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Chapter 1

Information Technology

1.1 Machine Learning

1.1.1 Compressed Pattern Matching of DNA Sequences

Lionel Carneiro, Chris Deruz, Clara Joseph, Vanlyn Dcunha, Prof. Sushree S.

We implement compressed pattern matching algorithm in DNA sequences called derivative Boyer-Moore (d-BM). This algorithm is based on the Boyer-Moore string matching algorithm. In this method, we will be compressing DNA patterns and sequences. A DNA stores information in a code made up of chemical bases represented by adenine (A), guanine (G), cytosine (C), and thymine (T). The whole DNA is built up using these four characters A, T, C, G. We use 2 bits to represent these characters. Experiments indicate that this approach is 10 times faster in searching long DNA patterns (length ≥ 50) than the exact match routine of the software package Agrep (known as the fastest pattern matching tool). Moreover, the compressed text stored will help us reduce the storage space by about 75%. In part, the enhanced speed of the algorithm is due to the increased efficiency of the Boyer-Moore method resulting from an increase in alphabet size from 4 to 256.

1.1.2 Simulation of Self Driving Car

Shivam Mishra, Yash Kadekodi, Manisha Bhat, Anubhav Singh, Prof. Uday Nayak

The project aims to build deep learning models that can drive a car in a simulated environment. The project assumes that the car is gearless, much like an electric car with a flat torque. We model the real world physics using the Unreal Engine, for this we leverage two open source simulator Carla (Intel) and AirSim (Microsoft). Parameters like wind, weather, gravitational forces etc, are programmed into the simulator. We plan on using two approaches or techniques for the project. End to End Deep Learning or Imitation Learning and Deep Reinforcement Learning. Once the models are ready, they will be trained on one of the simulators and then tested on both simulators for validation of the results. The outcome of the project will be a document comparing both the approaches comprehensively explain the merits and demerits of other approaches. The model will be built using the Keras library on top of TensorFlow-GPU.

1.1.3 Question Classification into Blooms Category using Machine Learning

Nalini Katiyar, Amit Nijasure, Tanvi Pandit, Daksh Gupta, Prof. Prasad Padalkar.

Question banks are a fundamental component of any learning management system. They are basically a collection of questions that help students and teachers in the educational process. These questions are generally stored in a database and teachers retrieve these questions based on Blooms different cognitive levels. The retrieval of questions becomes a tedious task for the teachers if the questions are numbering in thousands and they are not pre-classified. In this project we attempt to solve this problem by designing an automated system so that the same question which needs 5 minutes to be set according to the blooms category will now be done in a matter of few seconds. The approach we will be using in this project is doing semantic analysis using machine learning. For this a list of 512 questions from past papers of Mumbai University, Pune University, Gujarat University, IP University were selected and it was classified by domain experts into various categories of Blooms taxonomy. The entire dataset was then classified as whether the sentences were a part of colliding verbs set or non colliding ones. The colliding verbs are those verbs which appear in more than one category in Blooms verbs list and non colliding verbs are those verbs which are unique to one particular category. Our main aim is to increase the efficiency of the algorithm. Phase 1 of the project aims to create a system to semantically the classify the non colliding verbs.

1.1.4 Question Answering Engine

Aditya Hase, Sharanya Hegde, Shruti Iyer, Divya Mahindrakar, Prof. Prasad Padalkar

Machine comprehension refers to answering a query about a given context paragraph. Stanford Question Answering Dataset(SQuAD) dataset is state of the art dataset for machine comprehension. It consists of 100,000+ questions posed by crowdworkers on a set of Wikipedia articles, where the answer to each question is a segment of text from the corresponding reading passage. We will evaluate known models, combination of LSTM and attention and their variations. We first match the question and passage and try to derive answers from them and will train the model on the basis of the questions and answers, present in the training set and will test it with development set to check whether our prediction of answers matches with the original answers provided. Performance is measured in terms of EM and F1 scores. It will aid us in determining the effectiveness of our algorithm.

1.1.5 Development of Prediction Model for Placement of ads using Multi-Armed Bandit

Relvis Buthello, Bryan Dias, Anthony Fernandes, Savio Jacob, Prof. Tayyabali Sayyad

The project aims at developing a prediction model for placement of contextual ads using multi-armed bandit problem. With the ability of python and various machine learning techniques, it's possible to improve upon the current models and use it for better prediction of ads using side information from the user. This side information is also classified into certain important parameters that are must for a better CTR. We want to compare the current algorithms in which given user historical data the algorithms will show their respective performance and we will be able to determine which ad has been selected for each of the algorithm. This will not only help in better prediction of ads for various individual users, but also will boost the revenue for the various online websites. Various sectors of industries will adapt various algorithms depending on their product category for a better performance since every category consists of different parameters which stand to be important.

1.1.6 Investment Analysis using Event Detection on Alternative Data

Arnab Sanyal, Omkar Kadam, Rishabh Shetty, Marvell Periera, Prof. Anagha Shastri

The proposed systems aim is to find the correlation between the real-time events and financial trends of a company. This data can then provide insights as to the overall performance of the company and how it has been affected by events in the past and thus the kind of effect a current event might have. The project is implemented over 3 stages: Data Extraction which involves information extraction, knowledge representation and reasoning using methods like bag-of-words and TF-IDFs (Term Frequency Inverse Document Frequency) to store semantic data, Event Detection which involves training of a topic modeller to extract events, name entity recognition to increase the accuracy of the event detection and Visualization which includes a time series plot of parameters of company and the correlation between the trend and event.

1.1.7 Image Recognition using Deep Learning

Raj Sanghavi, Gladson Oliver, Robin periera, Chaitanya Ramaiya, Prof. Uday Nayak.

This paper will focus on applying convolution neural network machine learning methods to images for the purpose of automatic detection and classification. The main advantage of using neural network methods in this project is its adaptiveness at fitting nonlinear data and its ability to work as a supervised algorithm. The algorithms will be run on datasets like CIFAR10, so that our results will be easily reproducible.

1.2 Android Applications

1.2.1 Multi-Lingual Android App for new generation of Farmers

Meghna Patil, Bhumi Shetty, Gwen D'costa, Pavan Tiwari, Prof. Nilesh Ghavate

Agriculture is the main occupation of India. Today mobile devices are used frequently by everyone, including the farmers and countryside people. According to observations of Information and Communication Technologies (ICT) mobile plays vital role in daily life of farmers. The farmers, who were dependent on clouds for rain, now are looking into the Cloud Computing (CC) for their solutions towards cultivation of superior crops in today's modern agricultural world.

The project we have worked on is a multilingual android application for the new generation farmers. The working of the app is user friendly and keeps a track of the entire duration of the growth of the crop in advance keeping in mind the weather forecast at that particular area. The crop being used is RICE as of now. Displaying the LIFECYCLE of the crop is the most unique feature of our app covering the entire process right from the seedling level to the full-grown crop level. Symptoms of the crop at any level will be able to be detected by the user farmer, and the solutions to these symptoms will be provided accordingly. Not only the lifecycle, but also the process of the crops after the growth is handled by taking into account the various nearby market prices available to the farmers. Various government schemes will be provided accurately to the farmers that they are not aware of. Youtube links and videos will be uploaded too for more learning of farming. So, the application that we planned suggest various ways in which a farmer can utilize their handsets using an application, to assist them for relatively better cultivation and merchandise. The main awareness of this work is focused on new generation farmers as it addresses the key problems of getting the market updates of different products, weather updates and information about the rain and also provides multiple language support. All the information required by the farming will be provided at their fingertips.

1.2.2 A Security app for Safety During Adverse Situation

Sarabdeep Singh, Glanson Oliver, Shubham Pandey, Teny Thomas, Prof. Aruna Kubalkar

The aim of the project is to develop an application that let's it's user to send notification in case of emergency or panic situations. The users can send multiple text messages and emails on the press of a single button. The phone numbers, email ids and the contents of the text and email messages can be set from with the application. The text messages and emails sent, along with the content, also have the last known location of the user. This is very helpful in tracking the whereabouts of the person. The user can also call 911 directly from within the application, if the nature of the situation demands it. Additionally the user of the application may allow the app to track their location. If this option is selected, the application fetches the device location at about every 15 minutes and stores it in the database. This information is very useful and can be used in variety of ways. One such use of the location data is from within the Android app where the user can view a map that shows their location history over a period of time for a particular day.

1.2.3 Personal Budget Planner

Gaurav Ambavle, Rohit Chavan, Parth Dubal, Omkar Patil, Prof. Aruna Khubalkar

Budget planning is a very important factor to maintain expense within the income limit and manage the daily expenses accordingly. As nowadays smartphones are easily accessible to many people, so using a smartphone app they can conveniently look at their expenses, income, and budget at the reach of their fingertips. In traditional systems, one has to note down their expenses in a catalog, ledger, diary or handbook, but nowadays people don't have time to note down their expenses in a book. The applications that are currently available on play store basically focuses on creating the graphical representation of users expenditures, maintains a log of daily expenses and export data that have been entered in the application. In this project, we are creating an android application Personal budget planner which can be used by the people to maintain and manage their budget easily. It will analyze the daily expenditure and provide you the predictions for the current month. Also, the user will get alerts and reminders to be aware of his monthly budget. In this application, we are using time series analysis algorithm for prediction purpose as they are very useful models when we have serially correlated data. Time Series Analysis, as the name suggests, involves working on time (years, days, hours, minutes) based data, to derive hidden insights to make informed decision making.

1.2.4 Android Foodle App

Swati Adivarekar, Nikhil Ajarekar, Sheldon Carvalho, Lawrence Fernandes, Prof. Janhavi Baikerikar

Users are interested in a relevant search, big database of interesting recipes and their moderation. Also users look for mobile apps because its easier to use them in the kitchen. The recipe applications that are currently available on play store basically focuses on just providing a recipe to the user but sometimes it could be difficult for the users to find out recipes by name if they are beginners in cooking. Foodle is a mobile application built using Android SDK that helps beginners to search for recipes with available ingredients. User can just give the available ingredients and our app will return a recipe which contains those ingredients User will be able to filter the recipes as per different allergies. The user can review rate and feedback to the recipe. A user can share their own recipes and also user can narrow down to recipes by using the filters like a type of food and allergies. Some difficulty we may find is installing 'offline application' which requires a lot of space so that is why we have made this application online with the help of cloud computing services(AWS)

1.2.5 Diabetes Diet App

Gloria Dias, Deepika Gurav, Alfiya Sayed, Prof. Sushree Satapathy

The proposed system is to develop an android application for diabetes patient. Diabetes is a long-term condition that causes high blood sugar levels. So to maintain the sugar level we need to have a proper diet plan along with proper exercises as well as water intake. There are many application available which provides diet plan. But this plan may vary depending on each individual. So we will be providing a diet plan according to users age, blood sugar, calorie count, gender, and weight. Many application nowadays provides static diet plan. Either the plan is not suitable for the user or it is not according to their preference. The system aims to add a feature of providing a diet plan based on their preferences as well. The diet plan will change every week. As water is an essential part of a diet, the feature of water intake will be added.

1.2.6 Facility Automation Tool

Darshan Naik, Yogesh Naik, Mamta Sawant, Shivam Sompura, Prof. Sunantha K.

The proposed system "Facility Automation Tool" aims to ease the work of booking an event in an organization/institute. With the help of this system, the faculty members of an institute or people of organizations can organize an event very efficiently. These events include guest lectures, corporate events, marriages, seminars, sports event, Meetings etc. Such events require a lot of manual work right from booking till execution. It will run as a standalone application for every institute/organization. The proposed tool will aim to emerge as a solution for organizing and booking events managing resources and scheduling of the organized events. It is a time effective tool, which will help institutions and organizations to manage and plan their events efficiently without taking much efforts.

1.2.7 Travel Planner Application

Shailja Jha, Neha Tayade, Pooja Shejwal, Sherlin Shaji, Prof. Janhavi Baikerikar

The Aim of our project is to provide people to plan their trip according to their budget and comfort. The main objective of our project is to organize the trip according to their specified budget. It is a web-based application through which anyone can book a tour. Tour organizer makes it easy for us to plan our tour in a matter of minutes. It aims at offering a range of best-value services to people and ensures that it runs smoothly and efficiently. This application provides all available trip places with complete packages of Hotels, Travelling, Sight-seeing, Food, Shopping at affordable prices. The objective of our project is to mainly implement an app Tour Organizer which makes users easier to plan their trip within the specified budget they provide. Tour planners plan the tour for a customer as per their needs or provide them different tour packages. But Tour Organizer is tour budget planner that plans a budget for the tour in a customer specified budget. This help customer to plan their tour in the flexible and reliable budget. It will help to solve all budget-related problem. Here the user may get vehicles, hotels within their specified budget. As well as the user may get maps and weather conditions of that location.

1.3 Geo-Informatics

1.3.1 School GIS

Ashish Sharma, Raina Lopes, Furqan Khan, Joel Keerickal, Prof. Vaishali Kavthekar

With the growing digital world, there is huge amount of data generated daily. Amongst which there is geospatial data available which can be useful for getting fruitful knowledge. Such information can be used for the betterment and providing insights about a system as well as highlight important areas which need attention. The purpose of this project is to create a community driven and oriented GIS portal which will help to contribute as well as gain information about schools in Maharashtra. Currently there are two websites, first is schoolgis.in which maps schools and schoolreportcards.in provides data about a particular school. The goal of our project is to not only provide school data but also provide correlations between different demographic aspects and performance of the schools, provide a platform for the community to give reviews, rate a school, provide and validate school data through crowdsourcing.

1.3.2 Development of Community GIS system

Vinayak Gaonkar, Nicholas D'souza, Pratik Rane, Catherin Johnson, Prof. Tayyabali Sayyad

Mumbai is currently one of the fastest developing cities in the world. This development has been possible due to a well thought and executed set of plans. The latest urban development plan was released by the BMC in 2015. This data was made available to the public. The format, however, was not really in a manner that could be easily understood; or used. It was just raw data. Using GIS, this system aims at improving the quality of the provided data. The information will be digitalized and added to the survey maps provided by the BMC. This mapping will be done over in several steps and will require various software such as QGIS, GeoNode, Cartoview, ODK, etc. This platform will provide a much better and understandable data format. In such a system, incorrect data can be checked as the participation of the people leads to a better insight. The data provided was based on research from a foreign company and was not in complete sync with the actual state. All these issues can be resolved with this system and it will also help keep track of the development taking place and to check what tasks were promised, have been fulfilled, are being fulfilled or are being looked over. This technology could revolutionize the implementation of the urban development plan and could be a real change of scenario for a huge step towards realizing the goal that has been set out.

Chapter 2

Computer Engineering

2.1 Human Machine Intelligence

2.1.1 Audio Labeling for Tactile Graphics

Rohan Ingale, Gary Mendonca, Amey More, Prof. Dipti Jadhav, Prof. Mayura Gavhane

There are over two million children in India living with vision loss, and only 5% receive education. One of the largest reasons for this is unavailability of teachers with training in special education, or even basic knowledge of handling students with special needs.

Braille textbooks and special equipment can also make a blind childrens education considerably more expensive than that of a sighted child attending public school. Many public schools suffer from issues such as low funding, low teacher attendance and lack of amenities.

Tactile graphics are images that are formed in relief on paper or plastic sheets to represent graphics in a tangible form. As an alternative medium, it is an important part of inclusive design and has been used to make information accessible in schools, offices and public spaces. In this project, we have addressed the use of interactive tactile graphics in primary school education, although the framework described may be used in any situation where the basic equipment is available. We have built educational applications using Unity which features alphabet games, mathematical games. In these applications we have used image processing and AR technologies such as Vuforia. The application detects the arranged alphabets and the numbers which are tangible pieces. In the counting game we have used VuMarks for multiple detection instances of the similar objects. This app detects tangible objects and gives audio output which makes the visually impaired person understand what he interacts with.

2.1.2 Braille Plus : A Smart Refreshable Display for Visually Impaired

Prapti Chandanshive, Chris Dsouza, Shruti Vellat, Prof. Mayura Gavhane

Modern technology allows the visually impaired to consume digital content via audio based software add-ons. However, visually impaired students are still deprived of understanding theory using the diagrammatic illustrations in textbooks as sighted students do. Many of the visually impaired students in India cannot pursue sciences beyond standard 8 due to the lack of proper diagrams to explain concepts. The only real way the visually impaired can consume digital content is through physical tactile feedback. A lack of technological advances is a major setback for the visually impaired since only 1% of all books are translated to braille which hampers their education. Braille Plus presents an economical solution to this need to improve the quality of education provided to the visually impaired. Braille Plus is a graphical refreshable braille display to be designed and implemented using solenoid actuators powered by the ATmega2560 microcontroller. The device communicates

with an interface which is used to input the image to be converted to braille. The interface converts the image to braille using an appropriate algorithm and maps the image to the graphical display to output the 3D representation of the corresponding image.

2.1.3 An Immersive Interior Designing Solution Based on the Principles of Mixed Reality

Vivek Dsouza, Dayton Xavier, Dean Joyson, Prof. Deepali Kayande

To devise an immersive interior designing solution on a mobile platform based on the principles of Mixed Reality (MR). This work presents an application of Mixed Reality (MR) i.e. Augmented Reality (AR) and Virtual Reality (VR) technology for interior design. The progress of digital technology, virtual information techniques are also required for architectural projects. Thus, the technology of Mixed Reality offers many advantages for digital architectural design and construction fields. MR is also being considered as a new design approach for interior design. In an AR environment, the virtual furniture can be displayed and modified in real-time on the screen, allowing the user to have an interactive experience with the virtual furniture in a real-world environment. AR environment is explored as the new working environment for architects in architectural design works, and they can do their work conveniently as they can collaboratively discuss with the client through AR environment. Our goal is to develop a new method for applying MR technology to interior designing work, where a user can view virtual furniture and communicate with 3D virtual furniture data using a dynamic and flexible user interface. Plus, all the properties of the virtual furniture can be adjusted using choice based interaction method for an immersive experience.

2.1.4 Voice for Voiceless

Yusuf Khan, Tushar Rao, Siddhant Shettiwar, Prof. Imran Ali Mirza, Prof. Dipti Jadhav

Practical wearable gesture tracking requires that sensors align with existing ergonomic device forms. This technique senses both finger movements and rotations around the wrist and forearm, covering a wide range of gestures. In this project, we make use of EMG sensors which is suited for wrist and forearm movement and we make use of IMU sensors for sensing the fingers and together these two sensors can create accurate results. We also make use of arduino for storing the wide ranges of gestures and create a diverse database of gestures.

2.1.5 SAHAI: Supervisory Aid for Health in Aged Using Integrated System

Vaibhav Singh, Vineeth Suvarna, Sneha Golatkar, Prof. Sana Shaikh, Prof. Sejal Chopra

The elderly people living alone needs an automatic integrated solution as a support which would provide homely assistance by taking care of them. The problem faced by aged people proves to be sometimes lethal to their life leading to death or huge physical damage. They also tend to leave the appliances unattended due to forgetfulness. Thus there is a need to provide help to these elderly people as well as provide necessary information about them to their loved ones.

The proposed research work is using kinect device which does not invade their privacy while monitoring multiple elderly people's normal activities and detecting fall or catastrophic conditions by measuring their gait and analyzing change in posture when they change from sitting to walking or vice versa. Support vector machine is used to classify the gait and posture data obtained from the kinect device. Normalization technique is used to identify multiple users and activities. With the help of machine learning algorithm normal and abnormal activities are identified. The proposed

system also informs concerned person in the case of any emergency. Monitoring the status of usage of electronic appliances is also considered.

2.1.6 E-RTO Express Licensing Services

Ingale Supriya, Jagtap Sneha, Khan Gulkshah, Prof. Dipti Jadhav, Prof. Kalpita Wagaskar

Government systems are turning to be digitalised day by day. Similarly, RTO also has Web application for its services but after taking Applicants Interview, Meeting RTO Authorities and doing Survey of Available Web applications we found that due to designing issues and partial automation of the system, people are seeking help from brokers and the maintenance at offices is also not organised. This project aims to solve the problem at both sides as well as facilitating the traffic polices job. Keeping in mind the missing functionalities and design issues in the existing system, we are providing a Mobile Application for Applicants which comprises of All functionalities of RTO like Applying for Different Licenses and Vehicle Services, E-locker Facility, Paying the Penalties Charged and Information about Offices, Rules and Regulations, Application Processes. Traffic police are also given a Mobile Application through which they can Charge Penalties on rule Breakers. RTO offices are provided a Web Application that can be used for Checking License Requests, Penalty Details and for Deploying Documents in E-Locker. Latest technologies like React Native for Mobile Applications, React Js for Web application and Firebase for storage are used to ensure best Graphical User Interface, High Reliability and Maintainability.

2.2 Artificial Intelligence

2.2.1 Meeting AI

Faisal Khan, Royston Lobo and Swapnil Naik, Amiya Kumar Tripathy

Meetings and conferences are conducted in almost every organisation today. They are either held with all participants being present locally, over the internet or via telephone. One of the biggest issues here was keeping track of what was being said and discussed. Secretaries often do this, by taking notes and making minutes. However this task is rather difficult and becomes complex as the number of participants increases. Often important information is left out and overlooked. In this work an attempt has been made to eliminate the need of a personal assistant/a secretary, automate their purpose and generate precise minutes, detailed summaries, perform sentiment analysis and various other operations to high accuracy. The system has been made is a service based software which automatically reads meeting invitation emails, dials into a conference call meeting at the right time, records the entire conversation, converts the recording into text, analyzes and processes the data and finally uses it to generates minutes and sends it back to the meeting initiator along with other vital information.

2.2.2 BRAT - APP

Aquil Gonsalves, Aaron Pereira , Sunil Joseph, Prof. Kalpita Ajinkya Wagaskar

Internet based self-learning has become one of the important ways in learning. Students acknowledged much of their learning was within their control. However, they did note that faculty and administrators have a significant impact on their desire and ability to learn. In an effort to empower students to direct their own learning processes, the results of this study have been integrated into campus assessment initiatives including the development of a student organization to provide a consistent

,student-led forum for students to voice their opinion and concerns about their learning processes and assessment using the website and the android application.

2.3 AI and Image Processing

2.3.1 Gesture Controlled Virtual Reality Based Conferencing

Glen Martin, Nathaniel George, Vinay Mourya, Prof. Kadambari Deherkar

The technology available today for interacting with a virtual environment involves wired or wireless hand controls with limited buttons or a large setup involving a camera and/or a sensor to capture movements. The cost of such a setup is such that it makes it inaccessible to most. The project aims at providing a cost effective VR solution which can produce the same effect with precision and flexibility, which is accessible to all. The proposed idea is to provide a hardware device that provides the user with an immersive VR experience and uses hand gestures captured via a camera placed on the device to control and interact with the VR environment. As an application of the project, an interactive workspace environment would be simulated, using a single hardware component that provides the user the viewing interface as well as can be controlled by simple hand gestures eliminating the need for additional hand-held devices controls. The project will also delve into the field of supervised learning to make possible the implementation of gesture recognition.

2.4 Internet of Things and HMI

Khushboo M., Pratiksha Karde, Puja U. Prof. Dipti Jadhav

Physical web is a emerging technology. Now a days we use physical web in our daily life without knowing the the fact that we are using physical web.The basic idea of the physical web is to navigate and control physical objects in the world surrounding mobile devices with the help of web technologies. The Physical Web, like many new mobile and ubiquitous technologies, seeks to enable a range of seamless and enticing experiences. Its goal is to extend the web to physical objects, making them and their services easily discoverable by nearby mobile devices we explore the potential and barriers of one such new platform the Physical,Web in resource constrained contexts in Mumbai. The Physical Web is an open source Bluetooth - based beacon system, which aims to provide quick and seamless interaction with physical objects over a web platform. This emerging technology (Physical web and Beacon) provide local small enterprise traders in the regions with the facility to quickly and easily create and distribute a simple online presence via a local broadcasting medium.

2.5 Geo-Informatics

2.5.1 Climate Resilient Agriculture using GIS

Sanchita Kadge, Seema Kurade, Jenate Monteiro, Prof. Nilakshi Joshi, Prof. Sana Shaikh

Climate and other environmental changes in the developing world has become a major threat to agricultural economy. An agricultural sector necessitate for well-defined an automated system approach for predicting the crops and supporting farmers to take correct decision to enhance quality of farming. Achieving maximum crop yield at minimum cost is one of the goals of agricultural production. By considering various situations of climatologically phenomena affecting local weather conditions in various parts of the world. The predictive capacity of each feature is analyzed by

generated random forest algorithm. Crop prediction methodology is used to predict the suitable crop by sensing various parameter of soil and also parameters related to atmosphere.

2.5.2 Location Based Crime Mapping Using GIS

Joel Janson, Sagar Karnik, Blessy Varghese, Prof. Nilakshi Joshi, Prof. Sana Shaikh

With a total population of 184.1 lakh, the Mumbai city is witnessing an increasing rate of cognisable crimes year after year. It is the need of the hour for the cops in their role to catch criminals that they remain convincingly ahead in the race between lawbreakers and law enforcers. One of the paramount concerns of the police is how to enhance investigative effectiveness and to analyse the increasing number of crimes. The objective of the proposed research work is to provide a user-friendly interface to map crime, visualize, and analyze crime incident patterns. After mapping the crime, crime hotspots along with its proximity to police stations is identified. Identification of patterns in crime as well as prediction of possible crime locations is done. The mapped crime data is overlaid with education, sex ratio or occupational data to obtain a correlation. The domain of GIS and Data Analytics techniques has been used during the course of this study using clustering algorithms such as K-Means, Agglomerative and predictive algorithm such as SVM and Random Forest. This interdisciplinary proposed system focus on how GIS is applied to Criminal Justice theory and practices.

2.5.3 Traffic Analysis and Road Accident Prediction Using QGIS

Jovita Mathias, Shubhada Medhe, Raghasri Raghavan, Prof. Sana Shaikh, Prof. Nilakshi Joshi

Mumbai has been witnessing a sharp escalation in the number of road and transport related accidents in recent times. Increase in motorization coupled with unplanned piecemeal expansion of road networks have taken a toll on human capital and depletion of resources. The proposed research work focuses on the correlation between the various factors that could lead to an increase in road accidents. For this research work, the accident data of the BEST buses in Mumbai from the year 2009 to 2017 has been studied. The methodology incorporates a model which examines the link between the frequency of road accident occurrence and traffic, followed by an analysis of other significant factors such as road condition, time of the accident and driver experience. The model will be applied to the road network in the Mumbai region and identify accident black spots locations on the road with higher severity of accidents either in terms of the number of people injured or dead. The findings of this research suggest that safety evaluation and estimation will benefit engineers and decision makers in identifying high crash locations for potential safety improvements.

2.5.4 WISys: A GIS Based Solution for Water Problems

Linson Miranda, Ashdeep Kaur Vij, Preetham Monis, Prof. Amiya T. Prof. Sana A.

In the recent years, the region of Marathwada (Maharashtra) has been fraught with the severe problem of drought. The present water crisis has many components of an environmental, economic and social origin: overuses of water, pollution, changes in availability, and water mismanagement are some of the current problems. Managing these problems involves navigating through the conflicting needs arising from economic growth, poverty, and climate change. There is a need to develop a community-based GIS solution to provide available government data along with data from farmers which can help provide possible solutions that can be implemented to mitigate the problems faced. An attempt has been to provide a platform to the community wherein they can put forward the water problems faced by them and with the help of technology, trying to solve these problems. This involves

a platform which educates the community whether the available water is sufficient for growing crops cultivated by them and provide suggestions to grow alternative crops from existing ones to yield better results. It ensure that dynamic data provided by the community as well as existing government data can be used effectively for better management and monitoring of available water resources and perform analytics of obtained data and identify various other key issues that can be rectified either by the government or the community itself on single interface.

2.6 Machine Learning

2.6.1 Personalized Assistant Mirror

Jerry Devassy, Shaun Pinto, Eldrin Sanctis, Prof. Ms. Priya Kaul

Our lifestyle has evolved in such a way that optimizing time is the most important thing. Development of an innovating appliance is proposed that incorporates interactive services of information, offered through a user interface on the surface of a mirror. This work is based on the idea that every person looks at the mirror when he/she goes out, so why should not the mirror become smart. The framework will offer basic services, like the presentation of personalized weather data, time, date and will incorporate some additional functionalities like reminder service by mobile synchronization and through social media. Personalized Assistant Mirror framework is based on detecting the presence of humans using Passive Infrared sensors and Wi-Fi connectivity. Once a person comes in front of the mirror, it displays the information that is being fed from the web. This data or information includes calendar, time, weather, news feed, notifications and so on. Speech recognition is used to automate many tasks that usually requires hands-on human interaction, such as recognizing spoken commands to perform something like turning on lights or shutting a door. This system will incorporate speech activated music player that plays the music when a person gives a command.

2.6.2 MediBot: A Predictor and Analyzer for CVD

Gauri Rajgopal, Soukhyada Vaidya, Dikshita Iyer, Prof. Kadambari Deherkar

The prediction of Heart Diseases or Cardio Vascular Diseases (CVD) is one of the most important tasks right now. Cardio Vascular disease are now considered to be one of the leading causes for death. It is the need of the hour to predict such diseases beforehand so that people can take precautions and try to preclude CVD. Thus, it is important to devise a method that aims at predicting these diseases and in less time.

This project aims at developing a CVD predictor which also provides suggestions to the users for lifestyle improvement. For this purpose, this project is making use of the Random Forest Algorithm, which has shown to provide a better accuracy rate than the previously explored methods. The data utilized for training the predictor will be obtained through doctors. The objective is to seek authentic data to help make the prediction better.

The main aim of this project is to help the users catch the risk of a heart disease at an earlier age and curb this to lead a healthy and beautiful life. This project will include a Chatbot application called as the MediBot through which the user can enter their details as the input and get an almost accurate prediction of the risk level of a Heart disease. Also, this chatbot will give suggestions to the user regarding the best ways to improve their diet and lifestyle to lower the risk level.

2.6.3 DELGAS: Deep Learning GST Analytics System

Shalanki Gupta, Shruti Kadam, Shloka Shetty Prof. Amiya Kumar Tripathy, Prof. Kalpita Ajinkya Wagaskar

While the Goods and Services tax will usher in greater transparency and create a simplified channel for tracking through data, it has also spawned the need for ERP and data analytics solutions. An endeavor to make common man GST Compliant is definitely the need of an hour. In terms of data analytics, the GST rollout is expected to become a data analytics powerhouse. DELGAS (Deep Learning GST Analytics System) is a comprehensive Android Application that acts as a handy E-book to retrieve overall information about GST with an inbuilt tax calculator to calculate taxes that should be levied on different commodities with their corresponding HSN codes. It accommodates the Complaint handling section, Raise Your Voice with an intriguing concept of upvote, wherein a user can post complaints and track them. It includes a GSTIN Check section in which the user can enter a particular GST Identification number and check the validity of the vendor. The RSS Feeds based notification system to inform the users regarding the various awareness programs with respect to GST. DELGAS uses Sequence-to-Sequence machine learning based FAQ BOT to handle user queries efficiently. It generates meaningful data analytics and statistics regarding GST.

2.7 Societal Needs

2.7.1 Location based Food habit analysis and Dietary Recommendation for Rural Women

Ashvit Shetty, Crescent Bardeskar, Denzil Barboza, Niharika Shetty Prof. Prof. Ditty Varghese, Prof. Shafaque Syed

Nutrition is the key to the success and well-being of the current and future generations. The things we eat are a major factor in deciding our health status. When women turn 40, they undergo various hormonal changes that could potentially initiate various diseases if not detected at the right moment. Eating the right diet between the ages of 40 and 50 might help women fight off disease and improve their quality of life. The proposed system is a personalized recipe recommendation and disease prediction system for women of forty to fifty years of age. The system aims to provide recipe recommendations to individuals based on input parameters like food habits, weight, and available resources using clustering algorithms. Based on these parameters, aim is to predict the diseases by taking inputs such as allergies and symptoms of the illnesses and recommend recipes in an efficient way. For this purpose, a few prediction algorithms are considered and checked on their performance and accuracy levels. The outputs will be based on their food preferences, the availability of the products in that area and also their income status. The system will thus provide the right nutrition to women and will improve their health status. The GIS system will map all the resources like women population, type of diseases and average income and provide an overview of the current scenario in the area selected and enable the user to effortlessly understand the patterns of the huge data collected.

2.7.2 Just-Tap : A Bus Ticketing System Using NFC

Bianca Alphonso, Sarita Saldanha, Sisil Sunny, Prof. Deepali Kayande

There is a widespread dependency on buses for public transport, providing important means of transport within urban area throughout the world. There are various problems related to public transport like facing the severe problem of traffic jam, confusion and misunderstanding between the passengers regarding fares, having severe security problems in public transport due antisocial elements, etc. For making the everyday life more convenient for the commuters travelling in buses some technologies can be used like Near Field Communication (NFC) and Radio Frequency Identification (RFID). The proposed system is based on ticketing and tracking of the bus. The system suggest a user friendly automated ticketing system which will automatically deduct the passengers fare according to the distance travelled as well as will do a real time tracking of the bus so that the passengers know exactly when the bus will arrive. Along with this we also propose to include features like location based reminders which would remind the user about things that he needs to buy when he reaches a location while travelling by the bus.

2.8 Cyber Security and ML

2.8.1 Detection And classification of Phishing Attacks Using Machine Learning

Saif Sagri, Savio Varghese, Saurabhkant Shukla, Prof. Shainila Mulla

Phishing is a social engineering attack that aims at exploiting the weakness found in system processes as caused by system users. New patterns for phishing attack keep evolving everyday. There is no mechanism present for detecting these evolving patterns using SVM along with back propagation. The proposed system is intended to deal with a complete analysis of phishing attacks, their exploitation, analysing the recent approaches based on automatic learning for phishing and relative study. Analysing and proposing a current solution in the field of machine learning using SVM and back propagation approach to determine the recent trends in phishing attacks.

2.9 Mobile Communication

2.9.1 Cell Phone Radiations: Investigations and Alerts

Celina Mary, Jeenu Jose, Nikhil Desai, Prof. Sejal Chopra

In the recent decades mobile technology has engraved itself into our lives. More than half of the working population use their smartphones for carrying out most of their major work. Cell phones emit radiations which may pose potential health issues. The proposed work will help in minimizing the absorption of radiation in the human body from the user end by providing appropriate remedies. The proposed work is initiated with the survey conducted for the top five popular smartphones with a particular model among the IT industry professionals. In order to reduce the amount of radiations various issues are taken into consideration and appropriate remedies are provided. The various remedies suggested are warning is sent, switching off Wi-Fi and Bluetooth during the incoming call, blocking the messages during the call and blinking notification on high radiations scanned. Thus, the user will be aware of the amount of radiation he/she is exposed to, so they can switch off the parameters that are not currently required. The application will provide an accurate value taking into account the running parameters.

2.10 Wireless Network Sensors

2.10.1 Chili Plant Disease Detection Using Thermal Imaging Techniques

Agin Jose, Larissa Fernandes, Kevin Dias, Prof. Shafaque Fatma Sayyed, Prof. Ditty Varghese

Chilli crop is very essential to the Indian economy since it is the largest producer and consumer of chilli. It is one of the most important commercial crops of India. Since the crop is easily affected by environmental conditions like change in temperature, humidity, moisture and easily susceptible to diseases caused by bacteria or pests, the yield of the crop is greatly affected. The demand being so high and the supply being limited, measures need to be taken to prevent diseases from attacking the crop and increasing the yield. This project discusses about a methodology that proposes stress analysis as a measure to predict diseases. This can be prevented by performing stress analysis and calculating the evapotranspiration rate of the plant. Using thermal imaging and a decision support system which will continuously monitor the environmental changes and the stress level of the plant, a statistical as well as an analytical report can be provided to the farmer with the help of which he can make effective decisions which will benefit the growth of the crop.

2.11 Virtual Reality

2.11.1 V-LEARNING: Virtual Reality based Game for Dyslexia improvement

Ashley Dsouza, Shailan Aranha, Sagar Amin, Prof. Ms. Priya Kaul

Dyslexia is a specific learning disability in reading and writing. Kids with dyslexia have trouble reading accurately and fluently. Along with disability in reading and writing, they may also have problems like phonic and gross motor skills. Dyslexia is a lifelong condition that makes it difficult for people to read. Its the most common learning issue, although its not clear what percentage of kids have it. The reason for the wide range is that experts have defined dyslexia in different ways. A learn-to-read application is developed that includes exercises to improve phonic and gross motor skills via game therapy for assisting therapist/teacher in conducting remediation program of dyslexic children. Remediation for this is using a multisensory approach. The strategies include linking eyes, ears, voice, hand movements for stronger sensory receptors. Motivation and rewards are included at every level to encourage the students.

Chapter 3

Mechanical Engineering

3.1 Design

3.1.1 Smart Braking System

Alfred Fernandes, Tyron Fernandes, Ivan Fernandes, Saspat Acharya, Prof. Swapnil Gujarathi

Smart braking system is a design proposed for the brakes of the Sport Utility Vehicles. In this design study, the modification in the braking mechanism is done to apply brakes, immediately after the sensor detects the presence of an obstacle lying at a distance so that the vehicle comes to halt in the shortest possible time. A coded Arduino is used convert the sensed signal to the actuating medium of the linear actuator by pulling it back. In this design, calculations for the master cylinder dimensions are done to select a fast fill master cylinder to reduce the pedal effort and costing. Analysis is done on different materials of brake pads, brake drum to determine braking efficiency and thereby analyzing various parameters affecting life and efficiency of braking systems.

3.1.2 To Study Different Types of Treadmill, Design, Fabricate and Test for Maintaining Healthy Living Habits

Lavin Dabre, Grufin Dabre, Scott D'souza, Gladwyn Joseph, Prof. Johnson Nellisery

Treadmills have had its origin since the early 60's of the nineteenth century. Though the purpose for which it was used has been changing over the decades, this century has witnessed treadmills as an equipment solely for health purposes. Thus keeping our scope and objective relevant to the prevailing systems which face issues like lack of portability, large equipment size and cost; we have aimed at looking forward to better ways of eliminating these problems. The project includes studying different types of treadmills viz. manual treadmill & electric treadmill. The project compares both the treadmills & proceeds with calculations required for manufacturing. The replacement of these existing systems to the extent possible by us undergraduate mechanical students has been the sole purpose & objective of the project, thus meeting the health requirements involved in maintaining healthy living habits.

3.1.3 Altered Nozzle

Rohan Shekhar, Nrip Shoree, Tanish Quadros, Prof. Dilip Manohar

The rate of globalization and urbanization as been increasing at an alarming rate. Water conservation has become one of the primary concerns for all of us , as water is scarce resource. Almost 85% of the water used in day to day activities through traditional faucets, is wasted and only 15% is

used. Therefore, we have attempted to design an attachment to suit existing water faucets to reduce water wastage by a significant amount for cleaning application. We have used the concept of atomisation to increase the surface area with which the water contacts the surface. A single stream of water is broken into millions of water droplets, which carries out the desired Job of cleaning or washing articles, giving same performance with large quantity of water, with very much reduced quantity of water, due to atomisation. Thus atomisation reduces the volume of water consumed. The results of atomisation of water breaking into many droplets, would be verified by flow simulation techniques (computational fluid dynamics). The design parameters are such that the nozzle can be retro-fitted into existing faucets, thus reducing the need for alterations in the faucet design. The nozzles can be used in water lines having pressure -of 2-6 bar. Filtration of physical impurities is achieved, and chemical impurities will not be filtered. The material used is brass with chrome coating.

3.1.4 Design and Fabrication of Quad Bike (Chassis,Suspension and Steering)

Ryan Hubert Charles Dsouza, Ali Dabeer, Joel Monteiro, Mark Rodrigues, Prof. Pradeepkumar Suryawanshi

In this study, design and fabrication of a quad bike is done to compete at a national level competition organised by ISNEE. The chassis is designed to ensure safety of the driver in case of accidents and to protect other components of the bike while driving at a speed of sixty kmph. The suspension is designed to have a tuneable individual system which can be altered according the performance requirement. By the principle of lateral weight transfer between opposite axles, the suspension system is designed such that, while reducing the ride height at the rear of the bike its torque increases and the bike pulls a heavier load than its actual capacity. The steering system is designed to take sharp turns during cornering with a turning radius of 2.5m. In order to extend the reach of this design application a supplementary attachment is designed to help in farming application such as ploughing and harrowing. The design of chassis is made such that the ploughing modification can be easily attached to it, giving 0.3mm deflection while pulling a force of 1600N. Results of this study indicates that the designed ATV can serve as a cheaper equipment for farming.

3.1.5 Transmission And Braking System of Quad Bike

Aldo John, Hansel D'Souza, Osvin Rebello, Richa Mathews. Prof.Swapnil Gujarathi

Transmission system is a complex and integral mechanism on which the vehicle runs.It is an arrangement of shafts and gears through which the engine power is transmitted to the wheels of the vehicle.The transient analysis of the transmission system is done using ANSYS. This paper highlights the analytical outcomes essential in design consideratios to develop transmission and braking system of the quad bike.Hence the thermal analysis of brake disc and brake hub is done to analyse the effect of heat generated while simulating their actual loading conditions. Therefore the result of analysis we're within the permissible limits with respect to the design parameters. Also simulation of the wheel hub assembly is carried out for the failed parts.

3.1.6 Low Load Foot Powered Washing Machine

Karl Pereira, Ignatius Pauln, Jaideep Kanthak, Ishan Daftardar, Prof. Deepika Gupta

A commercial washing machine isnt practical in rural areas due to shortage of electricity and water. People residing in hostels also find it difficult to afford a commercial washing machine. The work presents a low load foot powered washing machine named "TUMBLer" which will tackle all these problems. It is a sustainable product, which can also operate at low loads without damaging

the clothes. It converts a linear input provided by vertical pushing action of the feet to rotary motion of the drum. The main objective of the project is to fabricate a product which will eliminate the monotonous task of washing clothes by hand and saving the electricity costs associated with the conventional washing machines. The design of the tumbler is unique as it has simple mechanism and also relatively cheap and reliable. The major advantage of this product is that can be operated with ease by people of all age groups.

3.1.7 Optimisation of Grass Cutting Mechanism

Animesh Bondre, Rushabh Gandhi, Abhijeet Jadhav, Sankeerth Bhargav, Prof. Atul Lohar

As we know, it takes a long time to cut unwanted grass which is normally observed on the playground, park, college premises, etc by manual operation. The thesis is related to optimise the grass cutting mechanism within less time hence cutting the unwanted grass easily. The optimisation can be done in many ways: i) Mechanical automation to cut the grass ii) To use non conventional energy source as a driving mechanism where conventional energy source is scarce. iii) To improve blade design, so as to cut the grass quickly with less power consumption. In this thesis, solar energy is used as a non conventional energy source. The complete structure of the equipment is made up of Fibre Reinforced Plastic (FRP) to reduce the overall weight of equipment. Blade is designed in such a way that it requires less torque to cut the grass without affecting the efficiency. Automation has been initiated by using the electromechanical devices like. Arduino Uno Microcontroller: (ATmega328. Operating Voltage: 5V) with stepper motor (Nema 17). This thesis deals with reduction of human efforts, negligible use of conventional energy source and less time required.

3.1.8 Exoskeleton for Support and Strength Enhancement

Bhavik Shah, Elkan Mascarenhas, Siddharth Mengle, Siddhanth Menon, Prof. Dilip Manohar

A lot of workers are not able to carry weight around due to muscle weakness and lifting heavy loads beyond human capacity may result in severe injuries to the workers. We will design an exoskeleton to lift a load (cuboidal box of dimension 50cm x 50 cm x 50cm), weighing 40kg from a table top, displace it by a distance of 10m and place it on another table with the help of an exoskeleton. The exoskeleton will make material handling and displacement easier in workshops where forklifts and cranes cannot be incorporated. We will be designing the upper and lower body to transmit the carried load to the ground resulting in less load on the operator. Linear electric actuators will be used to provide the necessary force which will be controlled by a micro controller (arduino) and supported by battery backup.

3.1.9 Aerodynamics on a Race Car

Sumeet Dcunha, Franklin Dsouza, Prof. Babitha Devdas

The biggest challenge in designing of a race car is the limitation of its power due to the induced drag that is generated at high speeds. This hampers the engine performance and also increases the fuel consumption. This project aims to design drag free aerodynamic body for a race car. This wing package is designed to produce maximum down-force within the stated acceptable limits of increased drag and reduced top speed. The initial steps involved are the selection of the aerofoil based on its lift and drag characteristics against angle of attack. Later developing the cad models and performing the flow simulation on ANSYS FLUENT for the optimization of the design. The results of the simulation are evaluated on the basis of lift and drag forces. A complete assembly of all the aerodynamic devices

is made and flow simulation is performed. After the finalization of design a small scaled aero package will be manufactured by 3D printing and it would be tested in a wind tunnel.

3.1.10 Design And Fabrication Of Intelligent Gear Shifting Mechanism In Motorbikes

Cyril Chettiar, Ralfy Chettiar, Felix Chettiar, Felix George, Prof.Sandeep Dasgupta

To design an automatic gear shifting mechanism which will work without any human intervention. This mechanism can be used in any bike which requires gear change by the person riding the bike. This system eliminates the need to not only change the gear but also the clutch. This results in a better riding experience and maintaining the efficiency of the bike. Thus, it gives the rider the comfort of a continuous variable transmission along with the better efficiency of a motorbike. This mechanism is achieved by using three main components- solenoid, DC geared motor and program to drive and control the bike. The microcontroller is pre-programmed which controls the solenoid and motor.

By implementing this system automatic shifting of gears while driving the bike can be achieved. This automated power transmission can be controlled by the speed of the bike.

3.1.11 Wheel Suspension

Daniel Shetty, Aniket Cardoza, Joy Larshan, Prof. Pawan Kulkarni

The bicycle's invention has had an enormous effect on society, both in terms of transport and way of living. Several components that eventually played a key role in the development of the automobile were initially invented for use in bicycle, including ball bearings, pneumatic tires, chain-driven sprockets, and tension-spoked wheels. This study presents a suspension system which is placed inside a bicycle wheel. The In-wheel suspension system isolates the sprung mass from excitations similar to conventional suspension systems. In traditional suspension systems the isolation is provided by spacious and complicated mechanisms, and mainly in the vertical direction. However, the in-wheel suspension system, not only fits the suspension mechanism inside the unused space between a wheel's rim and hub, but also allows for isolation both in vertical and horizontal direction. This analysis is conducted on low speed, low load, and man-powered vehicles such as bicycles and baby strollers and wheelchairs. The analysis has been done on the basis of mainly 3 parameters i.e. the load, speed and material. The wheel suspension is designed to take up loads between the range of 100-150kg and reach up to 20kmph of speed (bicycle wheel). The material used is steel which is easily available and cheap. The comparison of conventional suspension system with the Suspension incorporated in Wheel (SIW) has been done in the report. The objective of the project is to implement a simple but practical in-wheel suspension system and demonstrate its applicability.

3.1.12 Light Weight Tracked Vehicle

Sachin Kadam, Shivam Katkar, Atharv Kocharekar, Gaurav Kulkarni, Prof. Swapnil Gujarathi

Military high mobility vehicles are fitted with off-road tires and they make use of open differential, limit slip and locking differential as per requirement for power transmission (e.g. Maruti Gypsy, Thar). Even though these are special purpose built vehicles with off-roading capabilities, in certain cases the tires are not able to create enough traction with the ground and get stuck. Thus, this project ensures use of tracks to get enough traction. Also the vehicle under consideration is lighter in weight compared to vehicles mentioned above. This vehicle being small in size, it can be transported via ships and air planes easily. This vehicle ensures to be more fuel efficient due to the use of a single

cylinder Diesel Engine, thus reducing the overall cost compared to the cost of vehicle available with competitors in the market. The primary objective is to design a safe and functional tracked vehicle for surveillance purpose considering the technicalities. Our project vision is to develop technically sound and conceptually engineered tracked vehicle which includes design considerations, analysis and testing.

3.1.13 Design a Solution for Improving Drainage Cleaning Using Concepts of Design Thinking

Sanket Namjoshi, Sameer Singh, Sneha Usakoyal, Dr. Prasanna Nambiar

This report entails the information to design the solution for improving the cleaning of storm water drains by using the concepts of design thinking. The storm water drains are meant for carrying out the rain water only. The illegal connections, improper maintenance and public unawareness causes the blocking, clogging and flooding of storm water drains which leads to environmental issues, property issues, health issues in the society. After surveying drains at various places it has been found that the major source of waste generation are the open drainages and roadside storm water drains where people tend to throw the garbage due to lack of awareness or due to lack of facilities. These types of open drainages are mainly found in hutment area which further connects to major nalas. There are many type machineries available to clean the major nalas. These machineries cannot be used in hutment area due to the space constraint so for their cleaning conventional equipments like fawda, kata, ghamela are being used. Also in these areas cleaners have to enter into the drains for cleaning due to lack of proper equipments which leads to health problems to cleaners. The aim of this project is to design appropriate equipment/equipments to avoid the direct contact of the cleaners with drainage water and also to ease their work of cleaning. For this surveys will be conducted within the community of cleaners, residential, contractors, BMC official to understand the actual requirements which will be prioritised to evolve a solution.

3.1.14 Design and Fabrication of Paddy Uprooter

Pushkaraj Karve, Abhijit Mahalle, Saurabh Kambli, Abhishek Mishra, Prof. Sachin Sheravi

Design and fabrication of Paddy Uprooter undertakes the mechanisation of manual uprooting of rice saplings from nurseries before being planted in main fields. The machine reduces time required for manual process and also the human efforts required for the same. The machine is designed after taking into consideration various agricultural techniques and incorporating various design aspects to improve its manoeuvring in the field and increasing strength of critical components like springs and efficiency in adverse field conditions, also the gripping action is designed by taking into account its delicate operation. The machine is manually operated and estimated fabrication and maintenance cost is low.

3.1.15 Development of Intelligent Vertical Carousal System

Akshay Shettigar, Tushar Shinde, Sahana Wukkadada, Prashant Patil , Prof. Sandeep Dasgupta

In industrial design, effective space utilization is of prime importance. The need of developing an intelligent system which utilizes the maximum vertical space arises day by day. This concept suggests to eliminate the process of manually carrying the items, and to maximize vertical space utilization. The design of an electronically operated vertical storage system is carried out and tested successfully. The design principle is based on the adaptation of vertical carousel system. The automated racks is motor-driven vertical storage equipment that brings racks up and down so that they

can be easily available for the user. Designs are prepared based on functionality, durability, cost and standard availability, the components/materials selections is done. The system performance was tested on fabricated model. It has wide applications in material handling for industrial, domestic and commercial purpose.

3.1.16 Electricity Generation from Sea Waves

Xavier Dsouza, Margale Pallavi, Mathai Nehagracy, Shelke Namrata, Prof. Clea Augusta Pereira

For thousands of years we have relied on burning fossil fuels to generate energy, but in today's world using oil, gas and coal for our energy needs is becoming a problem. Climate change, energy security and depletion of fossil fuels are the three major problems faced in today's life. These three are the major reasons that describe the need for renewable energy. In order to preserve our planet, our wallets and our energy sources we all need to be involved in switching to renewable energy sources. Our project is based on creating a mechanism to generate electricity from sea waves on the principle of floating bodies. The upward and the downward motion of the waves are trapped by using buoy as a floating body. The linear motion of the buoy is converted into rotary motion of the shaft by gear system and the rotating shaft in the power generation unit generates power. Our goal is to develop an efficient and low cost mechanism compared to other wave energy converters and other renewable energy devices. It is reliable, sustainable, environmentally friendly power extraction procedure from sea waves.

3.1.17 Design And Fabrication Of Seed Planter

Ashley Rodrigues, Laukik More, Lester Serrao, Rinsli Solomon, Prof. Hemant Hogade

A seed planter is a device which has already come into existence for a while now, but has not reached enough to the farmers mainly because of the cost or most of them not knowing about it. So we decided to make something simple and easy to use and less costly so that the farmers can afford it. After a lot of research and development, we have tried to find a solution for this problem with the help of a seed metering mechanism. The mechanism which works with the help of push force applied to the device and plants the seed at proper spacing and depth as the device is in motion. The planted seed will be covered with soil with the help of furrow closer. On the other the device is designed in such a way that it is cost effective and requires less maintenance. Also, the scope is to test the machine for only maize seed; if we get the desired result obtained we will take it further to other different type of seeds.

3.1.18 Tree Lifting Machine

Deon Rapose, Sridhar Rampelli, Pranav Rane, Rochele Pinto, Prof. Johnson N. Varghese

The project entails the designing and fabrication of a structure that has the ability to lift a tree for the purpose of transplanting. The client, introduced to us by our project guide is based in Bangalore and has the above requirement. The necessary details such as the height of lift, space constraints and measurements of the tree are provided to us by the same. We've managed to design the structure similar to a Gantry crane with a few additions such as belts to secure the tree and provide minimal damage along with a chain hoist. Decisions on the cross-sections and market surveys have been made. Procurement of the material is underway and fabrication of the same remains. Cost of the beams included have been found out and certain aids such as belts and wheels have been decided. We have been in constant touch with the client and have adjusted the according to the same.

3.2 Manufacturing

3.2.1 Bionic Bird

Rovin DCruz, Sherburne Dias, Jason DSouza, Prof. B. S. Chavan

Our project aims at building a remote-controlled bird capable of generating both lift and thrust by the wing flapping motion. The dimensions of the bird are a length of one metre and a wing span of two metres, weighting one kilogram. The bionic bird is modelled after the Festo Smart Bird and will have an on-board cell, which will provide the necessary power for flight. Although the bird will be controlled by a remote controller, it will have an inbuilt program to correct its course and orientation. Project Space : $L*W*H = (1*2*0.4)m$

3.2.2 Portable Extrusion Machine

Francis Vaz, Elroy Cabral, Prof. Sudhakar Ambhore

The main purpose of this project is to produce 3-D filament extruder. The filament should be suitable for the use with FDM 3D printers. The dimension of the filament required is 1.75mm. The extrusion system only for the filament are not common and are only made by several makers and engineers around the world. The cheapest filament extruder on the market are still expensive comparing to the 3D printer itself. The normal price of extruder is around 2 times the price of 3D printer. This project enables people to make filament extruder under 10000 rs. The filament extruder would save lot of cost for those who need only filament for any purpose. Students, researchers and anyone who is willing to make their own filament can use this extruder rather than buying a filament. The extruder itself is small so, the maintenance cost for this extruder will be less. This project explains each steps that are needed to build the extruder.

3.2.3 Design And Manufacturing of a Wall Climbing Robot

Steven Jathanna, Chrisfredin Rajan , Snoel DSouza, Shubham Ande, Prof. ShreePrasad Manohar

A wall climbing robot is a robot with the capability of climbing vertical surfaces .This research work presents the design and manufacturing of a robot capable of climbing vertical planes. It is able to change the plane of motion from horizontal plane to vertical plane. Such a motion offers different functions like surveillance, crack detection, temperature detection or also for spying purposes. The robot's locomotion is performed using electrical connections between Bluetooth module HC05, arduino, motor driver module and the main function that helps in moving the bot is our BO motors attached to the wheels The robot looks like a car which can climb vertical walls. A new generation wall-climbing robots using aerodynamic suction, which has the capabilities to climb walls, walk on ceilings, and transit between different surfaces. The mechanism is based on the aerodynamic attraction produced by a vacuum rotor package which generates a low pressure zone enclosed by a chamber. The vacuum rotor package consists of a BLDC motor with impeller. So this principle is used to create temporary suction helping the robot to stick on the wall. The main body of the robot will carry all the components.

3.2.4 Automated Bottle Filling Mechanism

Clinton Almeida, Orine Gonsalves, Christo James, Mark Fernandes, Prof. Mahesh Rajwade

The project deals with the automation of processes of bottle filling in industry. This system gives a fast and efficient operation of task reducing manual control. This control program is fed to the controller using a programming device, computer. Sensors are used to sense the presence of the bottles at particular position. The signal from the sensor is an input to the controller. The controller gives the control signal to the actuators in the conveyor to move the bottles to the exact positions. The time interval is programmed of the controller to define the time the bottles to be fixed at a particular position i.e. the time of the bottle filling. The time intervals can be changed according to requirements. Thus this system gives a faster and reliable control system to reduce the manual control and increases the efficiency of the system. The problem faced by small industries compels to design this system. This proposed system is meant for small industries. It aims to eliminate problem faced by small scale bottle filling system.

3.2.5 Optimisation of Small Portable Foundry

Omar Almeida, Parth Ghodke, Mihir Gidwani, Shubham Hande, Prof. Sudhakar Ambhore

A foundry is a factory that produces metal castings. Metals are cast into shapes by melting them into liquid, pouring the metal in a mould and removing the mould material or casting after the metal has solidified as it cools. The most common metals processed are aluminum and cast iron.

The main purpose of the project is to optimize the portable foundry made by the previous year batch. We are planning to do that by reducing the previous mould filling time and solidification time. Diameter of the gate is directly proportional to the area of the gate and area of the gate is inversely proportional to the pouring time. Hence by changing the diameter of the gate, pouring time can be reduced. We have reduced the pouring time by changing the gating area of the system so that the molten metal would reach the mould cavity without undergoing the cold setting in its path. For doing so we have changed the pouring time and the solidification time parameters.

3.2.6 Evaluation of Autosampler and Design of Peripherals

Lloyd Fernandes, Jason Immanuel, Abhishek Goyal, Rheuben Kadam, Prof. Shreeprasad Manohar

Autosampler is a gantry robot which moves in three co-ordinates, i.e. x-axis, y-axis, and z-axis. Its vertical guideway holds a probe which detects various parameters of the liquid. The probe contains a total of 19 sensors. The liquid is held in a beaker which is placed in one of the 25 slots provided in a tray which slides in and out of the workspace. The tray is made of a matrix of 5x5 cavities, each for holding a beaker. Here we design an outer cover (shell) for this autosampler, which is aesthetically pleasing, ergonomic and turns it into an integral entity. We also intend to develop a washing mechanism to wash the probe. We would be doing a vibration analysis of the linear guideways which is responsible for movement of the probe in the workspace. Dimensions are as under Autosampler: 850x850x900mm, Washing Mechanism:200x200x800mm, Number of electricity supply ports: 1

3.2.7 Lean Six Sigma Implementation

Akhil Bhanu, Ashwin Sasichandran, Glen Dsouza, Allan Jolly, Prof. Mandar Damle

Lean Six Sigma is a synergized managerial concept, of lean traditionally focuses on the elimination of waste and six sigma focuses on reducing variation for improving the quality.

The project is being carried out in Control Print Ltd. Over last two years the annual revenue of the organisation was increasing but the increase in profit after tax percentage was flat. One of the area which had scope for improvement was the service department of the company. The various data was collected from the given service department and after analysis roughly 3

Out of 5 phases of DMAIC our team of green belt holders have implemented DMA phase and IC phase will be carried out in next 2 months. This project can be further extended to other departments to increase the overall profit after tax percentage.

3.2.8 Digital Fuel Indicator

Arman Khan, Sachin Mishra, Chinmay Waingankar, Shehan Kamle, Prof. Mahesh Rajwade

The project encompasses available and yet to be explored avenues in instrumentation and mechanical and electronic engineering to come up with an assemblage of systems which can accurately and cost effectively ascertain the actual value of the amount of fuel present in the tank of a motorbike immediately after the fuel has been completely discharged from the dispenser and so to this effect the proposed design incorporates the turbine flow meter system by also adding an Arduino Board and Hx711 chips in addition to calculated bends to remove fluid cavitation and AV converters by displaying and syncing the data on the LCD screen in real time. This area also has scope for further additions for GSM and GPS and systems to give us a rough approximation of the distance that can be travelled using that much quantity of fuel.

3.2.9 Electricity generation from sea waves

Xavier Dsouza, Margale Pallavi, Mathai Nehagracy, Shelke Namrata, Prof. Cleto Augusta Pereira

For thousands of years we have relied on burning fossil fuels to generate energy, but in today's world using oil, gas and coal for our energy needs is becoming a problem. Climate change, energy security and depletion of fossil fuels are the three major problems faced in today's life. These three are the major reasons that describe the need for renewable energy. In order to preserve our planet, our wallets and our energy sources we all need to be involved in switching to renewable energy sources. Our project is based on creating a mechanism to generate electricity from sea waves on the principle of floating bodies. The upward and the downward motion of the waves are trapped by using buoy as a floating body. The linear motion of the buoy is converted into rotary motion of the shaft by gear system and the rotating shaft in the power generation unit generates power. Our goal is to develop an efficient and low cost mechanism compared to other wave energy converters and other renewable energy devices. It is reliable, sustainable, environmentally friendly power extraction procedure from sea waves.

3.2.10 Robotic Arm with Vision

Sunny Kumbhar, Dwayne Lobo, Devang Mathurekar, Prof. B. S. Chavan

The growing trends in various image processing techniques and artificial intelligence have flabbergasted and opened various frontiers in the industrial market. In this fast growing industrial age, every company needs speed in manufacturing to cope up with the customers requirements. No industrialist can afford to transform his unit from manual to automatic or semi-automatic or fully automatic, as automation incurs cost.

The basic objective of our project is to develop a versatile and low cost robotic arm with 'vision', which will be utilized in an industry to bring into a glimpse of how various image processing techniques can be utilized for faster and fully automated manufacturing and inline inspection. The

robotic arm uses an Arduino mega 2650, which is connected to six motors of the arm. Arduino will be used to send Pulse Width Module (PWM) signals to the servo motors. The camera module connected to raspberry pi captures image of the object, then processes the image against edge detection algorithm to recognise if the object is of desired shape or not.

Raspberry Pi is interfaced with the Arduino. The Raspberry Pi is used to initiate code, store recorded movement like library functions, and to display the resulting parameters wirelessly via Virtual Network Computing (VNC) on an Android Smartphone. Our robotic arm can be used in number of application by changing the program of controller and storing it in above library functions. Our robotic manipulator can be widely used in the packaging department and pick & place assembly lines.

3.3 Thermal

3.3.1 Optimization of Grate used in Wood burning Chula using C.F.D.

Pranav Bait, Tanmay Gawas, Jaykumar Gupta, Varun Harkare, Dr. Prasanna Nambiar, Prof Georgena K.

The problem of inefficient wood burning Chula has become a global issue and in India mostly in rural areas, majority of women are suffering from respiratory diseases. After studying various literature we understood different stages of combustion and the phenomenon of heat transfer in chulas. We visited Adakhadak village for a pilot study and tried to understand the cooking practices, food habits, sources of firewood, health issues faced by women and design of Chula used by them. The design used by most villagers do not satisfy the requirements for efficient combustion. We designed a new Chula at DBIT on the basis of information collected from literature survey. We conducted water boiling test using the firewood obtained from Adakhadak village. We also conducted Orsat analysis first to check the composition of air but were unable to get accurate results. To enhance chula efficiency, we have designed grates to be placed in the chula. Tests are repeated with different grate designs. We plan to conduct CFD analysis to study temperature domain across Chula and air flow patterns to validate the results obtained with experimental results.

3.3.2 Design And Analysis Of Microchannel Heat Exchanger

Neil Castelino, Rohan Bajhal, Avil Correa, Prof. Cleta Pereira

In the wake of cutting edge technology that has produced high performance computing chips, an important aspect that facilitates the optimum functioning of these chips is the cooling technology adopted. A microchannel heat exchanger (MCHE) has been proposed as a better alternative to conventional heat sinks employed to cool computing chips. The design is based on Intel core-i3 540 with dimensions 37.5*37.5 mm having a thermal design power of 73 Watts. The number of microchannels, their arrangement and specific dimensions are all included as a part of the design of the MCHE. The parameters and dimensions for the project were obtained through rigorous research and design procedures studied from the literature survey. The analysis of MCHE focuses on the operating conditions that it is subjected to and was carried out on ANSYS Fluent. The simulations have been carried out for specific boundary conditions and considering water as the working fluid.

3.3.3 Design Concept of Rotary Engine

Digvijay Redekar, Sherwin Joe, Allwin Nadar, Sean Salve, Prof. Junaid Ahamad

The most efficient engine is sought by all automobile industries and hence many researchers and developers invest lots of capital and time in it. Traditional reciprocating engines are not only less

thermally unstable but also less efficient. With the innovation of rotary engine the automobile industry saw the future in cars and engines. But with many flaws and less research interest by conventional piston engine user companies, the rotary engines within a decade were out of use and so the future researches about it. But it is true that the rotary engines are better efficient and less vibrating at high speeds compared to piston engines. Recent developments in rotary engines show that these engines with different designs and sizes are better replacements for piston engines. Main problems with rotary engines were thermal imbalance, incomplete combustion, lubrication. Considering these problems if research is put up to minimize these problems, the rotary engines can be back on the road. Mazda car industry is doing the constant efforts in developments of new rotary engines better thermal efficiency and oil free combustion. In the coming years it is certain that increasing development in rotary engines would totally replace the traditional piston engines.

3.3.4 Oxy-Hydrogen (HHO) GAS as a Combustion Enhancer

Alex Sebastian Barcey, Anthony Barcey, Ryan D'souza, Norman Abreo, Prof. Sandeep Sabnis

In today's world, there's a lot of need for energy, so considering the crisis of current scenario, this project produce energy from water in form of HHO gas, this gas is also known as oxy-hydrogen and brown gas, which is obtained by the process of electrolysis. Hho gas a part fuel along with petrol which will improve the combustion efficiency of the IC engine. HHO gas burns clean and has lot more power due to high calorific value, thus increasing the power of the engine. The emission of hydrocarbons and carbon dioxide is reduced. The main purpose of the project is to test the HHO gas on the IC engine and to calculate the amount of increase in the efficiency of the engine.

3.3.5 Fridge Without Electricity

Gaurav Kajbaje, Kapil Patil, Vivek Patil, Prof. Nilesh Gaware

This design aims to take on the problem of food storage in areas with poor access to electricity. The goals of our alternative food preservation unit are to provide less expensive modern refrigeration methods, to not require any electricity grid, to incorporate the unit into the regions of poverty where it is most needed.

In our process wind blows warm air through a funnel and injects it into a copper tube. This copper tube directs this warm air into the underground where it cools down. It is then a coiled passed through a evaporation chamber where the air again cools down. This cooled air can be supplied to the insulation chamber where the consumables can be kept for cooling.

It is a design which is absolutely sustainable as it does not consume any conventional power. As it doesn't consume any electricity the energy expenditure on electricity of rural people also reduces. We believe we have come up with a project can change the world of those who need it.

3.3.6 Experimental Setup For Analysis Of Two Phase Fluid Flow

Ammar Qazi, Pankaj Nemade, Aditya Rokade, Runal Naik, Dr. N. M. Rao

Multiphase flow is the simultaneous flow of different phase, the simplest case being the two phase flow which is sometimes referred to as two-component flow in which the phases do not consist of the same chemical substance. Our Project is based on capturing different flow regimes of two phase flow such as bubbly flow, plug flow, stratified flow, wavy flow, annular flow by using high speed camera particularly for visulaising two component flow consisting of air and water. For this an experimental setup which consists of three acrylic pipes of 2, 4 and 6 inches respectively aligned horizontally and vertically so that fluid regimes can be captured in the vertical pipes. Ball valve,

Gate valve, Needle valve ,etc are required to control the flow. Based on different proportions of air and water as measured by Rotameter, the pressure difference is measured using differential pressure transducer. Mixing of air and water take place in sparger which results in the formation of bubbles in the pipes, the differential pressure to be measured between two points is done by using differential pressure transducer which is then displayed on the monitor screen.

3.3.7 Sustainable Green Building

Kenith Almeida, Jason Rebello, Sarthak Kulkarni, Prof. Hemant Hogade

Sustainable green building is a holistic approach to make a commercial or residential building environment friendly and reduce the overall carbon footprint of the building. We are concentrating on the energy aspect of the building. We are focusing on "NET ZERO" concept where the energy is produced on site and used on site and dependency on grid is during extreme weather condition, hence the total input and output is zero. We are focusing on solar power and energy conservation methods to make "A" wing of DBIT campus. The methodology includes auditing reducing consumption and applying engineering solutions to the building. The final report will contain financial aspects of energy generation on site and return on investment that can be achieved by the investor in the building.

3.3.8 Studies on Two Phase Natural Circulation Loops

Sarita L. Gudewar, Ojas S. Haldankar, Prof. (Dr.) N. M. Rao

Natural circulation loops (NCLs) are prone to subject to oscillations during start-up and shut down operations including steady state operation. In some other situations, they will be subjected to dynamic situations when any one of the fluids inlet temperature varies with time. These oscillations may be augmented if the NCL is operated in two phase. In the present proposed project first it is aimed to study the steady state behaviour of two-phase natural circulation loop with heat exchangers at the hot and cold ends and the dynamic properties of the loop with two phase by imposing excitation at hot fluid inlet temperature theoretically. A vertical rectangular loop with uniform cross section is considered along with the two concentric heat exchangers placed along the horizontal bottom and top sections of the loop. A one dimensional theoretical model is developed for steady state, non-dimensionalized and solved simultaneously (Momentum and energy equations) through guess and correct procedure. We are designing and fabricating the set-up to validate the results obtained theoretically.

3.3.9 Parametric Study of the factors influencing Earth Air Heat Exchangers (EAHE) using CFD

Leon Rodrigues, Glenn Monteiro, Brevin Nazareth, Siddharth Ghosh, Prof. Babita Devdas

An Earth air heat exchanger (EAHE) utilizes the property called thermal inertia of the soil surrounding or beneath the building in order to pre-heat or pre-cool incoming ventilation air. With the grounds large thermal capacity and relatively stable temperature, outdoor temperature variations are dampened and ventilation heating and cooling loads are reduced. The objective of our project is to perform a parametric analysis using CFD by varying the parameters such as length, velocity, diameter and pipe layout to get better thermal performance. The model developed is validated against an experimental setup installed in Bhopal. The simulated results were in close agreements with the experimental observation. The developed model would then be coupled with a case study in order to determine its performance.

3.3.10 Design of Solar Operated Portable Biometric Machine

D.Ganeshkumar, Prajyot Ghorpade, Prasoon Shelke, Pranav Chikorde, Prof. Nilesh Gaware

Our project aims at designing an student attendance system which could effectively manage attendance of students at Don Bosco Institute of Technology. We are modifying the existing Biometric machine to a portable Biometric Machine. This will help us to save time and minimise error while taking student attendance. To charge the Battery of Portable Biometric Machine we are using the solar panel so as to save electricity. Selection of Biometric machine was done as per our college server requirement. We developed the algorithms for our college schedule. We calculated the energy required to run the machine. Suitable panels, charge controller, battery and voltage regulator were selected as per our load requirements.

3.3.11 Waste Heat Recovery from Kitchen

Swarupa Suroshe, Rejin Jacob, Vinoy Varghese, Yogesh Yadav, Prof. Clea Augusta Pereira

Commercial kitchens waste large amounts of low-grade thermal energy, through the exhaust gases. Sustainability and energy conservation is the need of the hour. Waste heat recovery is a novel technique for sustainable and energy efficient solutions. However, waste heat recovery from low-grade heat sources has been a great challenge. The project aims at developing an efficient system, to recover the heat from exhaust gases in a commercial kitchen. In order to determine the quality and quantity of heat wasted, various commercial kitchens were surveyed. Plate-finned tube heat exchanger is designed, to recover the wasted heat. CFD analysis with different tube sizes and different flow rates are conducted to select the best alternative. The proposed system has been fabricated and experiments are being conducted to optimize the system for commercial use. This waste heat recovery system can be easily amalgamated with the existing kitchen exhaust system.

3.3.12 Heat Operated Portable Cooler

Prathamesh Manjrekar, Sagar Varandekar, Sujit Wani, Saurabh Yeole, Prof. Pavan Kulkarni

Use of thermoelectric modules for cooling and power generation is being seen as one of the important field in energy engineering because of the features provided by them such as long life, zero maintenance, light weight, etc. These modules can run on cheap fuels for power generation like biogas, plant waste, coal, vegetable oils, which are also sustainable. The modules, if used for refrigeration, have advantage of zero ozone depletion potential, zero noise and zero vibration, over conventional vapour compression. Since sustainability is major concern of the day, the applications of thermoelectric modules will contribute towards this. The present work describes use of thermoelectric module as refrigerator and electricity generator. It presents design procedure for constructing thermoelectric refrigerator of portable type and thermoelectric power generator of small capacity. In this work, both equipments are analysed for various conditions such as change in voltage, change in current, change in cooling methods, change in temperature difference etc. The work also deals with economic and sustainability aspects of the equipments. It also compares these equipments with conventional.

Chapter 4

Electronics & Telecom Engg.

4.1 RF & MICROWAVE

4.1.1 Design and fabrication of amplifier and coupler in GSM band

Richa Anmadwar, Abraham Joseph, Aniruddha Kulkarni, Himanshu Shekhar, Prof. Freda Carvalho

The signal received by mobile phones in an indoor environment is inescapably attenuated due to the surroundings. As a result a subscriber may experience unclear voice calls, call drops, excessive disturbance or absolute disconnection from the service. To overcome this problem an electronic device is needed which can improve the received signal strength indoors. A repeater system operating in the GSM band (880MHz-960MHz) picks up the attenuated signal, amplifies it and retransmits in the surrounding medium, providing optimum level of signal for flawless mobile phone operation. The scope of this project tends to the design of a coupler and a power amplifier for such a repeater system. The coupler divides and directs the received power to the up-link and down-link channels allowing the same antenna to function as a transmitter and a receiver. The power amplifier provides appropriate gain for the signal power to compensate for the losses which attenuate the signal and makes the signal usable for proper communication.

4.1.2 Design, Development And Integration Of High Q GSM Filter For Active Repeaters.

Farrelcloyed Barboza, Jolton Fernandes, Rugved Gole, Akash Panigrahi, Prof. Ashwini Kotrashetti

In indoor environment, we see that the GSM signals are weak. This problem is also faced in indoor environment of DBCL campus. To rectify this problem and for providing uninterrupted connection, we are designing a filter operating in the GSM band (ie.890-915Mhz Uplink and 935-960 MHz Downlink). In this project, we aim to design a cavity filter for High Q GSM band for active repeater system that serves the problem of poor cellular signal connectivity by picking up the filtered cellular signal from an outdoor antenna placed in a good signal strength region and re-radiating it in indoor environment using indoor antenna. The filter developed will allow only the required frequency to pass so that there is less noise available at the mobile receiver. Indoor call drop will be reduced substantially and aim to have an ideal condition in indoor environment will be achieved.

4.1.3 Design & Implementation of Multiband Microstrip Patch Antenna

Rose Basi, Glenn Rodrigues, Blaisey Soj, Vineet Suvarna, Prof. Naheed Anjum Khan

Different frequency bands are used in wireless communications that have driven the demand of antenna to operate in multiband frequencies. To provide the needs of data access at high speed with various standards, a multiband antenna is proposed which supports various applications in wireless communication systems. The proposed work describes the design implementation of a multiband antenna operating in 3 different frequency ranges i.e. WLAN-2.4GHz, GSM-930MHz, GSM-1.84GHz. U slot is used with L probe feeding to enhance the performance of the proposed antenna. The proposed antenna is designed using 3D HFSS software. Various measurements of performance parameters of proposed antenna are done using Vector Network Analyzer (VNA) after fabrication. A comparative study between the performance parameters of simulated and measured results are done.

4.2 Embedded Systems & IOT

4.2.1 Intelligent traffic monitoring system

Darshit Modi, Pratheep Kumar, Vivek Rao, Prof. Aparna Telgote

This project will illustrate the convenience and versatility of an automatic toll plaza system using RFID technology and its advantages over toll plazas using other techniques. A vehicle will hold an RFID tag. This tag is nothing but unique identification number which will be registered along with other information such as vehicle number, owners contact, personal info, amount balance, no. of trips at toll (for transparency), etc and this database will be maintained efficiently. Once the vehicle crosses the RFID reader the toll will be deducted from the owners prepaid account. If owner does not have sufficient balance still he can use the toll plaza but toll will be deducted (negative balance) and warning will be given to the vehicle to recharge their tag. Automatic toll plazas can eliminate this wastage of time, fuel, congestion of traffic and will ensure a smoother travel experience for the travellers.

4.2.2 Designing and Building a Cartesian Multicolored 3D Printer

Aheli Das, Chris Fernandes, Dalyn Fernandes, Davis George, Prof. Sudhakar Mande

This project describes the building and the implementation of a multicolored, Cartesian 3D printer. The principle of a Cartesian 3D printer is that it uses three axes namely, x, y and z. In a multicolored 3D printer, we make use of a Diamond nozzle extruder with 3:1 input to output. Stepper motors with step Angle 1.8 degrees are used to rotate the threaded rods which move the extruder in the three respective axes. The software used is Arduino IDE and the firmware used to interface is Repetier. Repetier accepts pre-processed cartesian data points and transposes the appropriate programmed printing commands to the motors unit. The software SolidWorks is used as a computer aided design tool. An object having height 150 mm, width 150 mm, length 230 mm is the expected outcome. This prototype prints using polylactic acid (PLA) filament. Additionally, a display screen updates every second the: printing time, extruder temperature, and status notifications.

4.2.3 Design and development of PC based Multichannel Data acquisition system

Aakash Gandhi, Anjali Gupta, Gayatri More, Prof. Yogesh Gholap

A Data Acquisition System (DAQ) is a collection of hardware and software that lets the user to measure physical values of the real world parameters. In this project of multichannel data acquisition system, our main aim is to make a real time and cost-efficient DAQ system with 32 input channels

which is capable of reading all the inputs, say from various sensors, one after another and providing output voltages with high precision. In order to read from 32 input channels with high precision, we are using eight 24-bit ADCs (ADS 1220), with each providing upto four input channels, and providing output voltages with a resolution of 2^{24} . Further, it has to be interfaced with the Arduino through the SPI protocol. Also, a PC-based Graphical user interface will be designed for data logging, channel selectivity and for displaying the output values from the 32 channels.

4.2.4 Design & Implementation of Child Security System

Cassandra Dsouza, Supriya Murkar, Anjanette Raj, Dhanshree Rane, Prof. Namita Agarwal

Crime against children has been increasing exponentially. There have been several unfortunate instances reported in the media about callous approach by certain schools with respect to the safety of school children during transit to and from the school. This has generated a deep concern regarding the safety of school children. The safety of school children is the most significant component encouraged to precede with the support of advanced technology. This project focuses on designing a child tracking system for every child attending school. The project will be implemented using 8051 microcontroller, GPS, GSM and a panic button along with an RFID tag and reader. An RFID reader along with 8051 microcontroller and GSM will be placed in the school/bus. The parents have an android application on their mobile phone in order to trace the location of their child. Hence this system would provide a affordable solution for security of school-going children.

4.2.5 Design and Prototyping Of Biomedical Signal Integrator For e-Health Applications

Pereira Hanston Henry, Tharappel Jovanna Cyril, Prof. Jithin Saji Isaac

In this project, ECG (Electrocardiogram) signal is obtained from the human body by using AD8232 module and pulse oximeter reading is obtained by using MAX30100 module. These readings are then interfaced with the ESP 8266 Wi-Fi Module. Using Internet of Things, these readings will be published on a website. Each patient will be provided with a unique username and password. The patient and family members will be able to view and monitor the data remotely. Availability of past data will help to create a viable database for accurate diagnosis and treatment.

4.3 Signal Processing

4.3.1 Cryptography using Artificial Neural Network

Dias Selena Wilson, Kumbhar Tanmay Vaibhav, Menezes Tyrel Jonathan, Pinto Caroline Harold, Prof. Pratibha Dumane

Cryptography is secured exchange of information among users without leakage of information to others. Public key cryptography techniques which are based on number theory have the drawback of requirement of large computational power, complexity and time consumption during generation of key. To overcome these drawbacks, neural network is the best way to generate secret keys. Complex computations can be easily performed with ease using neural networks. The objective is to investigate the use of Artificial Neural Network (ANN) in the field of cryptography in two ways: 1) ANN based n-state sequential machine and 2) Chaotic neural network. The paper includes experimental results and complete demonstration that ANN based n-state sequential machine and chaotic neural network are used to perform cryptography successfully.

4.3.2 Brain Tumour Detection and Stage Identification

Ladage Ashish, Shedje Sejal, Singh Siddharth, Tresa John, Prof. Satish Chavan

The incidences of cancer detection have been growing rapidly in the last two decades. The radiologists are analyzing the tumours intuitively using their expertise and correlating it with the histopathological reports (HPR). The analysis and grading of tumours are crucial and essential in cancer patient management system for treatment planning and prognosis. The proposed project work deals with the analysis of tumour and its grading using image processing algorithms. The system used K-means clustering, Fuzzy C-means clustering, and level set method to segment the tumour. The features of segmented tumour are extracted using discrete wavelet transform (DWT) and Gabor wavelet (Gabor) in order to classify it in grade 1, 2, 3 or 4 using neural network. The grading may help physicians to prioritise the treatment plan with better patient management. The segmentation accuracy and classification efficiency will be estimated using sensitivity and specificity measures and correlating the analysis with HPR and diagnosis by radiologist.

4.4 Communication & Networking

4.4.1 Design and Implementation of Light Fidelity (Li-Fi) System

Sneha V. Jadhav, Yogita V. Kore, M.K. Vishnu, Suchit R. Shinde, Prof. Poonam S. Chakraborty

Li-Fi (Light Fidelity) is a recent and promising technology which is used for short range, high speed wireless data transmission. LI-FI is a part of the VLC (Visible Light Communication) as it is implemented using white LEDs. In this project we are going to design an inexpensive transmitter and receiver using VLC system. The performance evaluation is done under the effect of natural and artificial ambient light noise sources. Also the effect of transmission distance with respect to optical power, photo sensitivity and correct reception of data will be investigated. The transmission and reception will be done using OOK (On-Off Keying) modulation and demodulation techniques respectively. The rapid change of intensity of light due modulation cannot be recognized by the human eyes. The rate at which the intensity of the LEDs change should be directly proportional to the sensitivity of the photo detector. We can also transmit voice and data signals using this technology.

4.5 Renewable Energy (SOLAR)

4.5.1 Design of an Electronic Load for plotting I-V characteristics of photovoltaic modules

Melroy Cordeiro, Shrikanth Deivendran, Prof. Jithin Isaac

The project includes an electronic circuit for testing Photovoltaic (PV) modules or strings by tracing their I-V and P-V characteristics. The project provides a cheap and effective solution for consumers and professionals to trace the I-V characteristics and measure the efficiency of the solar modules in open field conditions. The project consists of a fast varying electronic load based on a power MOSFET which is controlled by means of a sweeping gate-source voltage. Design equations giving the MOSFET rating and gate voltage range for obtaining a specified portion of the PV panel characteristics are used. With additional signal processing, the maximum power available from the panels and the corresponding current and voltage values are obtained. These current and voltage values are then plotted to obtain the desired IV curve which is displayed on a LCD screen.

4.5.2 Accelerated Testing of Solar Modules

Sarvesh Bhosale, Vaishnavi Kawthankar, Prof. Ashwini Kotrashetti

Micro cracks in solar panels, have been studied as a cause of solar module degradation, with root causes being thermal and mechanical stresses. The objective is to develop a system that will simulate the vibrations experienced by the solar panel during transportation or in the field, after installation. The system shall determine the threshold level of acceleration experienced by the module, above which the solar panel will start developing micro cracks. The system shall also have a programmable logic controller to enable system operation, a wireless control system, a backup system and a data acquisition system to collect the acceleration sensor data along with remote data storage.

4.5.3 I-V Tracer For Photovoltaic Module

Sanchit Mhatre, Nikhil Shinde, Prof. Yogesh Gholap

I-V Tracer is all about a new high-speed system, measuring a maximum power point (MPP) of photovoltaic (PV) modules by using the microprocessor and the capacitor for the load. This system features the function of data acquisition (DAQ) for monitoring and evaluation of PV module performance. I-V curve tracing method reveals more information about the performance of PV module or array, than any other measurement method. It is a standard tool used by electrical contractors and solar installers in the commercial and utility PV industry.

4.5.4 Detection and Classification of Microcracks in Solar Panels

Natasha Mathias, Farheen Shaikh, Sweekrithi Shetty, Chirayu Thakur, Prof. Satishkumar Chavan, Prof. Rajbabu Velmurugan

The increasing demand for solar electrical energy has translated into an increased use and production of solar cells in the recent years. In the view of the inspection and grading processes continue to be manual or semi-manual, this project work proposes the methodology for detection and classification of micro-cracks automatically using Electro-luminance monocrystalline and polycrystalline images. The proposed work involves contrast enhancement and feature extraction of these solar cells using Stationary Wavelet Transform and Discrete Wavelet Transform. The solar cells will be then classified based on extracted features into various modes by using a classifier such as support vector machine (SVM) and artificial neural network (ANN). The detection efficiency of the proposed system is 99.38% and 99.99% for SVM and ANN, respectively. The system may be useful in the estimation of the percentage damage to solar panel, degradation of power yield or life of solar panels.

4.5.5 Study of Impact of Solar Cell Mismatch on performance of PV Module using PSpice

Harshada Khandagale, Daniya Quadros, Dr. Sudhakar Mande

This project presents a methodology to minimize the impact of IV mismatch between various Photovoltaic cells. This is achieved by various binning techniques. For this purpose Dev C++ program is used to extract the parameters of solar cell module constructed using diodes. Extracted parameters are used in PSpice simulation program to obtain IV characteristic as well as power efficiency. The binning is done based on the efficiency obtained. Thus, a module with optimized efficiency is created using the cells from these bins. Further, the ideal power output is compared with the summation of practical power output of all cells to obtain the mismatch factor. This project can

be used to verify diode parameters, select an efficient cell sorting technique and finally calculate the mismatch of the entire cell module. We have used PSpice Simulation Software to validate our results.

4.5.6 Circuit Simulation Model for Large number of Solar cells

Baibhav Kumar, Pravin Yadav, Dr. Sudhakar Mande, Dr. Anil Kottantharayil

This project describes a methodology of extraction of various parameters of solar cell using experimental I-V data collected over large number of solar cells under different conditions. Parameters are extracted from Dark I-V data and illuminated I-V data. Python programming Language is used to determine the parameters of Solar cells. Various toolboxes (mathematical libraries) are used to calculate and solve equations within the program. Extracted parameters are used in Pspice to simulate the I-V data. Simulated I-V data is compared with the experimental I-V data to validate the extraction methodology. Any mismatch between experimental and simulated data is used to recalibrate the extraction process. This process of recalibration is repeated until the extracted parameters fall below a predetermined tolerance value. Expected error between simulated I-V data and experimental I-V data is less than 5%.

4.6 Sustainability

4.6.1 Implementation of an efficient noise and air pollution monitoring system using IOT

Renita Alva, Calvin D'souza, Manali Nagwekar, Darren Pais, Prof. Gejo George

Due to rapid growth in infrastructure and industrial plants, air and noise pollution is increasing everyday. Therefore it is very significant to have a system which efficiently monitors the air and noise pollution. In this project we are proposing a system which can efficiently monitor the air and noise pollution levels using Internet of things technology (IOT). This project aims at testing few parameters such as Carbon monoxide (CO), Particulate matter (pm 2.5), noise, temperature and humidity for a particular area of interest. The system is evaluated using some prototype implementation consisting of ESP 8266, sensors and Arduino software with ESP 8266 support package.

4.6.2 Implementation of Low Cost Automation for Water Treatment Plant

Samita Anvekar, Piyush Nandankar, Umesh Pendurkar, Prof. Madhavi Pednekar

Pure drinking water is a basic human need. It should be pure, free of microorganisms and should be treated before consuming. Water treatment plants treat the raw water and provide safe drinking water to mankind. Automation is a key to water purification system. Conventionally, Programmable Logic Controllers (PLCs) have been used for automation of water treatment plants. This project focuses on cost-effective measuring, monitoring and control system for Water Purification by using Arduino Uno as an effective alternative to PLCs for automation. This involves measurement, monitoring and control using various sensors and motors. One of the major objectives of this project is to test the quality of drinking water by measuring and monitoring its important parameters like pH, Turbidity and Temperature. Then we will analyze the performance of the measured parameters for various water samples. This project will provide a low cost measuring and monitoring system to decide the quality of drinking water.

4.6.3 Near Real Time Sensing System for Hydroponics based Urban Farming

Balaji Dontha, Naru Jai, Dr. S.S. Mande, Dr. Amiya Tripathy

Urbanization drives and alters various aspects of a place. It affects a common man's living style. As the population goes on increasing within an urbanizing area, the resources to adequately maintain their needs decrease. Due to scarcity of space and clean water, sustainability of these resources with time will be difficult. People in urban areas desire to have a small garden (e.g. Balcony Garden) as well as want to have healthy and clean food resources. An automated (or remotely monitored) IoT based system which utilizes optimum space by supporting plants for promoting the modern agriculture (e.g. Hydroponics) in urban areas or living spaces is needed. Parameters such as temperature, humidity, amount of light and pH values are monitored through sensors over a period of time to determine the best ambience which promotes and accelerates the growth of the plant. Automated encasing of the system is implemented to promote the growth of the plants in unfavourable conditions. The status of the plants and other parameters like temperature and light can be monitored/ controlled through a mobile application.