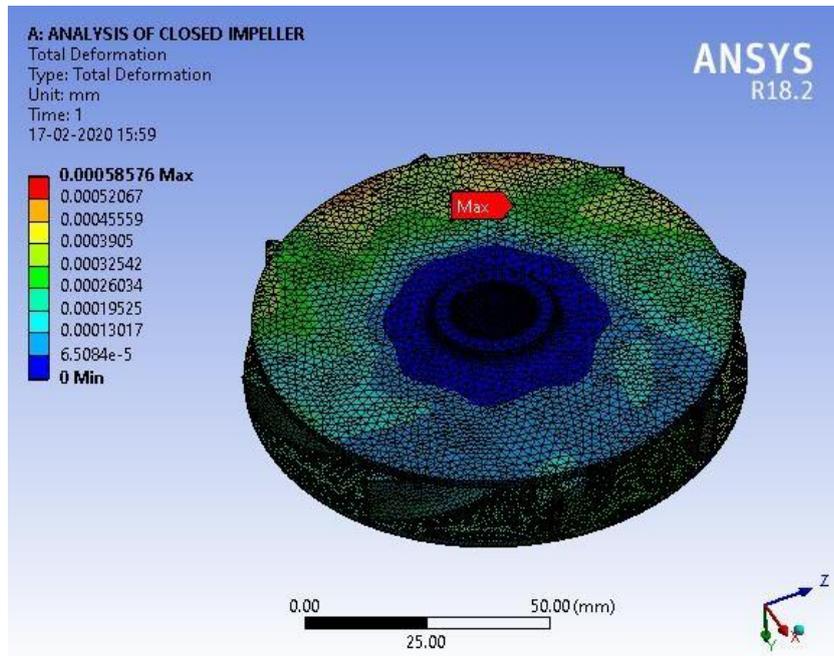| Name | Type | Min | Max |
|---|---|---|---|
| Stress1 | VON: von Mises Stress (Equivalent Stress) | 0.0027337Mpa Nodes: - 458001 | 22.359Mpa Nodes: - 458001 |
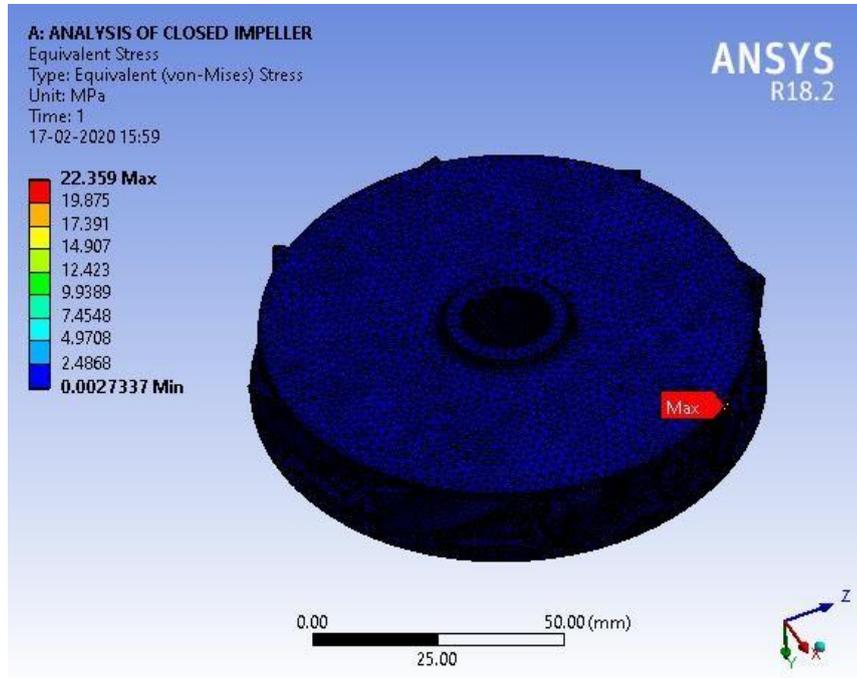


Fig. 4.1.4. Equivalent Von-Misses Stress

**Deformation**



Fig. 4.1.5. Total Deformation

95

| Name | Type | Min | Max |
|------|------|-----|-----|
| Deformation | Total Deformation | 0 mm<br>Nodes: - 458001 | 0.00058576mm<br>Nodes: - 458001 |

## 5. Post Processing after the AM process
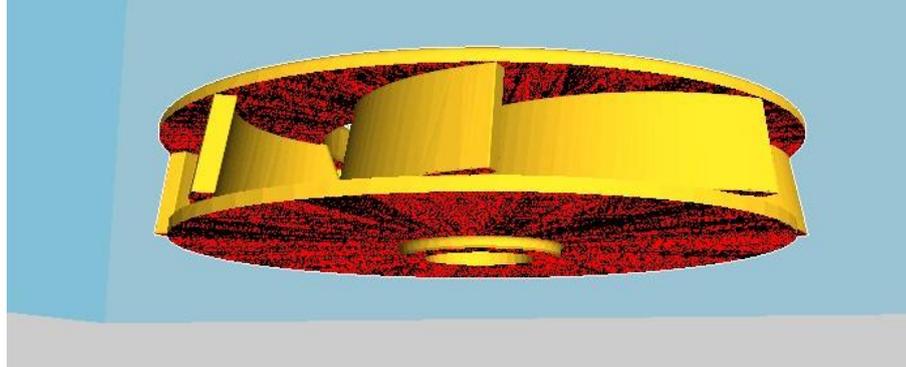


Fig. 5. Post Processing after the AM process

- Removed all supports after the AM process because of better surface finishing and quality of close impeller.
- Supports only have to apply on the red color portion which is overhanging part shown in the figure.
- Machining on the outer body of close impeller.

**Benefits of Additive Manufactured Close Impeller:**

- Utilizing AM technology caused to enormous time reduction in initial pattern manufacturing procedure compare to both traditional and machining way.
- Surface quality and dimensional accuracy in both machining and AM method is much better than conventional manufacturing methods.
- presents the AM method utilizing is dependable and applicable method in reverse engineering case of complicated blade shapes

## 6. Scope for future

The following are recommended for future work elaborations of this research.
- Measure the efficiency of the impeller by using CFD / CFX tool.
- Impeller analysis in this study consist of a hydraulic test.

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# A review on additive manufacturing process for hydraulic manifold block

Keshav H. Bhavsar[a*]

*[a]Mechanical Department, Gandhinagar Institute of Technology, Moti Bhoyan, Gujarat-382721, India*

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## Abstract

Additive manufacturing (AM) is a cyclic manufacturing process to create three-dimensional objects layer-by-layer directly from a 3D CAD model. Nowadays AM processes like SLM and SLS are suitable for direct part production. The processes have little restrictions regarding the shape of the object. The challenge to a designer is to use the unique characteristics of additive manufacturing in the development process to create an added value for the manufacturer and the user of a product.

In this review process of additive manufacturing for hydraulic manifold studied. A hydraulic manifold is a component that regulates fluid flow between pumps and actuators and other components in a hydraulic system. Aiming at the reduction in its geometrical layout and the typical hole structure of HMB is optimized with the supports of 3D printing and evaluating Finite Element Analysis and experiment. The whole process is called a Design for Additive Manufacturing (DFAM).

*Keywords:* Hydraulic Manifold Block, Additive manufacturing, Design for Additive manufacturing, Finite element analysis (FEA).
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## 1. Introduction

Additive Manufacturing (AM), or 3D printing as it is referred to in the media, is a group of manufacturing technologies that are capable to produce complex, three-dimensional objects without the need for individual tooling. Since the beginning of the 1980s additive manufacturing evolved from the first processes for the rapid production of prototypes into several different processes of which some are capable of direct part production. Today processes like selective laser melting (SLM), selective laser sintering (SLS), Direct metal laser sintering (DMLS) and with some limitations fused deposition modeling (FDM) is capable to produce direct parts in end-user quality out of metal or thermoplastics. Additive manufacturing processes are technologically mature for industrial production and due to rising competition between service providers, additive manufacturing becomes economically feasible for a growing number of industrial and end-user applications. From a design perspective, the challenge of additive manufacturing is to understand the limitations and opportunities of these new processes and to use them in the right applications.

There are mainly two design strategies to use additive manufacturing's benefits in product development. A manufacturing-driven design strategy allows the substitution of manufacturing processes at a later stage of the product life cycle, while a function-driven design strategy increases the performance of a product. The choice of strategy has a great impact on the development process and the design of components.

### 1.1 Additive Manufacturing Process

Before a designer can create a truly additive design, he needs to understand the characteristics of additive manufacturing. The common standard of ASTM and ISO defines additive manufacturing as a manufacturing process to produce three-dimensional objects by adding material layer-by-layer. The production is based on a 3D model that is digitally sliced into layers. There is a growing number of AM processes available with different processes to join material. Each process is limited to one type of material and only a few can process more than one material e.g. thermoplastics of a different color. In the last decade, the maturity of these processes was largely increased due to research on new materials, the development of better equipment and a deeper understanding of the processes which led to robust and stable processes. From an industrial perspective process capable of producing robust parts with high strength and long-term stability are most relevant because they allow the direct production of end-use parts.

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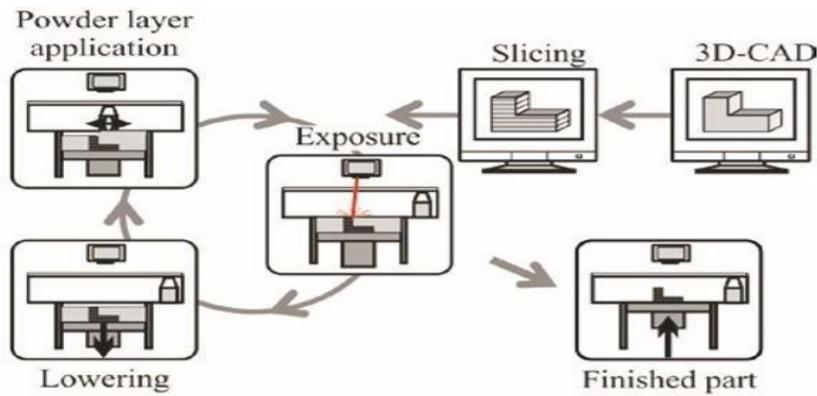*Keshav H. Bhavsar
*Email address:* 180120708001@git.org.in

Fig. 1. Additive manufacturing by laser-based powder-bed fusion

*Additive manufacturing by laser-based powder-bed fusion*

Two processes that meet this requirement are Selective Laser Melting (SLM), Direct Metal Laser Sintering (DMLS) for metallic parts and Selective Laser Sintering (SLS) for thermoplastics. Both processes are based on the principle of powder-bed fusion. Figure 1.1 depicts the cyclic process consisting of applying a layer of powder, solidifying the powder with the energy of a laser beam and lowering the powder-bed for the next layer to be applied.

*1.2 Design for Additive Manufacturing*

Design for additive manufacturing (Dam or DFAM) is design for manufacturability as applied to additive manufacturing (AM). It is a general type of design method or tool whereby functional performance and/or other key product life-cycle considerations such as manufacturability, reliability, and cost can be optimized subject to the capabilities of additive manufacturing technologies.

This concept emerges due to the enormous design freedom provided by AM technologies. To take full advantage of unique capabilities from AM processes, DFAM methods or tools are needed.

　　Typical DFAM methods or tools include;
　• Topology optimization,
　• Design for multiscale structures (lattice or cellular structures),
　• Multi-material design,
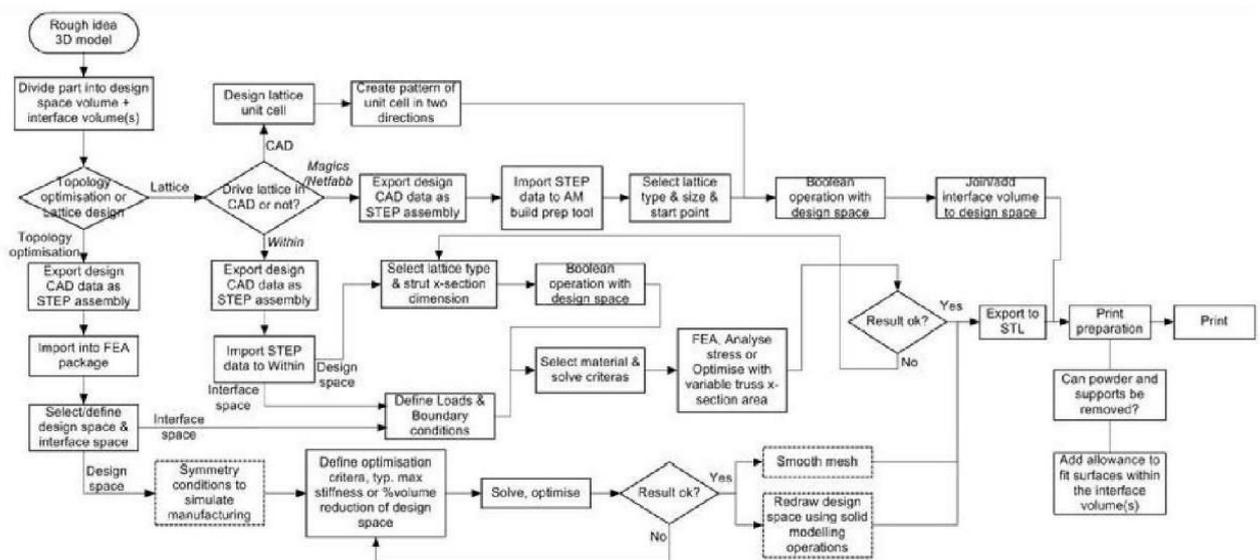　• Mass customization,
　• Part consolidation



Fig. 1.2. Lattice and Topology Optimization DfAM Design Process

The role of Dam in product development has become very immense due to several reasons including the fact that;
- the products are getting more complex,
- the market competition of similar product is very high,
- wide variety of end-users are available,
- the existence of needs for a large number of products and
- consistent high-quality expectation

*1.3 Hydraulic Manifold Block Conventional Process*

Modular manifold systems are easy to modify and can be added to existing manifolds. The blocks are usually made of **Ductile iron, Aluminium, or Steel**. Blocks can be custom designed or standard. From the circuit diagram in specific software, the manifold is designed in which first need to identify different types of valve patterns that are universally the same for hydraulics and check port connection sizes and start drilling as per circuit diagram and connections. Some of the passages connected by plugging drills that is just useful for connecting the passages later it will be closed by screw plug.



Fig. 1.3. Modular Hydraulic Manifold Block

The tops of basic modular blocks are ported and drilled to accept subplate-mounted valves. Blocks with different ports usually are available for each type of valve and subplate. Each type is identified for the valve it will accept. Some modular systems will accept cartridge valves as well as subplate-mounted valves. When specifying a manifold system, consider the interchangeability of valves, subplate, and blocks.

## 2. Literature Review

**J.T. Gating*, M.C. Wiese*, and M.F. Osborn*, [1]** "Design, fabrication, and qualification of a 3d printed metal quadruped body: combination hydraulic manifold, structure and mechanical interface" Had represented that they have performed Fatigue Analysis to estimate fatigue life of the manifold pipe with defect relative to the nominal wall thickness. They did a rigorous program involving post-processing, inspection, and destructive and non-destructive testing was performed to validate the design and manufacturing methods after fabrication. Constructed using powder-bed direct laser metal sintering (DLMS). *Naval Research Laboratory, DC 20375*, Solid Freeform Fabrication 2017.

**Christoph Kahan*, Bastian Laurencekirk*, Mirko Embolite*, [2]** "Design Strategies for the Process of Additive Manufacturing." They have used Fused Deposition Modelling (FDM) in which a thermoplastic filament is extruded through a heated nozzle and placed on the previously build portion of the part. The mechanical properties of FDM parts are highly anisotropic and this should be respected in design. They have also mentioned about manufacturing-driven design strategy, it allows substitution of manufacturing processes at a later stage of the product life cycle, while a function-driven design strategy increases the performance of a product. *Procedia CIRP 36 (2015) 230 – 235*, *Zurich, Switzerland.*

**L. Zhu, N. LI, P.R.N. Childs*, [3]** "Light-weighting in aerospace component and system design." Light weighting represents an effective way to achieve energy consumption reduction and performance enhancement. Here in this research

majorly focus on weight reduction for that they used different techniques like topology optimization etc. light-weighting in Aerospace components demand grown day by day to make it easy and can enhance performance. *Elsevier, Imperial College London, SW7 2AZ, United Kingdom. – 6 June 2018.*

**A.W. GeBIZ\*, H.G. Lemur, [4]** "Design for manufacturing to design for additive manufacturing: Analysis of implications for design optimality and product sustainability." Concerning the sustainability of products, the analysis shows that the technology is on promising progress with better achievements than conventional manufacturing techniques. *ELSEVIER B.V., Procedia Manufacturing 13 (2017), faculty of science and technology, Stavanger, Norway.*

**Melissa Orme 1, \*, Ivan Madera 1, Michael Schwedt 2 and Michael Ferrari. [5]** "Topology Optimization for Additive Manufacturing as an Enabler for Light Weight Flight Hardware." Here in this research they talked about Topology optimization exercise must be coupled to the Additive Manufacturing build direction, and steps are incorporated to integrate the AM constraints. This technology is one of the best methods to reduce the weight of the component for better use. *MDPI, Rag Space, 8052 Zürich, Switzerland. 25 November 2018.*

**Sebastian Hultgren, b\*, Lars Pejrydb\*, Jens Keenen\*, [6]** "(Re)Design for Additive Manufacturing". Here in this research shown that redesigning for AM can reduce mass but depending on part size and print speed, the part can become more expensive than the original design, creating a need to know the customer value of what the redesigned part provides, in this case, the value of reduced mass. *ELSEVIER a Saab Dynamics, Development, 69180 Karlskrona, Orebro, Sweden.*

**Hamed Seia, Anooshe Rezaee Javana, Shanqing Xua, Yang Zhaob, Yi Min Xiea,c,\*, [7]** "Design optimization and additive manufacturing of nodes in grid shell structures" It is represented about the improved structural performance and design efficiency by using the transitional section method and the bi-directional evolutionary structural optimization (BESO) method. The laplacian smoothing algorithm is effective in reducing the stress concentration of structural nodes. *ELSEVIER, Melbourne, Victoria 3001, Australia, Shanghai 200092, China, Hangzhou 310027, China.*

**Veronica Livescu, Cameron M. Knapp, George T. Gray III, Ramon M. Martinez, Benjamin M. Morrow, Bineh G. Ndefru\*, [8]** "Additively Manufactured tantalum microstructures" Deposition speed and laser powder were important parameters to consider for obtaining porosity-free material. Stripe Width had the most significant effect on grain growth. *ELSEVIER, material science, and technology division, Los Alamos, NM 87545, USA,*

**Daniel Tisha,b,\*, Wes McGee, Tim Schorkb, Geoffrey Thüna, Kathy Velikova, [9]** "Case Studies in Topological Design and Optimization of Additively Manufactured Cable-nets" had represented about the topology optimization methodology is ver efficient used to develop the cable-nets and in that material, system is designed in such a way that the desired formal qualities or performance characteristics are brought about through material agency in a bottom-up approach. *Taubman College of Architecture and Urban Planning, 2000 Bonisteel Blvd., Ann Arbor, MI 48109, USA.*

**Hanna E. Burton,b,\*, Neil M. Eisenstein,c, Bernard M. Lawless, Parastoo Jamshidie, Miren A. Segarrae, Owen Addisonf, Duncan E.T. Shepherd, Moataz M. Attallahe, Liam M. Grovera, Sophie C. Coxa, [10]** "The design of additively manufactured lattices to increase the functionality of medical implants" had represented about the lattice structures to mechanically match surrounding bone and reduce stress shielding of body components. It also described that AM methods can produce a lattice design for use in a titanium implant that could allow targeted drug delivery of a loaded therapeutic, without compromising the fatigue life of a load-bearing orthopaedic hip implant. *ELSEVIER, International Centre for Design & Research, Cardiff CF5 2YB, United Kingdom.*

**BotaoZhang, ArchakGoel, OmkarGhalsasi, Sam Anand, [11]** "CAD-based design and pre-processing tools for additive manufacturing" had represented about Various additive manufacturing (AM) parameters and Design for Additive Manufacturing (DFAM) metrics are calculated on the fly for assigning producibility score sat different part build orientations. *ELSEVIER Journals of manufacturing systems.*

**Enrique Alberta, Daniel Bareback, Roger C. Reedbuck, \* Ox Met, [12]** "Design of metallic bone by additive manufacturing" had represented about the Mechanical experimentations measure the ability of titanium lattice structures to mimic the properties of both cortical and trabecular bone in terms of stiffness and strength. *United Kingdom Department of Materials, University of Oxford, Parks Road, Oxford OX1 3PH, United Kingdom.*

**Clayton Greer,\*, Andrzej NYCs, Mark Noakes , Brad Richard son, Brian Post, Thomas Kufrs, Lonnie Love.[13]** "Introduction to the design rules for Metal Big Area Additive Manufacturing" had represented that they used a Gas Metal Arc Weld system on an articulated robot arm to increase build volume and deposition rate in comparison to powder bed techniques. They said topology optimization can only show which parts have to be removed in general terms and has the potential to guide a designer and build an efficient product. *A Georgia Institute of Technology, George W. Woodruff School of Mechanical Engineering, 801 Ferst Drive, Atlanta, GA, 30332, United States.*

**Anton du Plessis, ∗, ChrisBroeckhoven, Ina Yaroslava, Igor Yadroitsev, Clive H. Hands, Ravi Kunju, Dhruv Bate [14]** "Beautiful and Functional: A Review of Biomimetic Design in Additive Manufacturing" had represented that state-of-the-art for biomimicry in additive manufacturing to design a product in the best manner. It inspires from direct nature and self-supported structures for printing. They mentioned that Biomimicry may take different forms in AM, including customization of parts for individuals or optimization for specific properties such as stiffness and light-weighting. *Laboratory of Functional Morphology, Department of Biology, Universiteitsplein1, 2610 Wilrijk, Belgium. Additive Manufacturing 27 (2019) 408-427.*

*2.1 Summary of the Entire Research survey*

- The research survey was reflected in different types of case study on additive manufacturing.
- Some Research papers indicated the design for additive manufacturing (DfAM) methodology and state-of-the-art for biomimicry in additive manufacturing with their benefits.
- Some research papers indicated optimization methodologies like topology optimization, transitional section method, and the bi-directional evolutionary structural optimization (BESO) method also Laplacian smoothing algorithm and its procedure in broad.
- Some research papers indicated the material properties of the components in various loading conditions.
- Different types of additive manufacturing processes explained in brief like SLM, SLS, DMLS, FDM, etc.

*2.2 Conclusion*

- In this study, Hydraulic manifold is developed for enhancing its performance and Structural Stiffness.
- The research survey was reflected in different types of case study on Hydraulic manifold block and additive manufacturing process with manifold block can be built. It reflects different techniques like Direct Laser Melting Process (DMLS) for metallic parts, Selective Laser Sintering (SLS) for polymers and Selective laser melting (SLM), etc.
- Some research papers represented the improved structural performance and design efficiency by using Design for additive manufacturing, the transitional section method, and the bi-directional evolutionary structural optimization (BESO) method.
- From referring different case studies were containing detail of analysis of manifold block, precaution requires developing it, Procedures for the design for additive manufacturing and advantages of the manifold block and different applications for additive manufacturing, etc.

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# Optimization and analysis of Square and ACME threaded power screw with hollowness

Chintan T. Barelwala[a*], Darshit R. Khalas[b]

[a]*Assistant Professor, Gandhinagar Institute of Technology, Gandhinagar, Gujarat, India*
[b]*BE Mechanical, Narnarayan Shastri Institute of Technology, Jetalpur, Gujarat, India*

## Abstract

The bolt and nuts are used for temporary fastening in the machines and structural assembly; they play an important role to restrict the movement of individual parts in the assembly. Improvement in power screw has provided machines of higher ratings with better tolerances and controlled behavior in foundation. These machines give rise to considerably higher dynamic forces and thereby higher stresses and, in return, demand improved performance and safety for failures. Screw may be subjected to either static loads or a combination of static and dynamic loads. The unequal load distribution in the threaded fasteners causes the fatigue failure due to stress concentration in this project stress distribution in square and ACME threads, for various symmetrical models such as groove added to bolt, hollowness in screw, half thread on the bolt are designed, modelled and analyzed as well as developed to reduce stress concentration. In this paper, we have optimized and analyzed Square and ACME threaded power screw with hollowness to improve its strength and decreases stress concentration. Model developed is to be validated using theoretical calculations. Stresses and torques are studied.

*Keywords*: Power screw, Square thread, ACME thread, ANSYS, Stress, deformation.

| Nomenclature | |
|---|---|
| d1 | Major diameter |
| d2 | Minor diameter |
| p | Pitch |
| h | Height |

### 1.1 Power Screw

Power screws convert the input rotation of an applied torque to the output translation of an axial force. They find use in machines such as universal tensile testing machines, machine tools, aircraft flap extenders, trench braces, linear actuators, adjustable floor posts, micrometers, and C-clamps. The mechanical advantage inherent in the screw is exploited to produce large axial forces in response to small torques. The efforts required in achieving the desired output can be effectively and economically be decreased by the implementation of better designs. Power screws are used to convert rotary motion into reciprocating motion. Screw jack is a device which is used to lift and support a heavy load in automotive vehicles, such as a car. [14]

Bolts are often used to make a bolted joint. This is a combination of the nut applying an axial clamping force and also the shank of the bolt acting as a dowel, pinning the joint against sideways shear forces. For this reason, many bolts have a plain unthreaded shank (called the grip length) as this makes for a better, stronger dowel.

Two principal categories of power screws are machine screws and recirculating ball screws. The screw threads are typically formed by thread rolling, which results in high surface hardness, high strength, and superior surface finish. Since high thread friction can cause self-locking when the applied torque is removed, protective brakes or stops to hold the load are usually not required.

Standardization of screw threads has evolved since the early nineteenth century to facilitate compatibility between different manufacturers and users. Additional product standards identify preferred thread sizes for screws and nuts, as well as corresponding bolt head and nut sizes, to facilitate compatibility between spanners (wrenches) and other tools. [15]

### 1.2 Power Screw threads

A power screw is designed to translate radial motion into linear motion. [5] There are at least three types of power screw threads: the square thread, the Acme thread, and the buttress thread. Of these, the square and buttress threads are the most efficient. That is, they require the least torque to move a given load along the screw.

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*Chintan T. Barelwala
*Email address:* chintan.barelwala@git.org.in

However, the Acme thread is not greatly less efficient, and it is easier to machine. The buttress thread is desirable when force is to be transmitted in only one direction. V-threads are less suitable for lead screws than others such as ACME because they have more friction between the threads. Their threads are designed to induce this friction to keep the fastener from loosening. Lead screws, on the other hand, are designed to minimize friction. [2]

- **Acme thread:-**The tooth shape also has a wider base which means it is stronger (thus, the screw can carry a greater load) than a similarly sized square thread. This thread form also allows for the use of a split nut, which can compensate for nut wear. Compared to square threads, disadvantages of the Acme thread form are lower efficiency due to higher friction and some radial load on the nut (angular offset from square).
    - Easier to make
    - It is modified square thread.
    - Good when well lubricated
    - Efficiency slightly lower than square thread.



Fig. 1.  Acme thread.

- **Square thread:-**The greatest advantage of square threads is that they have a much higher intrinsic efficiency than trapezoidal threads (Acme or metric trapezoidal). Due to the lack of a thread angle there is no radial pressure, or bursting pressure, on the nut. This also increases the nut life. The greatest disadvantage is the difficulty in machining such a thread. The single-point cutting tools or taps and dies used to cut the thread cannot have efficient rake and relief angles (because of the square form), which makes the cutting slow and difficult. Square threads also cannot carry as much load as a trapezoidal thread, because the root of the square thread is smaller. [13][16][17]
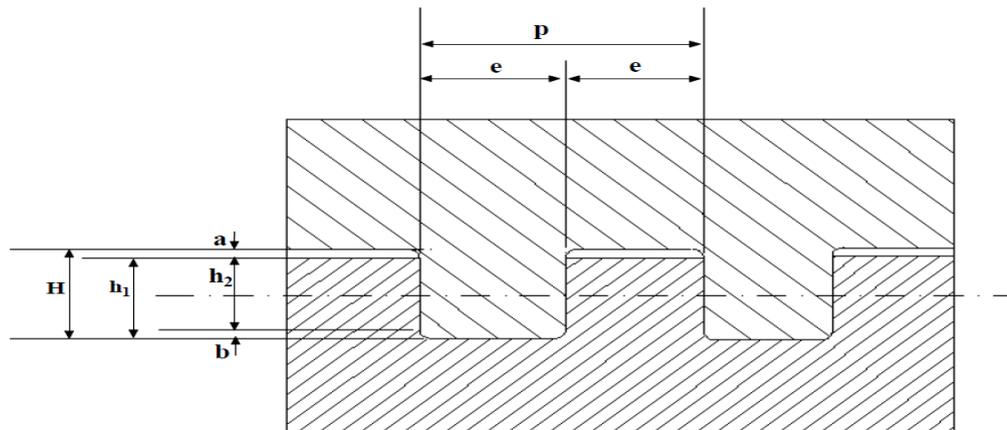


Fig. 2. Square thread.

*2.1 Literature Review*

Bolt connectors are one of the basic types of fasteners used in machines and structures. They play an important role in the safety and reliability of structural systems. The load distribution in typical bolt connectors is very unequal, with a high stress concentration at the thread roots. This stress concentration can cause fatigue failure in the bolt connectors. For example, hundreds of different bolt designs with various sizes, strength levels, and materials are used in the assembly of an aircraft. On the average, 2.4 million fasteners are used to assemble a Boeing 747 aircraft. Of this total, 22% are structural bolts. The importance of the reliability of bolt connectors cannot be overemphasized in such applications. Hence, it is of considerable interest to study the stress concentration in bolt connectors. In the past, several researchers have studied the stress distribution in bolt connectors using computational and experimental methods.

Omkar V. Shejwal et. al. have tried to reduce the weight of the jack body by creating holes on the body. So that the screw jack would be easy to port and increase the human comfort while handling the screw jack. [1]

Kapatel Jainil et. al. have reviewed and discussed on result obtained by theoretical analysis is carried out for statement of conclusion. [2]

Aman B. kotwal et. al. have designed and analysed the lead screw against gradual load and by considering different loading condition. [3]

N.Lenin Rakesh et. al. have performed analysis of stress square threaded power screw using Ansys through torture test used in industries manufacturing screw jacks so that there is no misalignment or problem while using screw jack. [4]

A. Thirugnanam have designed the screw jack according to the process and analyzed using ANSYS software. Model developed had validated using theoretical calculations. Stresses and torques were studied. [5]

R. Gopinath have designed the power screw is used for lifting and lowering the mass slowly which is required in any assembly shop of heavy industry. It mainly contains a set of worm and worm gears, a pinion and bevel gear, a screw and bronze nut and a motor to drive. [6]

### 3.1 Problem Definition

The foundation of the machine is to be fixed with the screw joint or fastener. The screw carries a load. So, it must have high strength. Considering the material in which the threads will be tapped or the nut used, there must be sufficient engagement length to carry the load. Ideally, the length of thread engagement should be sufficient to break the fastener in tension.

An estimate, a calculation or joint evaluation will be required to determine the tension loads to which the bolt and joint will be exposed. The size bolt and the number necessary to carry the load expected, along with the safety factor, must also be selected. The thread pitch must be considered when a given stress is to be applied, since the cross-sectional area used for stress calculations is the thread tensile stress area and is different for coarse and fine threads. The torque recommendations, therefore, are slightly higher for fine threads than for coarse threads to achieve the same stress. We have calculated its solution for two different threads with different helix angle and hollowness. [7][9][10][11][12]

### 3.2 Design Calculations

We have taken an ISO standard screw M10. Its data are mentioned as below:

Square thread:-
M10 ISO standard
Major diameter = 10mm
Minor diameter = 8mm
Pitch = 2mm
Height (h) = 1mm
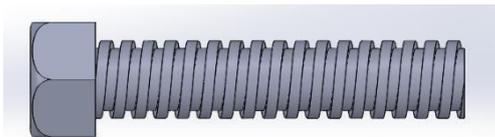Length = 40mm
(Shank - 34mm & head - 6mm)

Fig. 3. (a) Square thread full length Solid screw.                    (b) Square thread full length hollow screw.

**Trapezoidal threads or Acme thread**

M10 ISO standard for Helix angle 15 degree
Nominal diameter = 10mm
Major diameter (d1) = 10mm
Minor diameter (d2) = 8.38mm
Pitch (p) = 1.5mm
Height (h) = 0.8mm
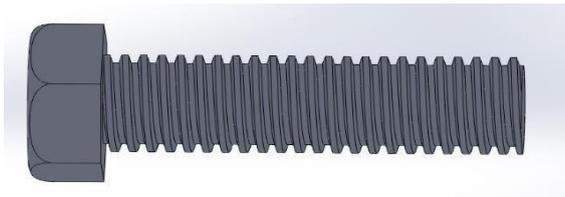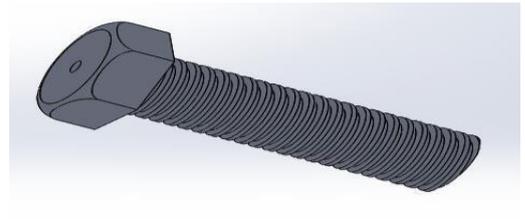Helix angle = 15 degree
Length = 40mm

Fig. 4. (a) ACME thread full length angle 15 solid screw.            (b) ACME thread full length angle 15 hollow screw.

## 4. FEA Analysis

A mathematical model of the object had created, typically in a modelling system, capable of producing precise solid and surface geometry (Geometry Modelling) by using Solid works. [4]

The geometric model have subdivided in to discrete elements; element & material properties are assigned for finite element modelling by using the software ANSYS. It is also called as Meshing. Loads and boundary conditions had applied to simulate the operating environment. The structural response, such as deflections, stresses etc. had computed by performing static analysis and found the following results:

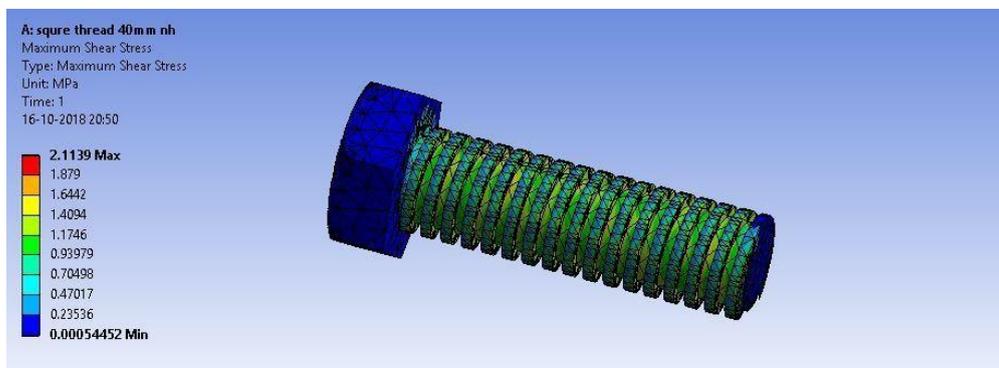[a] For Square thread full length solid screw:
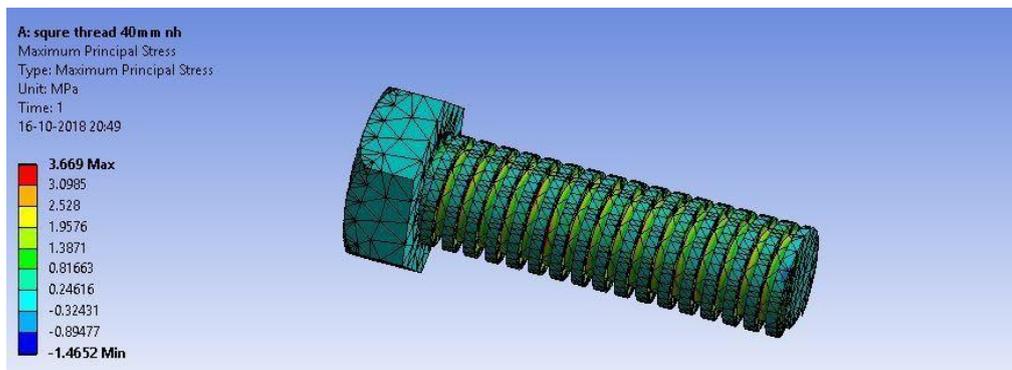


Fig. 5. Maximum shear stress



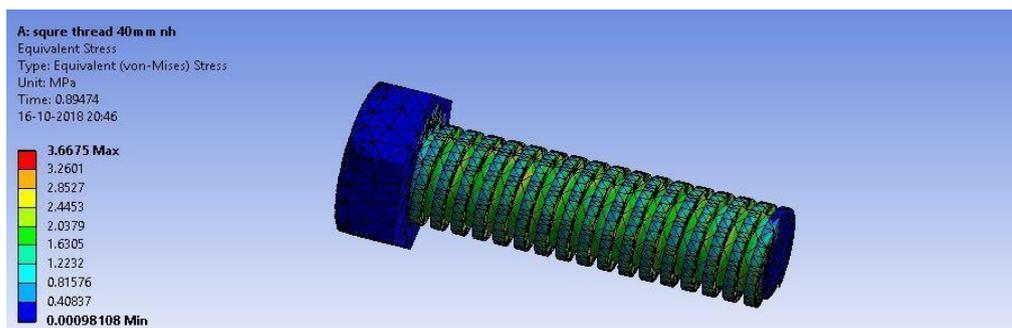Fig. 6. Maximum principal stress



Fig. 7. Equivalent (Von-Mises) stress

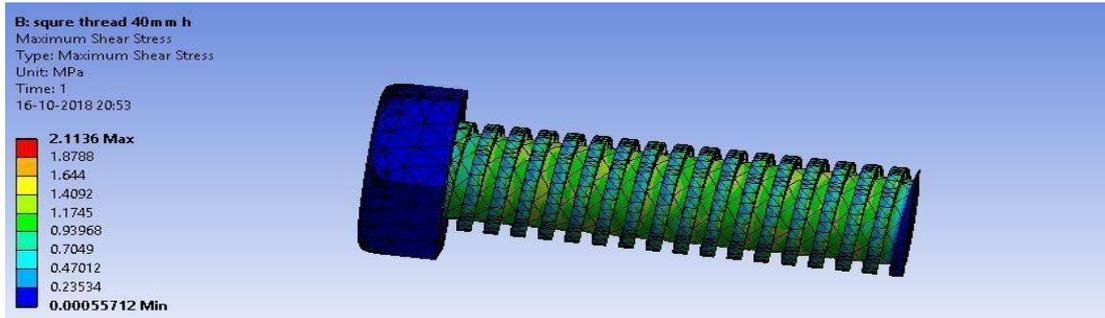[b] Square thread full length hollow screw



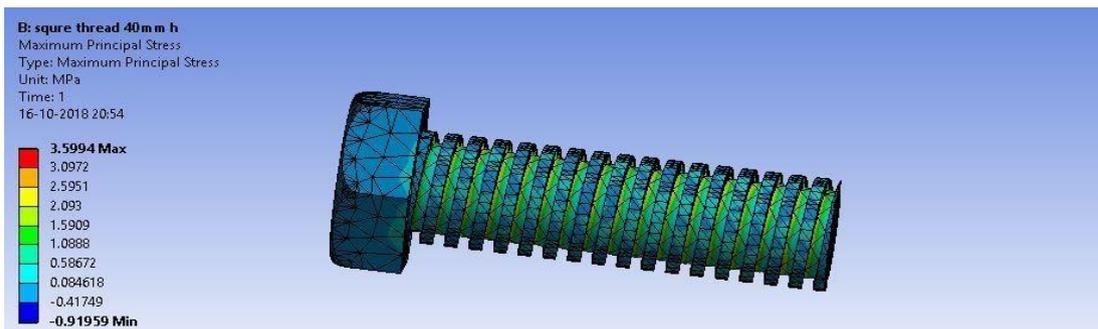Fig. 8. Maximum shear stress
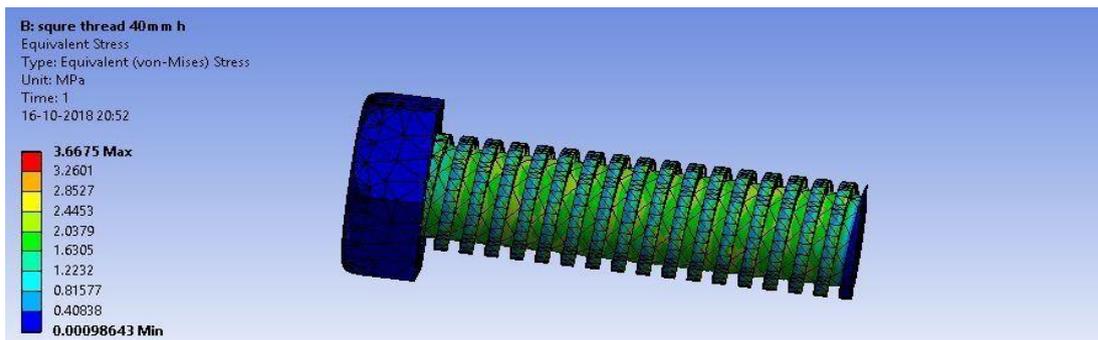


Fig. 9. Maximum principal stress



Fig. 10. Equivalent (Von-Mises) stress.

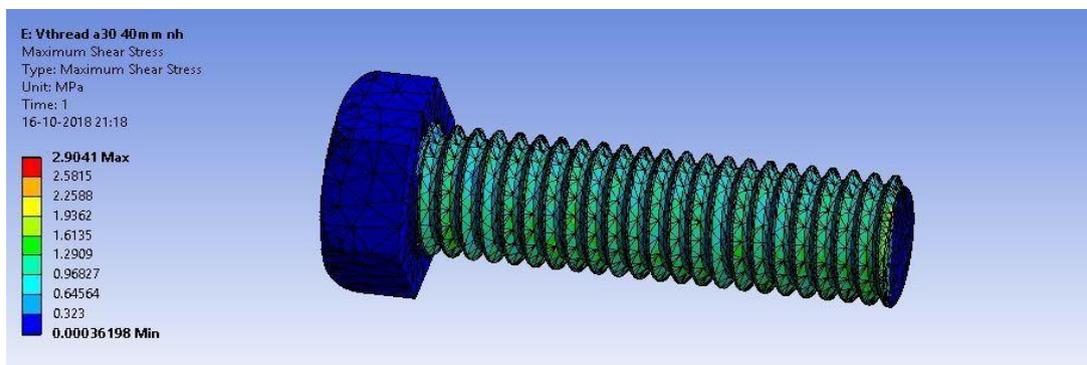[c] Acme thread full length angle 15 ˚ solid screw
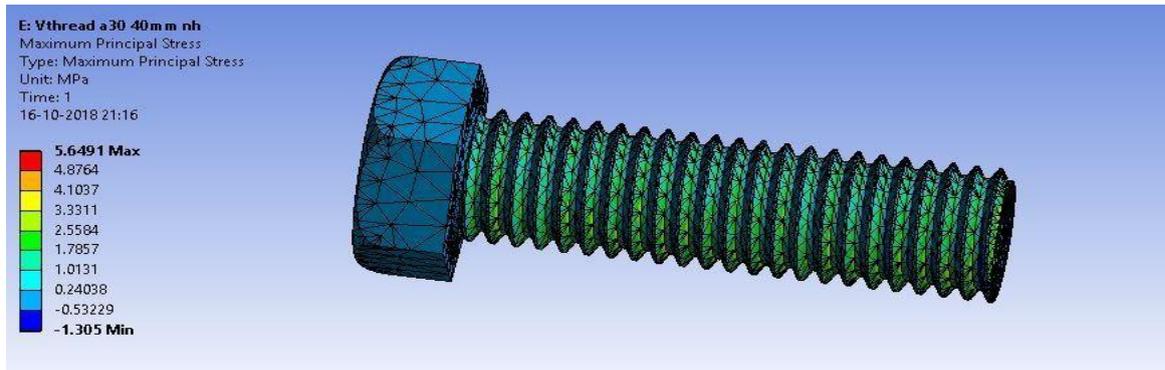


Fig. 11. Maximum shear stress

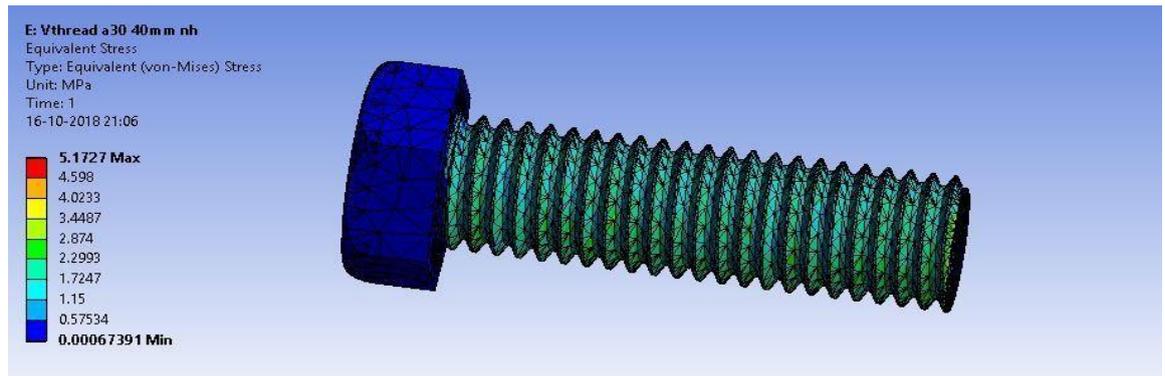Fig. 12. Maximum principal stress



Fig. 13. Equivalent (Von-Mises) stress

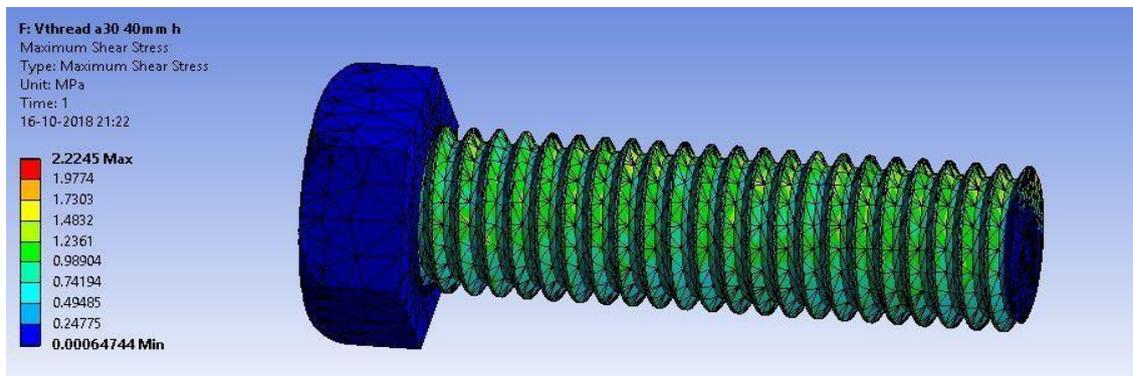[d] Acme thread full length angle 15 ° hollow screw


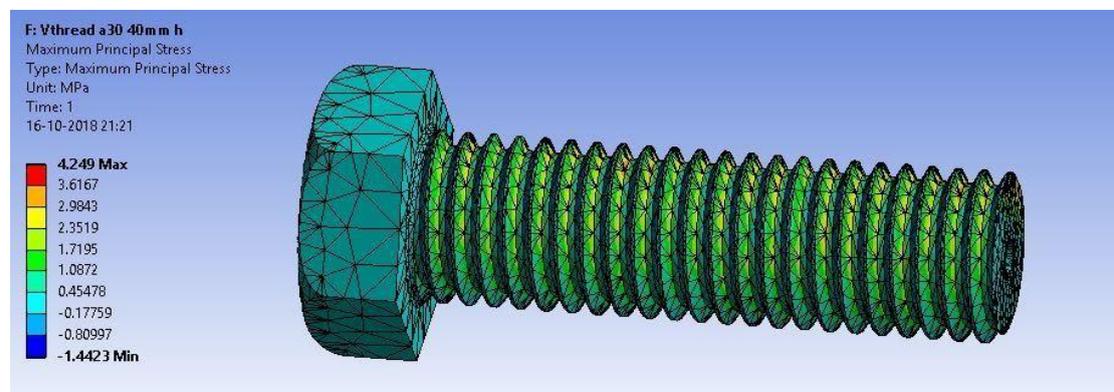
Fig. 14. Maximum shear stress
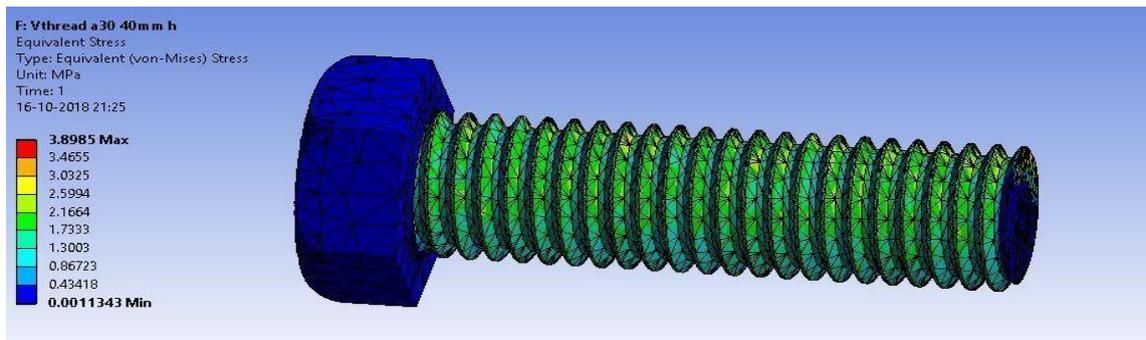


Fig. 15. Maximum principal stress

Fig. 16. Equivalent (Von-Mises) stress

If the computed response-stress, for example is greater than the allowable value, the structure is re-designed and reanalysed until an acceptable design is achieved. FEA Results for square and ACME (trapezoidal) thread full length angle 15˚ and 4.5˚ hollow screw are mentioned as table below where optimum values found shown in bold:

Table 1. Result fot Square and ACME thread

| Types of Screw | Stress (N/mm²) | Square thread | ACME thread | |
|---|---|---|---|---|
| | | | 15º | 14.5º |
| **Full length Solid screw** | **Max shear stress** | 2.1139 | 2.9041 | 2.3142 |
| | **Max principal** | 3.669 | 5.6491 | 4.5653 |
| | **Equivalent (Von-Mises)** | 3.6675 | 5.1727 | 4.1447 |
| **Full length hollow screw** | **Max shear stress** | 2.1136 | 2.2245 | **2.043** |
| | **Max principal** | 5.5994 | 4.249 | **3.1887** |
| | **Equivalent (Von-Mises)** | 3.6675 | 3.8985 | **3.5386** |

## 5. Conclusion

Analysing the power screw using ANSYS software it is observed that in the static analysis, the equivalent stress of the power screw is within the permissible limit. It was found that the stress analysis by conventional method is much difficult, takes a longer time and error chances are high. ANSYS also allows us to find the stress throughout the section. It also helps to differentiate the stress formation in section by colour coding.

## 6. Future Scope

Dynamic analysis of similar different threaded model could be performed by using the software ANSYS. Loads and boundary conditions could be applied to simulate the operating environment. The structural response, such as deflections, stresses etc. could be computed by performing dynamic analysis and presented for display through assessed results. If the computed response-stress, for example is greater than the allowable value, the structure will be redesigned and reanalysed until an acceptable design would be achieved.

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# A Survey of Video Object Tracking Methods

Mukesh Parmar[a*], Birendrasinh Zala[a], Nishith Parmar[a]

[a]*Asistant Professor, Gandhinagar Institute of Technology, Gandhinagar, Gujarat, India*

**Abstract**

Object tracking finds its application in several computer vision applications, such as video compression, surveillance, robotics etc. Object tracking is a process of segmenting a region of interest from a video scene and keeping track of its motion, position and occlusion. The tracking is performed by monitoring objects' spatial and temporal changes during a video sequence, including its presence, position, size, shape Difficulties in tracking objects can arise due to abrupt object motion, changing appearance patterns of both the object and the scene, nonrigid object structures, object-to-object and object-to-scene occlusions, and camera motion. tracking of an object mainly involves two preceding steps object detection and object representation. Object detection is performed to check existence of objects in video and to precisely locate that object. In this survey, we categorize the tracking methods on the basis of the object and motion representations used, provide detailed descriptions of representative methods in each category, and examine their pros and cons.

*Keywords*: object detection, object representation, object tracking, point tracking, shape tracking.

## 1. Introduction

Object tracking is an important task within the field of computer vision. The proliferation of high-powered computers, the availability of high quality and in expensive video cameras, and the increasing need for automated video analysis has generated a great deal of interest in object tracking algorithms. [1] There are three key steps in video analysis: detection of interesting moving objects, tracking of such objects from frame to frame, and analysis of object tracks to recognize their behaviour. Therefore, the use of motion-based recognition, that is, human identification based on gait, automatic object detection, automated surveillance, that is, monitoring a scene to detect suspicious activities or unlikely events video indexing, that is, automatic annotation and retrieval of the videos in multimedia databases ,human-computer interaction, that is, gesture recognition, eye gaze tracking for data input to computers ,traffic monitoring, that is, real-time gathering of traffic statistics to direct traffic flow ,vehicle navigation, that is, video-based path planning and obstacle avoidance capabilities.[2]

In its simplest form, tracking can be defined as the problem of estimating the trajectory of an object in the image plane as it moves around a scene. In other words, a tracker assigns consistent labels to the tracked objects in different frames of a video. Additionally, depending on the tracking domain, a tracker can also provide object-centric information, such as orientation, area, or shape of an object. Tracking objects can be complex due to loss of information caused by projection of the 3D world on a 2D image, noise in images, complex object motion, nonrigid or articulated nature of objects, partial and full object occlusions, complex object shapes, scene illumination changes, and real-time processing requirements. [2]

There are three key steps in video analysis: detection of interesting moving objects, tracking of such objects from frame to frame, and analysis of object tracks to recognize their behaviour [3].Actually videos are sequences of images, each of which called a frame, displayed in fast enough frequency so that human eyes can percept the continuity of its content. It is obvious that all image processing techniques can be applied to individual frames. Besides, the contents of two consecutive frames are usually closely related [3].An image, usually from a video sequence, is divided into two complimentary sets of pixels. The first set contains the pixels which correspond to foreground objects while the second complimentary set contains the background pixels. This result is often represented as a binary image or as a mask. It is difficult to specify an absolute standard with respect to what should be identified as foreground and what should be marked as background because this definition is somewhat application specific . Generally, foreground objects are moving objects like people, boats and cars and everything else is background. Many a times shadow is represented as foreground object which gives improper output. The basic steps for tracking an object are described below:

a) Object Detection

Object Detection is a process to identify objects of interest in the video sequence and to cluster pixels of these objects. Object detection can be done by various techniques such as temporal differencing, frame differencing, Optical flow and Background subtraction [1]**.**

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∗Mukesh Parmar
*Email address:* mukesh.parmar@git.org.in

b) Object Representation

Object representation involves various methods such as Shape-based representation, Motion-based representation, Color based representation and texture based representation where object can be represented as vehicles, birds, floating clouds, swaying tree and other moving objects. [4]

c) Object Tracking

Tracking can be defined as the problem of estimating the trajectory of an object in the image plane as it moves around a scene. Point tracking, kernel tracking and silhouette tracking are the approaches to track the object.[1]

## 2. Object Tracking Methods
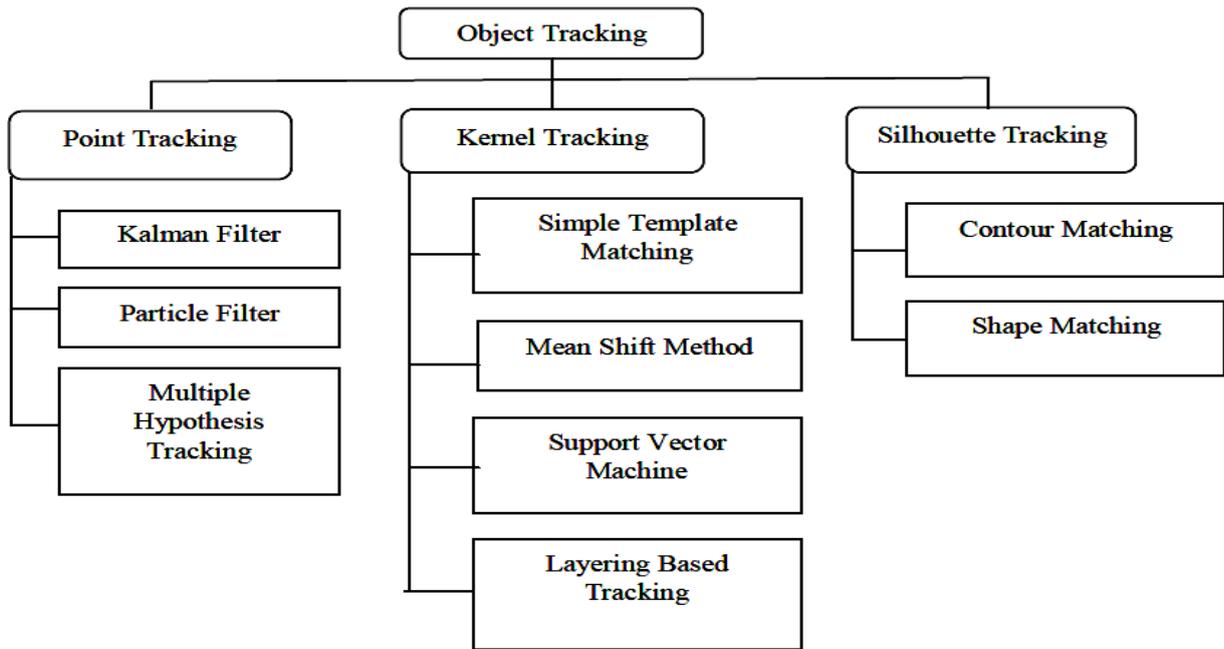


Fig. 1. Types of Object Tracking [1]

*2.1 Point Tracking*

Objects detected in consecutive frames are represented by points, and the association of the points is based on the previous object state which can include object position and motion. This approach requires an external mechanism to detect the objects in every frame. An example of object correspondence is shown in figure
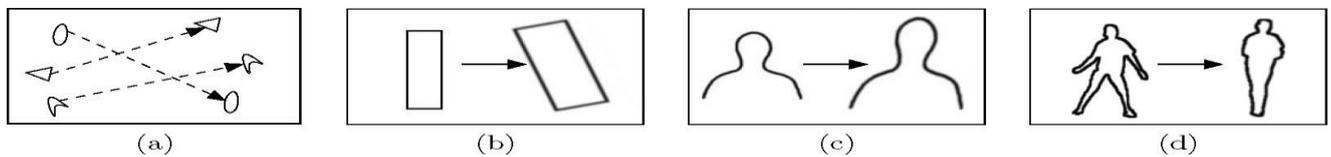


Fig. 2. (a) Different tracking approaches. Multipoint correspondence, (b) parametric transformation of a rectangular patch, (c, d) two examples of contour evolution. [2]

*2.1.1 Kalman Filter*

A Kalman filter [10] is used to estimate the state of a linear system where the state isassumed to the distributed by a Gaussian. The Kalman filter is a recursive predictive filter that is based on the use of state space techniques and recursive algorithms. It is estimated the state of a dynamic system. This dynamic system can be disturbed by some noise, mostly assumed as white noise. To improve the estimated state the Kalman filter uses measurements that are related to the state but disturbed as well. Kalman filtering is composed of two steps. Thus the Kalman filter consists of two steps: [4]

1. The prediction
2. The correction

In the first step the state is predicted with the dynamic model. The prediction step uses the state model to predict the new state of the variables.

$$X^t = D\,X^{t-1} + W \qquad (1)$$
$$\Sigma^t = D\,\Sigma^{t-1}\,D^t + Q^t \qquad (2)$$

Where $X^t$ and $\Sigma^t$ are the state and covariance predictions at time t. D is the state transition matrix which defines the relation between the state variables at time t and t-1. Q is the covariance of the noise W. Similarly the correction step uses the current observation $Z^t$ to update the object state.

$$K^t = \Sigma^t\,M^t[\,M\,\Sigma^t\,M^t + R^t]^{-1} \qquad (3)$$
$$X^t = X^t + K^t[Z^t - M\,X^t] \qquad (4)$$

where M is the measurement matrix, K is the Kalman gain which is called as the Riccati equation used for propagation of the state models. The updated state $Xt$ is distributed by Gaussian. Similarly Kalman filter and extended Kalman filter assumes that the state is distributed by a Gaussian. In the second step it is corrected with the observation model, so that the error covariance of the estimator is minimized. In this sense it is an optimal estimator. Kalman filter has been extensively used in the vision community for tracking. [4] The Kalman filter estimates a process by using a form of feedback control. The filter estimates the process state at some time and then obtains feedback in the form of noisy measurements. The equations for Kalman filters [3] fall in two groups: time update equations and measurement update equations. The time update equations are responsible for projecting forward (in time) the current state and error covariance estimates to obtain the priori estimate for the next time step. The measurement update equations are responsible for the feedback. Kalman filters always give optimal solutions.

*2.1.2 Particle Filter*

Particle filter is a filtering method based on Monte Carlo and recursive Bayesian estimation. The particle filter, also known as condensation filter and they are suboptimal filters. The core idea is that density distribution is present using random sampling particles. There is no restriction to the state vector to deal with nonlinear and non-Gaussian problem, and it is the most general Bayesian approach. [5] The working mechanism of particle filters is given as follows. The state space is partitioned as many parts, in which the particles are filled according to some probability measure. The higher probability, the denser the particles are concentrated. The particle system evolves along the time according to the state equation, with evolving pdf determined by the FPK equation. Since the pdf can be approximated by the point-mass histogram, by random sampling of the state space, we get a number of particles representing the evolving pdf.
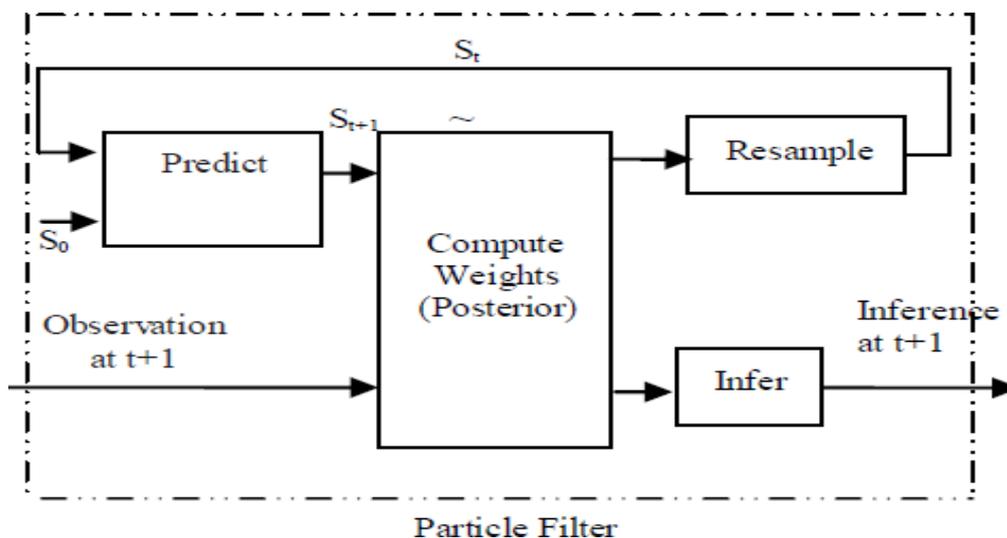


Fig. 3. Particle Filter

The basic steps block diagram in particle filtering is shown above [6]

The above Fig. 3 represents the particle filtering (PF) scheme. Consider a system whose state is changing in time St = f (St-1 , Wt) where St is the system state at time t. The function f is called the state transition model and says that the system is Markovian. That is, St depends on the previous state St-1 and the system (process) dynamics Wt, which enable the system to change in time. Also, assume the system is being partially observed using a set of noisy sensors Zt = h( St, Vt). Here h is

called the observation model and captures the relationship between the current system state St, the sensor observation Zt, and sensor noise Vt. The randomness associated with Wt and Vt is assumed to be known and captured through pdfs [6].

### 2.1.3. Multiple Hypothesis Tracking

A key strategy in MHT is to delay data association decisions by keeping multiple hypotheses active until data association ambiguities are resolved. MHT maintains multiple track trees, and each tree represents all of the hypotheses that originate from a single observation. At each frame, the track trees are updated from observations and each track in the tree is scored. The best set of non-conflicting tracks (the best global hypothesis) can then be found by solving a maximum weighted independent set problem. Afterwards, branches that deviate too much from the global hypothesis are pruned from the trees, and the algorithm proceeds to the next frame. [7]

If motion correspondence is recognized using only two frames, there is always a limited chance of an incorrect correspondence. Better tracking outcomes can be acquired if the correspondence choice is overdue until several frames have been observed. The MHT[11] algorithm upholds several correspondences suggestions for each object at each time frame The final track of the object is the most likely set of correspondences over the time period of its observation.[1] MHT is an iterative algorithm. Iteration begins with a set of existing track hypotheses. Each hypothesis is a crew of disconnect tracks. For each hypothesis, a prediction of object's position in the succeeding frame is made. The predictions are then compared by calculating a distance measure. MHT is capable of dealing with: Tracking multiple object, Ability to tracks for objects entering, exit of Field Of View (FOV).  It also handles occlusions, Calculating of Optimal solutions [7].

### 2.2. Kernel Tracking

Kernel tracking [1] is usually performed by computing the moving object, which is represented by a embryonic object region, from one frame to the next. The object motion is usually in the form of parametric motion such as translation, conformal, affine, etc. These algorithms diverge in terms of the presence representation used, the number of objects tracked, and the method used for approximation the object motion. In real-time, illustration of object using geometric shape is common. But one of the restrictions is that parts of the objects may be left outside of the defined shape while portions of the background may exist inside. This can be detected in rigid and non-rigid objects .They are large tracking techniques based on representation of object, object features ,appearance and shape of the object.

### 2.2.1. Simple Template Matching

Template matching [1] is a brute force method of examining the Region of Interest in the video. In template matching, a reference image is verified with the frame that is separated from the video. Tracking can be done for single object in the video and overlapping of object is done partially. Template Matching is a technique for processing digital images to find small parts of an image that matches, or equivalent model with an image (template) in each frame. The matching procedure contains the image template for all possible positions in the source image and calculates a numerical index that specifies how well the model fits the picture that position. It can capable of dealing with tracking single image and partial occlusion of object.
Template matching [7] is a brute force method of examining the ROI in the ongoing video a simple way of tracking it reference image. Here in template matching, a reference image is verified with the frame that is separated from the video. It can track only single object in the video. Translation of motion only can be done in template matching. Capable of dealing with: Tracking single image, Partial occlusion of object, Necessity of a physical initialization.

### 2.2.2 Mean Shift Method

Mean-shift tracking [1] tries to find the area of a video frame that is locally most similar to a previously initialized model. The image region to be tracked is represented by a histogram. A gradient ascent procedure is used to move the tracker to the location that maximizes a similarity score between the model and the current image region. In object tracking algorithms target representation is mainly rectangular or elliptical region. It contain target model and target candidate. To characterize the target color histogram is chosen. Target model is generally represented by its probability density function (pdf). Target model is regularized by spatial masking with an asymmetric kernel.

The task is to first define a Region of Interest (ROI) from moving Object by segmentation and then tracking the object from one frame to next. Region of interest is defined by the rectangular window in an initial frame. Tracked object is separated from background by this algorithm. The accuracy y of target representation and localization will be improved by Chamfer distance transform. Minimizing the distance amongst two color distributions using the Bhattacharya coefficient is also done by Chamfer distance transform. In tracking an object, we can characterize it by a discrete distribution of samples and kernel is localized. Steps for kernel tracking: Probabilistic distribution of target in firs frame is obtained using color feature. Compare the distribution of first frame with consecutive frame. Bhattacharya coefficient is used to find the degree of similarity between the frames. Loop will continue till the last frame [8].Capable of dealing with: Tracking only single object, Object motion by translation and scaling. Necessity of a physical initialization. Object is partial occlusion [7].

*2.2.3. Support Vector Machine (SVM)*

SVM [1] is a broad classification method which gives a set of positive and negative training values. For SVM, the positive samples contain tracked image object, and the negative samples consist of all remaining things that are not tracked. It can handle single image, partial occlusion of object but necessity of a physical initialization and necessity of training. SVM is a broad classification method which gives a set of positive and negative training values. For SVM, the positive samples contain tracked image object, and the negative samples consist of all remaining things that are not tracked. During the analysis of SVM, score of test data to the positive class Capable of dealing with: [7] Tracking single image. Partial occlusion of object. Necessity of a physical initialization. Necessity of training. Object motion by translation.

*2.2.4. Layering based tracking*

This is another method of kernel based tracking [1] where multiple objects are tracked. Each layer consists of shape representation (ellipse), motion such as translation and rotation, and layer appearance, based on intensity. Layering is achieved by first compensating the background motion such that the object's motion can be estimated from the rewarded image by means of 2D parametric motion. Every pixel's probability of calculated based on the object's foregoing motion and shape features [8]. It can capable of tracking multiple images and fully occlusion of object. [7] Capable of dealing with: Tracking multiple images. Fully occlusion of object. Object motion by translation, scaling and rotation.

*2.3 Silhouette Tracking*

Some object will have complex shape such as hand, fingers, shoulders that cannot be well defined by simple geometric shapes. Silhouette based methods [9] afford an accurate shape description for the objects. The aim of a silhouette-based object tracking is to find the object region in every frame by means of an object model generated by the previous frames. Capable of dealing with variety of object shapes, Occlusion and object split and merge. [1]

*2.3.1 Contour Tracking*

Contour tracking methods [9], iteratively progress a primary contour in the previous frame to its new position in the current frame. This contour progress requires that certain amount of the object in the current frame overlay with the object region in the previous frame. Contour Tracking can be performed using two different approaches. The first approach uses state space models to model the contour shape and motion. The second approach directly evolves the contour by minimizing the contour energy using direct minimization techniques such as gradient descent. The most significant advantage of silhouettes tracking is their flexibility to handle a large variety of object shapes. Contour tracking methods [8], in divergence to shape matching methods, iteratively develop an original contour in the foregoing frame to its new position in the present frame, overlapping of object between the current and next frame. Contour tracking is in form of State Space Models. State Space Models: State of the object is named by the parameters of shape and the motion of the contour. The state is updated for each time according to the maximum of probability. In Contour Tracking, explicitly or implicitly are used for the representation on silhouette tracking. Representation based on explicitly will defines the boundaries of silhouette whereas in case of implicitly, function defined by grid.

*2.3.2 Shape Matching*

These approaches examine for the object model in the existing frame. Shape matching performance is similar to the template based tracking in kernel approach. Another approach to Shape matching [9] is to find matching silhouettes detected in two successive frames. Silhouette matching, can be considered similar to point matching. Detection based on Silhouette is carried out by background subtraction. Models object are in the form of density functions, silhouette boundary, object edges. Capable of dealing with single object and Occlusion handling will be performed in with Hough transform techniques. These approaches examine for the object model in the existing frame. Shape matching performance is similar to the template based tracking in kernel approach. Another approach to Shape matching is to find matching silhouettes detected in two successive frames. Silhouette matching, can be considered similar to point matching which is described. Detection based on Silhouette is carried out by background subtraction. Models object are in the form of density functions, silhouette boundary, object edges. [8] Capable of dealing with: Edge based template, Silhouette tracking feature of shape matching are able to track only single object. Occlusion handling will be performed in with Hough transform techniques.

Table 1. Qualitative Comparison for Tracking methodologies.(#:no of objects tracking, S:single,M:multiple,P:partial,F:full, Symbols √ and × denote whether the tracker can or cannot handle occlusions, and requires or does not require training).

| Sr.no. | Method | Category | # | Entry | Exit | Occlusion | Optimal | Training Rule |
|--------|--------|----------|---|-------|------|-----------|---------|---------------|
| 1 | Kalman filter | Point tracking | S | √ | √ | × | √ | - |
| 2 | MHT | Point tracking | M | √ | √ | √ | √ | - |
| 3 | Particle Filter | Point tracking | M | × | × | √ | √ | - |
| 4 | Template matching | Kernel Tracking | S | - | - | P | - | × |
| 5 | Mean shift | Kernel Tracking | S | × | × | P | - | × |
| 6 | SVM | Kernel Tracking | S | - | - | P | - | √ |
| 7 | Layering based tracking | Kernel Tracking | M | - | - | F | - | × |
| 8 | Shape matching | Silhouette tracking | S | - | - | × | - | × |
| 9 | Contour matching | Silhouette tracking | M | - | - | F | √ | √ |

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# Drone remote sensing for forestry research and practice

Pranto Saha[a*]

[a]*Gandhinagar Institute of Technology, Gandhinagar, Gujarat, India*

**Abstract**

Drones of various shapes, sizes, and functionalities have emerged over the past few decades, and their civilian applications are becoming increasingly appealing. Flexible, low-cost, and high-resolution remote sensing systems that use drones as platforms are important for filling data gaps and supplementing the capabilities of manned/crewed aircraft and satellite remote sensing systems. Here, we refer to this growing remote sensing as drone remote sensing and explain its unique advantages in forestry research and practices. Furthermore, we summarize the various approaches of drone remote sensing to surveying forests, mapping canopy gaps, measuring forest canopy height, tracking forest wildfires, and supporting intensive forest management. The benefits of drone remote sensing include low material and operational costs, flexible control of spatial and temporal resolution, high-intensity data collection, and the absence of risk to crews. The current forestry applications of drone remote sensing are still at an experimental stage, but they are expected to expand rapidly. To batter guide the development of drone remote sensing for sustainable forestry, it is important to conduct comparative studies to determine the appropriate drone remote sensing technologies for various forest conditions and/or forestry applications.

*Keywords*: Drone, Remote, Sensing, Forest

## 1. Introduction

Accurate information about forest composition, structure, volume, growth, and extent is essential for sustainable forest management and can be extracted directly or indirectly from remotely sensed imagery [1] (Shao 2012a). Over the past few decades, increasing attention has been focused on improving remote sensing applications in forestry. This is evidenced by the increase in publications in ISI-indexed journals: the results of an ISI-indexed publications search using forest and remote sensing as key words reveal one article published in the 1960s; four in the 1970s; 24 in the 1980s; 536 in the 1990s; 2519 in the 2000s; and 2930s; from 2010 to 2014. The sharpest jump in the number of publications between the 1980s; and 1990s reflects the rapid advances in civilian satellite remote sensing achieved during that period [2] (Boyd and Danson 2005; Shao 2012b). The landsat program is world's longest remote sensing program for observing earth resources, and its imagery is most often used in forestry [3](Alberts 2012).

Along with the development of sensor and computation technologies, remote sensing applications in forestry have evolved from conventional aerial photography-based forest inventories [4](Lyons 1966) to satellite imagery-based forest resource monitoring [5](Asner et al. 2005;) from multispectral data-based forest cover mapping [6](Zhu and Evans 1994;) to hyperspectral data-based biophysical [7](Martin and Aber 1997;), and from passive remote sensing-based forest leaf area index measuremts [8](Thakur et at 2014) to active remote sensing-based forest structure characterizations [9](Dubayah and Drake 2000; Lefsky et aI 2002;). Through the integration of multiple data sources, it is possible to improve estimations of forest volume and biomass [10] (Lu 2006; Koch 2010 ;). Although remote sensing is widely used in forestry, technical challenges still exist. One of the most critical barriers to remote sensing applications in forestry is the lack of timely data collection over target areas.

## 2. Drones as platforms

A notable advantage of fixed-wing drones is that minimal experience is required to operate them. However, as more rotor blades are added, the risk of system crashes is reduced for rotary wing drones. Large fixed wing drones need a runway to take The Merriam-Webster Dictionary defines a drone as an unmanned aircraft or ship guided remote

control or onboard computers. Drones are referred to as ummanned aerial vehicles (UAV), unmanned aerial systems (UAS), unmanned aircrafts (UA), or remotely piloted aircrafts (RPA). Sometimes the term (UAV) is purposely changed to (UAS) to reflect the complex systems that are involved in drone operations.

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*Pranto Saha
*Email address:* sahaemon96@gmail.com

The term RPA is typically used by the millitary [11] (Ambrosia et aI 2011a). Initial forms of drones were developed in the early 20th century [12] (Zaloga 2008;). Since the 1950s, drones major mission has been aerial reconnaissance. As of 2005, the development of drones for military purposes still dominated the drone industry [13] (Colomina and Molina 2014;).

Over the past few decades, drones of various shapes, sizes, and capabilities have been developed so rapidly that their potentials for civilian applications are overwhelming [14] (Colomina and Molina 2014). There are different classifications of drones. For example, [15] (Watts et aI 2012). Classified drones into seven categories; MAV or NAV, VTOL (Vertical Take-off and Landing), LASE (Low Altitide, Short Endurance), LASE close, LALE (Low Atitude, Long Endurane), MALE (Medium Aititude, Long Endurance), and HALE (High altitude, Long Endurance). [16](Anderson and Gaston (2013). Classified drones into four size classes: large, medium, small and mini,and micro and nano. Furthermote, others have classified drones in to five usage types; target and decoy, reconnaissance, combat, research and developemen, and civil and commercial. (www.theuav.com).

There are two major types of drones based on takeoff and landing techniques; horizontal takeoff and landing and vertical takeoff and landing. Horizontal takeoff and landing are typical characteristics of fixed-wing drone (airplanes), whereas rotorcrafts or rotary -wing drones ships, and balloons perform vertical takeoff and landing. For the purpose of remote sessing applications, stability and flight range are critical considerations in drone development. Fixed and rotary-wing drones perform differently in terms of stability and range. When field coverage is large, fixedoff and land, whereas smaller ones can be launched manually or by using ground stands pr vehicles.

Power source directly affects fligts endurance [17] (Dudek et al 2013;), and is thus, one of the most important elements of drone equipment. Although in ternal combustion engines are common for state-of-the-art-drones, electrical motors are better choices for smaller drones. Because electrical motors are more economical and vibrate less, they are more suitable for remote sensing applications. Various batteries and fuel cells are available to power electrical motors on drones. In the future, solar energy will be able to help increase flight endurance from hours to days and even years.

## 3. Drone remote sensing

The earliest aerial photographs were taken in the 1860s using balloons as platforms. During World Wars ll and l, airplanes were used as aerial photographic platforms. The first generation of earth-orbiting satellites was launched into space around 1960, and they were exclusively made for reconnaissance. Previously, all the data collected from the earts atmosphere or space was in analog from since the 1970s, digital sensors have been employed, satellites have been launched for civil applications, and the term remote sensing has become formal. In addition, airborne remote sensing and satellite remote sensing have gradually become well know terms. Drone had been used for reconnaissance for decades before they were employed for civilian purposes, but their recent application to remote sensing was exceptionally fast. Currently, drones are found in the fields of meteorology, precision agriculture, wildlife research, forestry, land management, infrastructure inspection, traffic monitoring and wilderness search and rescue [18](Shahbazi et al. 2014). We recommend calling this large-scale remote sensing drone remote sensing to distinguish it from crewed aircraft remote sensing and make it comparable satellite remote sensing. Drone can carry a variety of sensing instruments, including visible light, near infrared (NIR), shortwave infrared (SWIR), thermal infrared (TIR), radar and lidar sensors. Drone-borne optical sensors, including visible, NIR and SWIR also record data as multispectral or hyperspectral bands (Berin et al. 2009; Saari et al. 2001;). Owing to advances in sensor technology, increasingly smaller, lighter, and cheaper sensor have become available for drone remote sensing applications. [19](Anderson and Gaston 2013) and [20] (Colomina and molina 2014) provide detailed.

As shown in figure 1, a conceptual comparison of relative development trends among three remote sensing disciplines. Dashed lines represent reconnaissance-dominated applications, and solid lines indicate mainly civilian applications. Slopes of the temporal curves reflect the pace of advancement in platform diversity, sensor functionality, and data richness.
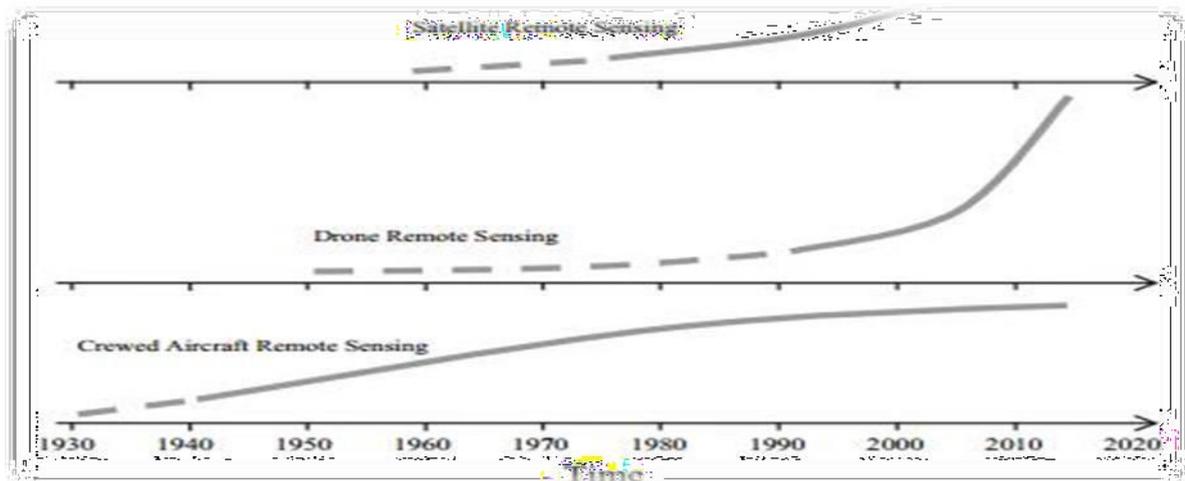
Fig. 1. Remote Sensing using Satellite, Drone and Crewed Aircraft Remote Sensing

## 4. Application examples

The benefits of drone remote sensing include low material and operational costs, flexible control of spatial and temporal resolution, high-intensity data collection, and absence of risk to crews. The following pioneer studies demonstrate the unique advantages of drone remote sensing for forestry research and practices.

## 5. Surveying forests

[21] (Koh and wich 2012) experimented with using drone remote sensing to survey and map tropical forests in indonesia because of the high costs of high-resolution satellite remote sensing data, frequent cloud cover, and diffcult ground surveys. The experiment an inexpensive and light weight (~`650g) fixed-wing drone prowered by a 2200mAh battery and a still/video camera. This drone could fly for `~25min per mission and cover a total distance of ~15 km. The researchers assembled the drone images to develop land use map at a spatial resolution of 5.1 cm, used the video footage to detect human activities and combined the photographic and video information to survey wildlife species and identify flora. They suggested that using remote sensing could lead to significant savings in terms of time, manpower, and financial resources for local conservation workers and researchers in the developing tropics. Such applications especially make sense for community-based forest monitoring and forestry programs, such as REDD, in developing countries [22] (Paneque-Galvez et al. 2014;)

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# A study on customer perception towards electronic food ordering system

Virendra Chavda[a]*, Manish Maurya, Jatav Dipesh

[a]*Gandhinagar Institute of Technology, Moti Bhoyan, Gandhinagar, Gujarat,India 382781*

**Abstract**

Owing to the changing Indian demography, there is need for building up of infrastructure for processing and marketing of the agricultural yield. As more and more people in the developing countries are moving towards the cities, urban food and nutrition issues are becoming increasingly relevant and pressing. There exists wide disparities between these cities in terms of their geography, history and culture which make reference to an average urban consumer as an individual misleading and the identification of consumer groups having different cultural backgrounds, socioeconomic status, lifestyles and consequently different consumer behavior and needs is preferred. Consequently, the food and diet patterns of the various strata of urban population deserves more attention than they have been given so far, not only for their implications on food and agriculture planning but also for determining remedial actions and preventive measures. The purpose of this study is to measure the perceptions of customers regarding electronic food ordering among the customers of Ahmedabad city.

## 1. Introduction

With the coming of the 21st century, we have entered an "e" generation era. The Internet has generated a tremendous level of excitement through its involvement with all kinds of businesses starting from e-Commerce, eBusiness, eCRM, eSupply Chain, eMarketplace, ePayment, eEntertainment, eTicketing, eLearning, to eCitizenor eGovernement. The Internet has been widely used in many sales and marketing activities, from the collection of valuable data to the dissemination of information to different stakeholders, for example, information retrieval, product communication, sales tool, distribution channel, and as a customer support tool (Singh, Jayashankar and Singh 2001; Calles 2000; Sandberg 1998; Peterson, Balasubramanian and Bronnenberg 1997). The Internet has opened a window of opportunity to almost anyone because of its ability to make viable the conduct of business in cyberspace, or by connecting people worldwide without geographical limitations. Consumers can order goods and services virtually anywhere, 24 hours a day; 7 days a week without worrying about store hours, time zones, or traffic jams. The Internet has also provided new opportunities for marketers by offering them innovative ways to promote, communicate, and distribute products and information to their target consumers.

E-commerce has grown phenomenally in the past decade for a variety of reasons including changes in consumer lifestyles, technological advancements, increases in consumer income and education, and rapid financial development throughout the world. The use of the Internet as a shopping or purchasing vehicle has been growing at an impressive rate throughout the last decade. The tremendous growth of online sales and the unique functions of the Internet have drawn a great deal of attention from many companies rushing in to set up businesses over the Internet without knowing what factors actually motivate consumers to buy products or services online. Many marketers agree that Internet marketing will definitely increase customer spending and loyalty to both online and offline products if it is executed properly. This is due largely to the Internet's significant advantage of two-way communication and its ability to transmit information quickly and inexpensively when compared to other traditional mass media using solely one-way communication (Warrington, Abram& Caldwell 2000; Waldo 2000). The simultaneous and rapid rate of consumer adoption of personal computers and network systems have encouraged and pressured marketers to provide Internet retailing sites. Some researchers in fact predict that the need for physical stores could be eliminated in roughly four decades and replaced with electronic retailing (Cope 1996).

While many marketers acknowledge the importance of using the Internet in their marketing mixes, only a handful of researchers have studied what factors encourage or discourage consumers when buying products or services online. Despite the increasing popularity of the Internet, most knowledge of Internet marketing is based on anecdotes and experiential evidence from television, radio, popular press or magazines. In summary, the benefits of using the Internet in marketing are enormous as they offer a huge opportunity for marketers to create innovative activities that have not previously been viable. However, marketers need to develop an insightful understanding of consumer behaviour when purchasing products online. This information will help marketing managers to plan their marketing mixes and offers to better meet customer's requirements. By doing so, companies will establish, maintain or increase customer satisfaction, build strong brand loyalty and ultimately, provide consumers with a solid rationale for continuing to buy the same brand. This study is thus significant as it is a preliminary attempt to identify factors and their relative strength in influencing consumer decision making when buying health foods online.

\* Virendra Chavda
*E-mail address: virendra.chavda@git.org.in*

## 2. Research Objectives

- To find out the customers perceptions and knowledge of Electronic food ordering that influences their buying decisions.

- To analyse what channel is used more frequently in electronic food ordering.

## 3. Literature Review

Grunert stated that "people seek food, not nutrients. The common beliefs underlying all these classifications are that food has social and psychic meanings that meals serve as communicative symbolism, and "that eating is an experience that may be invested with many intellectual and emotional values quite apart from metabolic utilization of the food" (Babcoke, 1948). Eating is a deeply engrained source of satisfaction, and the restaurant customer wants an eating experience which combines food, service, decor, and indefinable extra (Oser & Hall, 1977).   H.S. Sethu and Bhavya Saini (2016) investigated the preference satisfaction and perception of students towards online food delivery apps, their goal was to find out how students felt about online food ordering and delivery services, as well as how they behaved and how satisfied they were. According to their findings, online meal ordering services assist students with better time management. It is also discovered that the convenience of having their desired meal available at any time and having convenient access to the internet are the primary reasons for using the service. (Das, 2018) According to Ansar Z. and Jain S. (2016), the ecommerce industry's growth is a key factor in the success of online meal ordering and delivery services. According to research, over 400 food delivery apps are thriving in India, thanks to $120 million in funding from venture capital firms and other investors. Given that each person consumes at least three meals per day, the food industry is referred to as a repetitive business sector, which draws the attention of investors and entrepreneurs. In his research, Jyotishman Das reveals the different factors that impact customers' decisions to use online food delivery services. He investigated the most popular online food delivery service portal among customers. He has also shown the barriers that consumers face when using online food delivery services. Each food ordering app has its own specialisations, such as Zomato's best discounts and Swiggy's on-time delivery. Dr. Mitali Gupta (2019), discusses the influence of food delivery apps on restaurants. The study discusses the advantages, as well as the positive and negative impacts of electronic food delivery and various online food delivery apps. The writer has also concentrated on food delivery app strategies, with a particular emphasis on Zomato and Swiggy. Sheryl E. Kimes (2011) found that both users and non-users valued perceived control and convenience associated with online food ordering services. Non-users want more personal interaction and have a greater level of technology anxiety when it comes to using the services. (Das, 2018) According to Varsha Chavan (2015), Customers can view, order, and navigate using a smart device-based interface, which has aided restaurants in quickly managing customer orders. Wireless communication and smart phone technology's skills in meeting and expanding company management and service delivery. Their findings, this system is convenient, efficient, and simple to use, and it is expected to increase the overall restaurant industry in the future. (Das, 2018) Zulkarnain kedah (2015) the study's primary goal is to identify the "essential success factors" of online food ordering services, such as whether website quality (design), service quality, or website confidence are factors that influence loyalty in an online ordering environment. Service quality and loyalty reflect the fact that effective food ordering services require efficient delivery, dependable customer service, and food characteristics (e.g. freshness, presentation, and health). (Poulose, 2019).

## 4. Research Methodology

Research type: Quantitative

Research design: Conclusive-Descriptive - single cross sectional research design

Primary data source: Primary survey through questionnaire

Secondary source: Reference Material, Book, Encyclopedias, Magazine & Newspapers, Internet

Data collection method: Survey method

Population: Citizens residing in Ahmedabad city

Sampling method: Non Probability Convenience sampling procedure

Sampling location: Ahmedabad city

Sample size: 100 respondents

## 5. Analysis and Interpretation

As stated earlier the purpose of this study was to find out the customers' perception towards online food ordering among the customers of Ahmedabad city. The data obtained from responses to the questionnaire and tabulated and analysed. The data for

this purpose was collected with the help of readily available tools. Interest of customers is necessary to find out the answer for the questions.

Table-1. Gender profile of respondents

| Sex | No of respondents | % of respondents |
|-----|-------------------|------------------|
| Male | 58 | 58% |
| Female | 42 | 42% |

Nearly 58 percent of the respondents were male and 42 percent were female who have answered the questionnaire. It was selected randomly.

Table-2. Age group of respondents

| Age of respondents | No of respondents | % of respondents |
|--------------------|-------------------|------------------|
| 20 - 25 | 9 | 9% |
| 26 - 30 | 22 | 22% |
| 31 - 35 | 34 | 34% |
| 36 - 40 | 26 | 26% |
| 41 – 45 | 5 | 5% |
| 46 – 50 | 2 | 1% |
| Above 50 | 2 | 2% |

It was found from table 2 that most of the respondents who ordered food electronically were between the ages of 31-35years followed by 32 percent who are between the ages of 26-30 years. 8 percent of the respondents are between the ages of 36-40 years, 7 percent of the respondents are between 20-25 years of age, 5 percent of the respondents were between 41-45 years of age and the least was 2 percent between the age of 50 and above.

Table 3: Occupation of the respondents

| Occupation of respondents | No of respondents | % of respondents |
|---------------------------|-------------------|------------------|
| Student | 5 | 5% |
| Self Employed | 10 | 10% |
| Professional | 43 | 43% |
| Employee | 39 | 39% |
| House Wife | 3 | 3% |
| Retired | 0 | 0% |

It was found that nearly 39 percent of the respondents were employees followed by 39 percent who were professionals, 10 percent of the respondents were self-employed, and 10 percent were housewives.

Table-4. Perception towards convenience of electronic food ordering

| Perception | No of respondents | % of respondents |
|------------|-------------------|------------------|
| Yes | 50 | 37% |
| No | 7 | 8% |
| To some extent | 38 | 53% |
| Quite an extent | 4 | 2% |

It was found that nearly 50 percent of the customers found easy and convenient to some extent followed by 38 percent who say to some extent and next is 7 percent No and the least is 4 percent that is quite an extent. By reviewing the above data one can conclude that the Electronic Food ordering media.

Table 5: Gadgets or Technology customers/users prefer to use while ordering food

| Perception | No of respondents | % of respondents |
|---|---|---|
| Simple cell phone | 36 | 20% |
| Smart phone | 58 | 33% |
| Laptop | 56 | 32% |
| I pad | 22 | 12% |
| others | 5 | 3% |

Nearly 33 percent of the respondents used smart phone and laptops to order food electronically followed by 32 percent who ordered food through Laptop, 20% use simple cell phones 12% use I pad simple call phone 12%, 3% use other gadgets. Now a days the smart phones are the most commonly used gadgets and people are finding it very easy to access the locations/information etc., Development of application in improving the services in Mobile applications will help in growing the business. Usage of available mobile technology will help in expanding the business.

Table-6. occasion's customers/users ordered food electronically

| Occasions | No of users | % of respondents |
|---|---|---|
| Business event | 37 | 24% |
| Special occasion | 37 | 24% |
| Romantic | 10 | 06% |
| Social | 36 | 23% |
| Don't want to cook | 36 | 23% |

Respondents were asked to evaluate the important of different dining occasions (defined as at least once a month) users order food on occasion like Business Event and Special Occasions are 24% each wherein on social and don't want category contributes 23% each. On Business events and special occasion's people tend to order foods online hence the customers.

Table-7. Frequency of ordering food online

| Frequency | No of users | % of users |
|---|---|---|
| Daily | 2 | 02% |
| Weekly | 25 | 24% |
| Monthly | 68 | 64% |
| Yearly | 8 | 08% |
| Never | 3 | 03% |

As indicated in the table 7, 64 percent of the respondents order food monthly followed by 24 percent who order food weekly. Nearly 8 percent of the food is ordered yearly followed by 3 percent of the respondents who never ordered food. According to our survey, we found foods ordered monthly is higher hence the company should look into improving/providing benefits to customers who order foods on monthly with some discounts, additional benefits, etc.

Table-8. Days on which customers order food online

| Frequency | No of users | % of users |
|---|---|---|
| Weekdays | 11 | 11% |
| Weekends | 37 | 37% |
| Anytime | 52 | 51% |
| Never | 1 | 01% |

Nearly 52 percent of the respondents order food anytime followed by 37percent of users order on weekends. The major segment of order received without having any time frames. As the demands are expected any point of time the company should be able to

meet the requirements and make necessary arrangements to accept and fulfil the customer requirements. 24/7 support is made available to customers.

Table-9. Money spent for ordering food online

| Amount Spent | No of users | % of users |
|---|---|---|
| 1000 | 46 | 47% |
| 2000 | 38 | 39% |
| 3000 | 7 | 07% |
| More than 3000 | 7 | 07% |

Interpretation from the above table 9 shows that nearly 47 percent of the respond opened Rs.1,000 per month on using online food followed by 39 percent who spend Rs. 2000 and 7 percent respond spend 3000 & 7 percent in more than 3000. The highest order is received in 2000 category, the middle class people have placed more orders and the bulk of order is medium. Company should adopt measures wherein the interest of order category of 2000 is addressed well on time which will help in meeting the organizational goals.

## 6. Conclusion

After studied the customers' perception of electronic food ordering it is concluded that every system has its strengths and weakness. The purpose of this online food ordering system is basically to save the time of the customers especially when he/she has to invite people for any occasion. The chief reason of electronic ordering is convenience. The single most important attribute of electronic ordering is accuracy. This study found that online food ordering is reasonably popular among the residents of Bangalore city. Nearly 90 percent of the respondents were aware of the electronic food ordering. Customers between 21 -30 years of age ordered more electronic food and it was often ordered as they didn't want to cook especially during the weekends. Customers who evaluate service quality based on interactions with employees won't want to use self-service ordering. Similarly, customers who were uncomfortable with technology may be reluctant to try an electronic self-service site because they may be afraid of getting tangled up in the technology. This study has shown that perceived control and convenience are keys to customer use of online ordering which leads to higher satisfaction. My findings indicate that restaurant operators should focus on giving their customers higher levels of perceived control and convenience, since these are associated with a higher intent to use online ordering in the future. Young customers are more likely to use online, mobile or text ordering. Young customers place a greater value on convenience and speed than older users do.  To conclude customers will appreciate not having to wait and other waiting customers may be motivated to try electronic food ordering.

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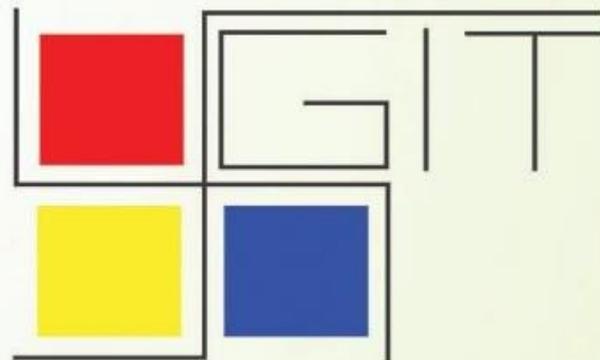
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Khatraj_kalol Road,Moti Bhoyan
Ta. Kalol Dist. Gandhinagar - 382721

📞 **9904405900 / 01**   ✉ **director@git.org.in**

🌐 **www.git.org.in**

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