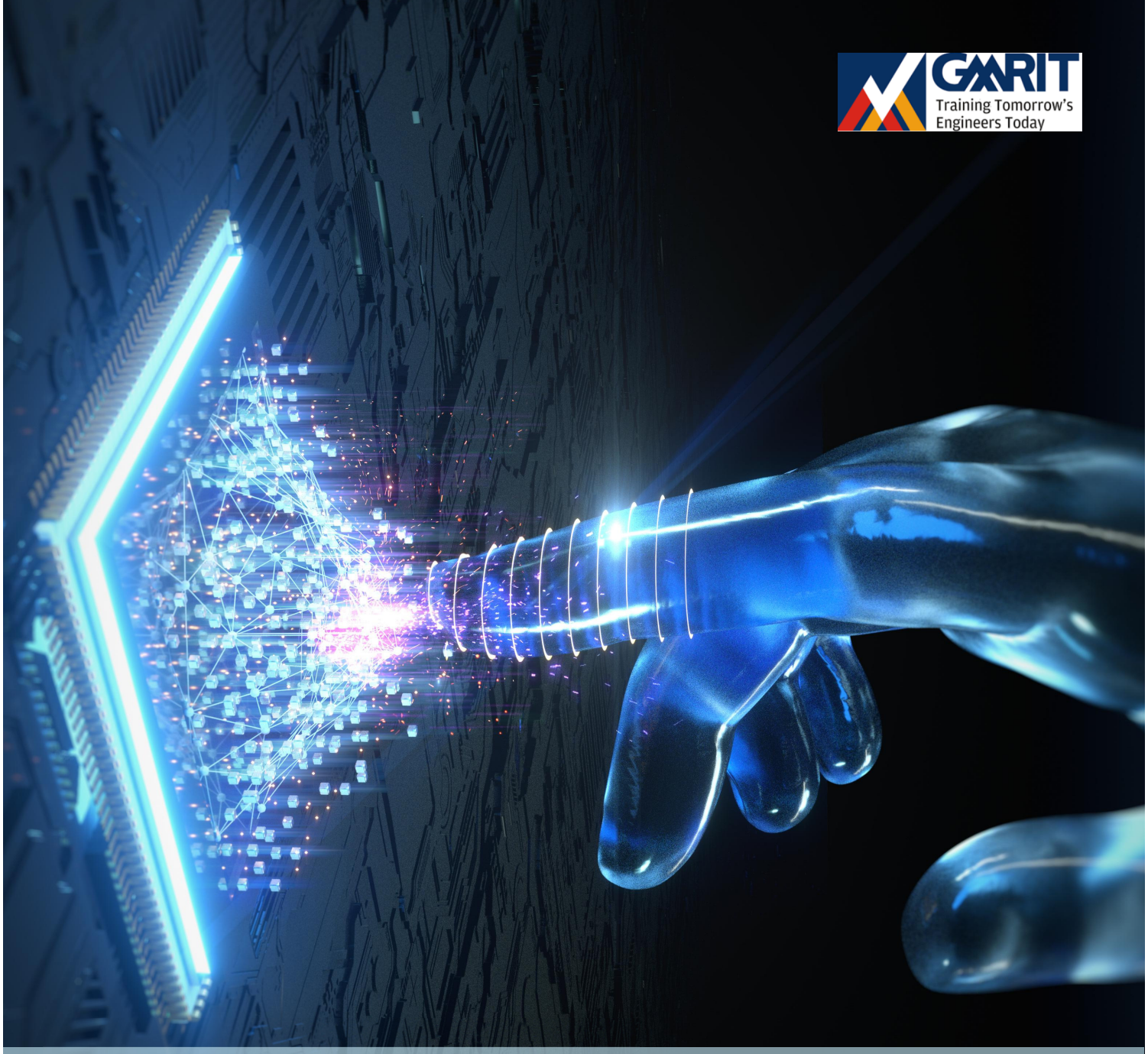


GMRIT Training Tomorrow's Engineers Today

GMRIT TECH MAGAZINE

TECHMAG 2K22

VOL- 10

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MESSAGE FROM EDITOR



It gives me immense pleasure in bringing out the college TechMag 2022 successfully. We put forward the dynamic piece of the talents, ideas, skills and enthusiasm of the students across the institute with the support of esteemed faculty in the last year. TechMag 2022 is more than a technical magazine where the potentials, achievements of the individuals and the institute and vision and mission of GMRIT are reflected. This is the purpose and positive drive behind the magazine. The vision and mission of GMRIT plays a vital role in the life of young engineering graduates learning both knowledge and wisdom, which empowers them holistically for their bright future. I would like to thank all TechMag 2022 Committee i.e., faculty and student coordinators for their support in collection, revision of the articles and designing the magazine. This contribution required generous time and effort. I would like to express my deep gratitude to our Director Dr. J. Girish and Principal Dr. C.L.V.R.S.V. Prasad for their constant support and encouragement for making out the TechMag 2022.

- Dr. S. V. N. Pammi
Associate Dean- R & D.

MESSAGE FROM DIRECTOR

It gives me immense pleasure to present TECHMAG 2K22 brought out by the students of GMR Institute of Technology. The magazine covers the focused research areas of the students from various branches of engineering under the guidance of distinguished faculty members. It helps the junior students to know about the emerging areas in science and technology and thereby choosing minor and major projects. It enables the students to choose and interact with the faculty members based on their areas of interest as their guide. I am happy to mention that the areas covered are extensive and various emerging fields like real-time multi-disease prediction by using deep learning techniques, MIMO antenna for 5G applications, pantographs, smart water supply system, metal matrix composites through powder metallurgy, synthesis of hydroxyapatite from Labeo Rohita fish scale for biomedical applications etc. The magazine articles illustrate the agility of GMRIT students and distinctiveness of faculty members for guiding the students to learn and become expertise in the niche areas. I congratulate the editor, student coordinators and faculty members for bringing up this excellent magazine. I appreciate all students who have contributed their articles.



- Dr. J. Girish
Chairman, Governing Council, GMRIT
Director Education, GMRVF.

MESSAGE FROM PRINCIPAL

I am very glad to share that GMRIT is keeping up its tradition of bringing "TECHMAG" A technical annual student's magazine with a prime objective of creating a platform to share and bring out innovations in the Technology among the peers. The young engineers need to take lead in providing technical solutions for the sustainability and development of the society maintaining the innovative ecosystem. Targeting this TECHMAG gives an opportunity to the young talents to exchange novel ideas and global trends in the technological arena in the form of articles. I am greatly impressed that since its inception in 2010, TECHMAG is giving the Young engineers a consistent opportunity to contribute and develop their technical writing skills. I convey my best wishes to the editorial board and the students who have contributed to this addition of TECHMAG.



- Dr. C. L. V. R. S. V. Prasad
Principal, GMRIT.

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SMART ATTENDANCE BY FACE DETECTION USING YOLO-V3

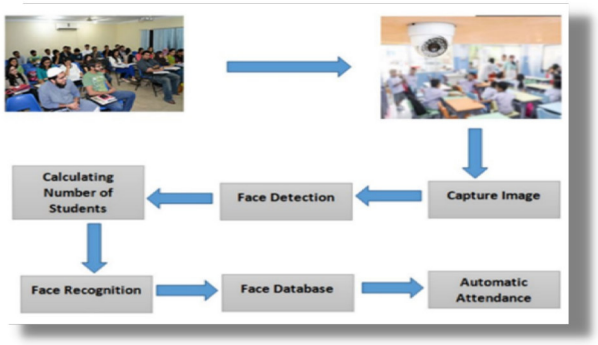
K. Venkata Sai - 19341A0570, K. Akhil Abhilash - 19341A0577, M. Ganesh - 19341A05A4K. Anirudh - 19341A0585, L.B. Abhishek - 19341A0592

Introduction

Water scarcity in the present world is a major concern to be concentrated upon. As per the growing population, the demand of fresh water is rising high and is needed to be satisfied with the constant supply and its conservation to be taken place simultaneously. Thus, in order to meet the same, this model has been designed aiming at the automatic bill generation system during the supply of water to any particular household and on the other hand treating the grey water being produced from it. This project helps to regulate the proper maintenance of water tank information to monitoring section with proper updation of records. The problem affects various processes in water management, such as water consumption, distribution and the water dust formed in the water tank. These problems can be overcome by implementing proper monitoring system and information update system. Set of sensor like Turbidity, Salt sensor, pH sensor and Water flow sensors were used. These sensors inform about the water level in the tank and communicate to the monitor section. To maintain the tank without bacteria and microbes the Chlorine powder is sprayed, if there is any changes in the pH value is found. If the water level reaches its minimum position the motor automatically starts and when it reaches the maximum level the motor stops automatically. A wireless sensor network (WSN) is formed by connecting two and more water tanks using a RF radio channel transceiver along with a monitoring section.

Methodology- About YOLO

You only look once (YOLO) is a state-of-the-art, real-time object detection system. YOLO is an algorithm that uses neural networks to provide real-time object detection. It has been used in various applications to detect traffic signals, people, parking meters, and animals. This algorithm is popular because of its speed and accuracy. On a Pascal Titan X it processes images at 30 FPS and has a mAP of 57.9% on COCO test-dev. In mAP measured at .5 IOU YOLOv3 is on par with Focal Loss but about 4x faster. We employ the YOLO V3 method to detect faces, which is often used to detect objects (almost 9000), but we adjusted it for face detection in this study.



Residual blocks: First, the image is divided into various grids. Each grid has a dimension of S x S.

Bounding box regression: A bounding box is an outline that highlights an object in an image. Every bounding box in the image consists of the following attributes: Width (bw), Height (bh). Class (for example, person, car, traffic light, etc.) represented by the letter c. Bounding box center (bx, by). The bounding box IS represented by a yellow outline.

Intersection over union (IOU): Phenomenon in object detection that describes how boxes overlap. Each grid cell is responsible for predicting the bounding boxes and their confidence scores. The IOU is equal to 1 if the predicted bounding box is the same as the

real box. This mechanism eliminates bounding boxes that are not equal to the real box.

Work Description

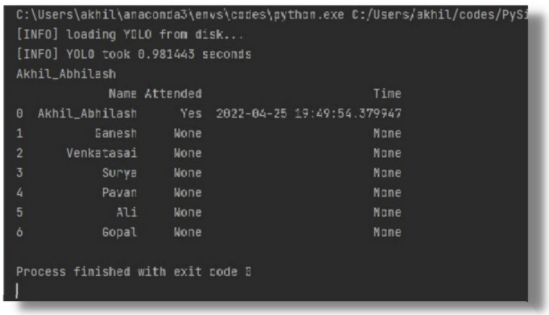
Create a Dataset: Dataset would be created by using huge amount of collected data with labels for the YOLO format and generated with the help of GPU using darknet.

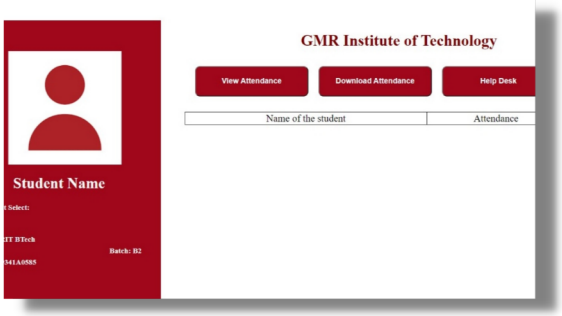
Auto Labelling: Auto labelling is a feature found in data annotation tools that apply artificial intelligence (AI) to enrich, annotate, or label a dataset. Tools with this feature augment the work of humans in the loop to save time and money on data labelling for machine learning.

The project focusses on providing attendance through a picture taken by the camera in the classroom and detection of faces in the images later giving the validation. Using the YOLO algorithm for the detection of multiple faces or objects at a time which reduces the work of scanning each person. The generation of the custom dataset needs much of images per class and the work is completed using darknet 53 - A convolutional neural network-based algorithm. The training of the input images needs a proper computation speed with GPU for better training. After creation of weights, a picture taken by camera will be checked for attendance and the detected faces will be checked with local database. If there exists the same label as detected then attendance is marked yes and the time and date are also noted. A web interface model was deployed where students and the faculty members can access the attendance and options were given to faculty to change or modify the details of the students. Whereas the students can view their attendance profile, attendance excel sheet can be downloaded from the given web interface. The main aim of the work is to reduce the human services in the process of marking attendance in classrooms which is time consuming and has very less chances to manipulate the E attendance. YOLO being one time detection, would be able to provide better and more accurate in the sense of capacity and time complexity.

Conclusion

This research demonstrated a face recognition- based class attendance system using the YOLOv3 deep learning algorithm. This system required that each listed student photograph himself in front of a web camera. The inferential image was then automatically recognized by the facial recognition model. To automate and monitor the attendance system, this system was built and implemented in a real-time context. The main purpose of automatically taking attendance is to address a flaw in the traditional system, which is time consuming and results in proxy attendance and paper waste. We attempted to eliminate all problems in this project, and attendance will be recorded in a classroom using a webcam. Students are counted, and faces are recognized in images and automatically gives attendance.





A REAL TIME MULTI-DISEASE PREDICTION FRAMEWORK USING DEEP LEARNING TECHNIQUES

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Introduction

The living habits and environmental conditions of human beings are continually changing as society and technology advance, which increases people's hidden hazards of various diseases. The food we consume, the people with whom we share the shelter, or the environment in which we live will somehow affect people's health conditions. Major diseases such as malaria, diabetes, cancer, heart disease, and the covid-19 virus, which has been destructing the whole world for the last two years has a huge impact on this world. A total of five models are proposed in this work with five different diseases respectively. To detect covid-19, we use transfer learning, the process of using the already trained models by directly importing their weights and biases from the Keras applications package to reduce the computational time for building and training the model. A convolutional neural network is used to detect malaria and skin cancer. Gradient boost and Logistic Regression combined with a random forest model are used for heart disease prediction, a machine learning model for diabetes prediction. These models are finally integrated with the help of a backend python framework called Flask. The dataset is initially loaded and is pre-processed into the required format. The pre-processed dataset is then split into train and test sets where the train dataset is used for training the model and the test dataset is used for the evaluation of the model. The features are then extracted from the train dataset using various feature extractors and the resultant features are then used for detecting the disease. The developed model is evaluated using test dataset and the process of regularization is then carried out for making the developed model more reliable.

COVID

The dataset is loaded directly from the Kaggle Kernel into a new notebook. The dataset is equally segregated into training and test sets using stratify parameters. After processing the data set using the training and test sets, the best algorithm with the highest accuracy is chosen. The imbalanced dataset is converted to a balanced dataset with the help of the Synthetic Minority Oversampling Technique (SMOTE), utilizing the K-nearest neighbor algorithm. The transfer learning method is used for model building. The VGG-16 transfer learning model is used as the base model by freezing all its layers and importing the weights directly from the imagenet.

MALARIA

As mentioned for covid-19, the same process is followed. Blood smear images are used to determine the presence of the disease. The dataset contains images of both malaria infected and uninfected people. It is then divided into train and test sets using the train-test split of sklearn pre-processing library. A Neural network-based deep learning model is used for the classification of the given images into uninfected and parasitized images.

HEART DISEASE

A machine learning-based model is used to detect heart disease in patients by considering factors such as age, gender, type of chest pain, resting blood pressure, cholesterol, an. The data is acquired from the Cleveland dataset, which has 1,190 records in CSV (Comma-Separated Values) format.

The model is built by combining the Random Forest Classifier and Logistic Regression Models. The entire dataset of 1,190 images is segregated into train and test sets, with the training dataset being utilised for model training. The performance of the trained model is determined by testing it against the test dataset. Here, the random forest algorithm is used for the extraction of features from the dataset and the extracted features are then passes to the logistic regression model for the prediction.

SKIN DISEASE

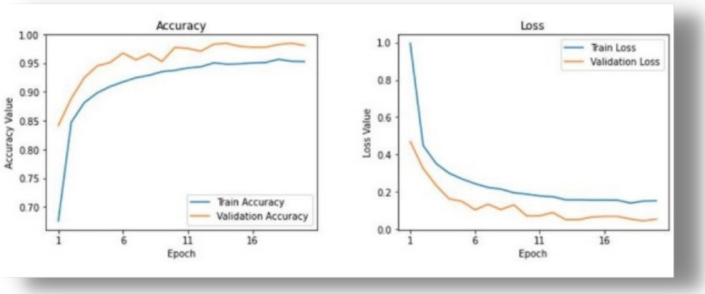
The detection of skin cancer in the given skin images is performed using a CNN-based neural network model. The Skin Cancer ISIC dataset, which contains 2,357 pictures is used. Images of pigmented benign keratosis, melanoma, vascular lesion, actinic keratosis, squamous cell carcinoma, seborrheic keratosis, dermatofibroma, nevus, and basal cell carcinoma are included in the dataset. Data augmentation techniques are used to enhance the amount of the dataset, and the resulting data is utilized to develop the model.

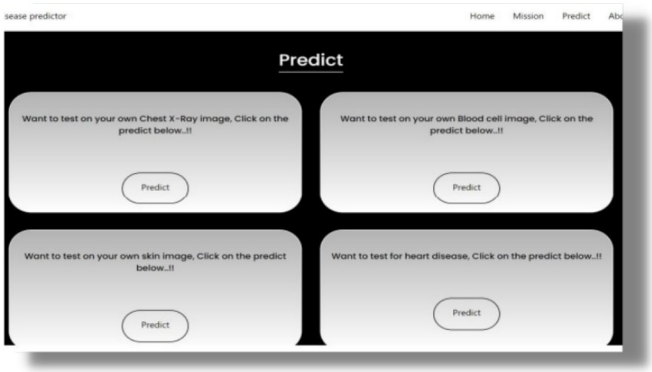
DIABETES

The Pima Indians dataset is used to develop the model for detecting diabetes. Features such as pregnancies, glucose, blood pressure, skin thickness, insulin, BMI, Diabetes pedigree function, age, and outcome are all included in the dataset. Based on the values for the various features, a Random Forest based classifier is employed to identify diabetes in patients. The data is first fit to the Random Forest classifier. The resultant output is encoded using the one-hot encoder. This encoded data is then fit to the Logistic Regression model to get the final output. The training dataset is used to train the machine learning model, while the test dataset is used to assess its performance. Metrics used to evaluate the model's performance are accuracy, precision, recall, and f1-score.

Conclusion

Through this project, we come up with a web application that is built by combining multiple models and thereafter a graphical user interface is designed as a communication channel between the model & user. We implemented models for a total of five diseases - Covid-19, Malaria, Heart Disease, Skin Cancer, & Diabetes. We experimented with a combination of a transfer learning model and a custom-built model, which turned out to be successful and comparatively improved with already existing models. Unlike the existing models, in this work, we emphasize hyperparameter tuning and portability to be the most important features that contribute to the improved accuracy and performance of the models. The metrics used for evaluation are accuracy, precision, recall, and F1-Score. The accuracy scores for the Covid-19 radiography dataset, cell image for detecting malaria, Cleveland dataset, Skin Cancer ISIC, and Pima Indians dataset are 92.14, 92.74, 93.0, 93.36, and 90.25 respectively.





WHEELCHAIR MOVEMENT THROUGH EYEBALL RECOGNITION USING RASPBERRY PI

P. Akhila- 18341A1235

Introduction

The goal of this study is to suggest a method for controlling a wheelchair using ocular localization. By reducing both costs and complexity, an algorithm provides an efficient method of processing data. During this project physical features of the pupil and eye were taken into account, as well as pixel values from nearby areas, since the purpose was to track and detect eyeballs in real time. Localization of the eyeball is used in a variety of applications, and many algorithms have been developed to easily achieve the results that are desired. We had to develop an algorithm specifically designed for this application, since none of these algorithms could be implemented on controllers with limited RAM speed. Another objective of this project is to build a hardware assembly to remotely control an eyeball by observing its position. A wheelchair with a completely automated gear box, motor, and power supply is created, allowing people with disabilities to move around independently. Additionally, the wheelchair's incorporation of multiple modules and other optional features made it more affordable and more practical. Keeping in mind the larger welfare of human society this project conception and execution were designed. Harr Cascade classifier is used by us. In this system, using the place on the face where the eyeball is located is detected, and accurate location of the eyeball is located using statistical analysis and geometrical technique, by using these techniques the detection of unwanted region of face that are close to the eyeball from being recognized and from being detected.

Proposed Work

Gives the information about implementation of our work. This section consists of three stages. First stage is about detection and conversion of image, second about partition of the image and third stage about sending logic from the raspberry pi to dc motor using motor driver.

Stage one - Detection of the Eyeball and Conversion of the image: In this stage, the color of the eyeball is essentially black. In order to find the direction of the eye we have to count the number of black pixels in the eye. To accomplish the above process, we have to give the persons eye image as the input to the code that we have to be executed. As a result, the person's image is captured and then eye image will be send to the raspberry pi using raspberry pi compatible camera. The image that was captured is color. The colored image will convert to grayscale by color spaces using thresholding. As the darkest region in any human eye is eyeball, when it is converted to grayscale image this will be in the brightest shades of gray.

Stage two – Division of the image: In this stage we have to break the image int three vertical parts. By writing the Python code we will count how many pixels in the picture are black. It must go right if there are more black pixels in the right portion, and it must go left if there are more black pixels in the left portion. In other case we have to divide the image into three horizontal parts. In the middle of the image, there are a greater number of black pixels with our Python function, we'll determine how many black pixels are in each region. We must proceed if the number of dark pixels in the top area increases. In the same way we move backward when the black pixels on the bottom section are higher. In the central part of the chair, when the number of black pixels reaches a certain point, it halts.

Stage three – Transmitting the logic of DC motor from Raspberry pi using driver motor IC: Here the motor driver IC is L293D. The motor driver IC that operates on the principle of H-bridge circuit. In H-bridge circuit to make power supply there are four switches connected in parallel. We have a motor between the parallel connections. If S4 and S1 are both turned on, the motor will rotate front; if S3 and S2 are both turned on, the motor will rotate back. H-bridge circuit is an electronic circuit that switches the polarity of a voltage applied to a load. L293D driver motor IC is connected to the dc motors then that L293D driver motor will be connected to GPIO pins of Raspberry Pi. Now the motors move forward when the input given as HIGH-LOW, in the same way motors move in backward direction when the input is given as LOW-HIGH. Dc-motors used for turning movement.

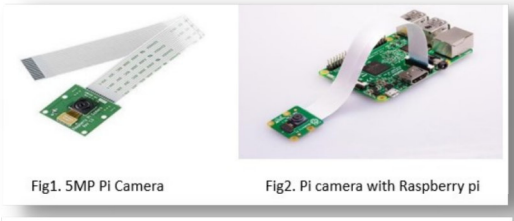


Fig1. 5MP Pi Camera Fig2. Pi camera with Raspberry pi

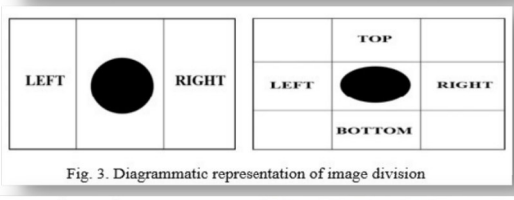


Fig. 3. Diagrammatic representation of image division

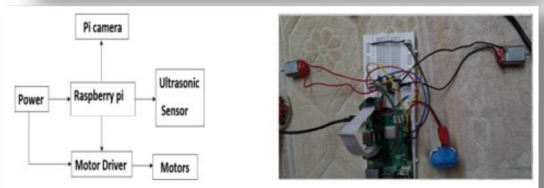


Fig6. Block Diagram of the System **Fig7**. Prototype of our System

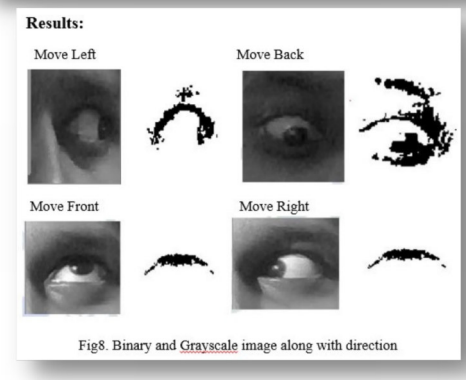


Fig8. Binary and Grayscale image along with direction

SIMPLE STEPS TO INTEGRATE ANDROID APP WITH GOOGLE FIREBASE

K. N. V. R. S. Sai Kiran- 18341A1224

Introduction

Firebase is one of the Platform-as-a-Service provided by Google. There are many services provided where we can use it on a pay-as-you-go pricing. Most of the services provided are on the basis of the Free tier so there is a limit set on the Services we use. Currently, Firebase is supported for Android, iOS, the web, C++, and Unity. For every platform, there is Official Documentation available for Integration and the Next Steps. We will be focusing on the Android Platform today and the step-by-step process we need to follow to Integrate Firebase into our Android Application. There are many services provided like Authentication, Realtime Database, Cloud Firestore, Crashlyitcs, Machine Learning where we can use them in our application once Integration is Successful.

Step 1: Create a Firebase Account: Creating a Firebase Account is very easy and it's free for everyone. Just log on to https://firebase.google.com/ and navigate to the Sign-in Button on the right end. Now it will prompt you to select the Gmail Account or enter your Gmail address, and hit the Sign in Button. That's all you have your Firebase Account ready with you. Let's get ready for the next step which is going to be more interesting.

Step 2: Creating a New Project: Once after a Successful login, click on the Go to Console Button situated on the right end. Now you will enter your Console aka Dashboard containing the list of all the projects created under your Account. Since it's a fresh account and no projects are present, you will see a Homepage something like below:

Hit on Create a Project Button to get started with your first Project. There will be a total of 3 Steps in which you are going to create your Project in Firebase. 1. Now you will be prompted to enter the Name of the Project which needs to be unique since automatically your Firebase Account will be linked to Google Cloud Platform (GCP). So, this means in backend once you create a Firebase Project, automatically a Project in GCP will be created. 2. Enabling Google Analytics for the Project. This is one of the powerful tools provided by Google where we can track our Project by various parameters. I recommend you to enable Google Analytics for your project which helps us to gather various insights from our Users. 3. Configuring Google Analytics. Here we need to choose our nearest Country and accept the Terms of Google Analytics and make sure you select the Use the default settings for sharing Google Analytics data. Now hit on Create Project Button and now we are good to go! Wait for some time until the project gets created and visible in your Console.

Step 3: Adding Android Application to Project

Click on the Android Logo now a new Window opens where we need to add our Android Studio project to Firebase. Before this, first, we need to create a project in Android Studio. Now open Android Studio on your Desktop/Laptop by searching in Search Menu and once it's open. Click on *File > New > New Project > Empty Activity*. Now you will see the following window where you need to enter your Project details. Once you are done entering all the details of your Android Application, hit on Finish Button. Now your Android Studio project gets built. Wait until the whole project gets built successfully. Now, in the Firebase Console, this window will be opened once you click the Android Icon, here we need to enter details of our Android Studio Project.

Copy the applicationId which is present in defaultConfig and paste into the Android Package Name field in Firebase Console. Finally, your file needs to look like the below figure, now you can see a prompt at the top like the "Sync Now" Button. Click on Sync Now and now all the Firebase SDK gets downloaded to your project. In the Firebase Console, click on Continue now it shows a message like "Waiting for Analytics Data…". This message is shown because, since we have integrated Firebase to our app now once our App gets successfully installed on the Phone then it starts sending data to Firebase Servers then our Analytics Dashboard will be shown.



Fig (1): Homepage of Firebase Website



Fig (3): Project Homepage in Firebase Console



Fig (4): Creation of Android Project in Android Studio



Fig (2): Sample Project Creation



Fig (5): Gradle file in Android Studio



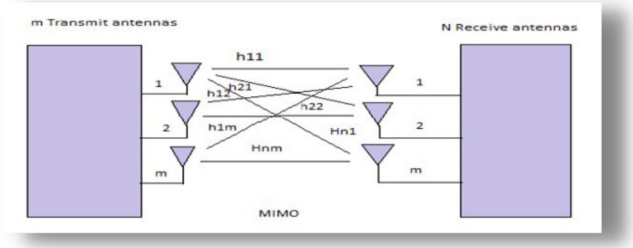
Fig (6): Gradle file after adding required dependencies

METAMATERIAL BASED MIMO ANTENNA FOR 5G APPLICATIONS

Nadiminti Rakesh- 18341A04A3

Introduction

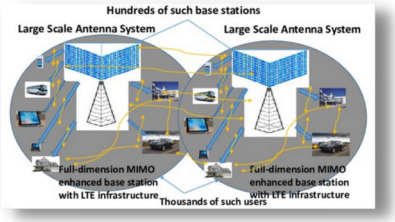
Antennas are the primary constituents for the successful deployment of communication networks. Therefore, the antenna design is of great significance to real size communication at the mm Wave frequencies. These 5G systems are expected to have numerous antennas at the base station and at user terminals. Also, the arrays, MIMO, and beamforming technologies are the key enablers for 5G mm-Wave communication. To enhance the communication system capacity, MIMO technology is considered to be of great significance as it enables the multiple antennas to operate concurrently, thus improving the data rate, capacity, and reliability of the communication link. Several literary works reported MIMO antennas operating at mm-wave frequency band. The antennas presented in these works demonstrate good MIMO performance with significant isolation. However, the gain exhibited by these MIMO antennas is comparatively low. In recent years, metamaterials have been investigated extensively owing to their various electromagnetic characteristics not commonly present in natural materials. Several works reported mm-wave MIMO antennas with metamaterial structures to enhance the antenna performance, particularly reduction in mutual coupling or antenna gain improvement. This work proposed a four-element MIMO antenna for mm-wave 5G communication devices involving metasurface for gain and isolation enhancement. In order to enhance gain, a single element antenna is modified to array structure. Thus, each MIMO antenna comprises of 1 × 2 element array fed with a parallel feeding network. To further enhance gain and to decrease the coupling effects between the MIMO elements, a metasurface of periodically patterned 9 × 6 square Split Ring (SSR) shaped cells is placed above the MIMO antennas. The final proposed antenna covers the mm-Wave frequency band 24 - 26 GHz supporting 5G applications. A prominent increase in gain is observed with a peak gain value. In addition, an improvement in isolation is attained after the introduction of the metasurface.



About related technology and applications

Multiple-Input MIMO (Many-Input, Multiple-Output) technology is a wireless technology that uses multiple transmitters and receivers to carry more data at once. MIMO technology takes advantage of a radio-wave phenomena known as multipath, in which transmitted data bounces off walls, ceilings, and other objects several times, arriving at the receiving antenna at slightly varied angles and times each time. MIMO technology uses numerous, "smart" transmitters and receivers with an added "spatial" dimension to substantially boost performance and range by using multipath behavior. MIMO allows many antennas to simultaneously send and receive numerous spatial streams and to operate smarter by combining data streams arriving from different paths and at different times to boost receiver signal-capturing power. Smart antennas take advantage of spatial diversity technique that makes use of excess antennas if there are more antennas than

spatial streams, the extra antennas can boost range and add receiver variety.



Multiple input multiple output (MIMO)

MIMO TECHNIQUE	BENEFITS	BEST CONDITIONS
SPATIAL MULTIPLEXING	Increases the throughput of the system	Best performance is achieved at low velocity near to the base station (strong signal)
TRANSMIT DIVERSITY	Increases the range by countering fading (less possibility of errors) usually at base station	Good when beam forming is not appropriate
RECEIVE DIVERSITY	Increases the range by countering fading (less possibility of errors) usually at mobile station	Advantage over single antenna under all conditions
BEAMFORMING	Increases the range at base station	Works best at relatively low velocity when distance is extremely large (cell edge).

MIMO antenna performance

AUTOMATIC TRACKING AND TRAFFIC CONTROL FOR AMBULANCE USING RFID

P. Murali Krishna- 19341A04C0, P. Vamsi- 19341A04C5 & P. Sai Ganesh- 19341A04C6

Introduction

Traffic congestion is a significant problem in many cities around the world. As per the Indian Government report, the number of road accidents increased to 16 deaths per hour in major cities such as Chennai, Hyderabad, and Delhi. Further, traffic congestions lead to long waiting times, fuel loss and also the wastage of money. Specifically, traffic congestions result in high pollution levels which affect the health of the local people, commuters and animals. In general, traffic congestions are also associated with few more traffic problems such as emergency vehicles get blocked. Precisely, the traffic congestion often blocks the path of the emergency vehicles which may prove fatal at times. Also, the number of deaths due to delay in arrival of emergency vehicles have increased to a greater extent in recent times. Therefore, emergency vehicles like Ambulance needs to be on time to prevent loss of human life. Thus, helping an emergency vehicle to move out of traffic congestion is very much essential in the current traffic scenario. In order to solve the above given problems, RFID technology can be used. Radio Frequency Identification (RFID) refers to a wireless system comprised of two components: tags and readers. The reader is a device that has one or more antennas that emit radio waves and receive signals back from the RFID tag. Tags, which use radio waves to communicate their identity and other information to near by readers, can be passive or active. Passive RFID tags are powered by the reader and do not have a battery. RFID tags can store a range of information from one serial number to several pages of data. RFID technology helps in calculating the density of vehicles to control the traffic signals. In general, Emergency vehicles are detected using RFIDs of different range. RFID systems use radio waves at several different frequencies to transfer data. When emergency vehicles are detected the particular lane is cleared of to help the easy passage of the emergency vehicles.

About RFID technology

Radio frequency identification system (RFID) is an automatic technology and aids machines or computers to identify objects, record metadata or control individual target through radio waves. The RFID technology was first appeared in 1945, as an espionage tool for the Soviet Union, which retransmitted incident radio waves with audio information. Similarly, the IFF (Identification Friend or Foe) transponder developed in the United Kingdom was routinely used by the allies in World War II to identify aircraft as friend or foe. A typically RFID system is consisted of tags (transmitters/ responders) and readers (transmitters/receivers). The tag is a

microchip connected with an antenna, which can be attached to an object as the identifier of the object. The RFID reader communicates with the RFID tag using radio waves. The main advantage of RFID technology is the automated identification and data capture that promises wholesale changes across a broad spectrum of business activities and aims to reduce the cost of the already used systems such as bar codes. Although RFID technology was discovered many years ago, it has advanced and evolved only during the last decade since cost has been the main limitation in all implementations.

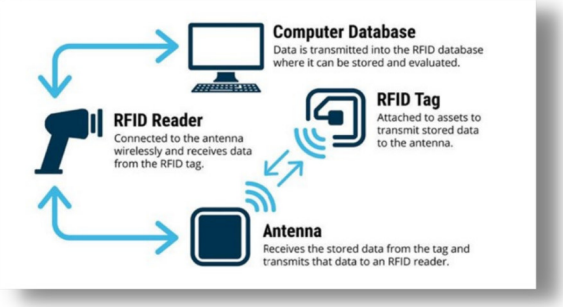
Applications of RFID Technology

The functions of RFID system generally include three aspects- monitoring, tracking, and supervising. Monitoring generally means to be aware of the state of a system, by repeated observing the particular conditions, especially to detect them and give warning of change. Tracking is the observing of persons or objects on the move and supplying a timely ordered sequence of respective location data to a model. Supervising is the monitoring of the behaviors, activities, or other changing information, usually of people. It is sometimes done in a secret or inconspicuous manner. The RFID applications are numerous and far reaching. The most interesting and successful applications include those for supply chain management, production process control, and objects tracking management. Now RFID has been gradually and broadly used in the following fields.

1. Logistics and Supply
2. Manufacturing
3. Agriculture Management
4. Health Care and Medicine
5. Marine Terminal Operation
6. Military and Defense
7. Payment Transactions
8. Transportation and Retailing

Summary

The proposed system deals with the cheaper and effective obstacle detection with a wide range of coverage. First we should dump the Arduino code into the Arduino UNO board. We combined the EM – 18 Reader module with the Arduino UNO board. Connect the components as per the circuit. When the RFID tag is sensed by EM - 18 module, EM - 18 module will confirm the code for the tag which was taken in the code dumped in the UNO board. As a output, there will be glow of green led which can be having some time limit and afterwards glow of red led leads us the indication of traffic lights. If an emergency vehicle is detected, then make the traffic signal of that particular lane as green and allow all the vehicles to move. This will result in a clear path for the emergency vehicle. The RFID tag number is a unique identification number which are placed inside the general vehicles. The density of vehicles is calculated and recorded by the Arduino controller. The density of the vehicles helps to determine the congestion of traffic. The signals are controlled by the Arduino controller. Based upon the readings of the Arduino, the traffic signal changes. This helps to dynamically adjust the timer of the traffic signal thus efficiently managing the traffic. Emergency vehicles are properly detected by using sperate range of RFID signals. Once the emergency vehicle is detected, the green signal for that particular lane is turned on.



A WEARABLE SAFETY DEVICE FOR KIDS

M. Sireesha- 19341A0491 & K. Syam Sundar Rao- 19341A0487

Introduction

The Internet of Things System (IOT) refers to the set of devices and systems that stay interconnected with real-world sensors and actuators to the Internet. IOT includes many different systems like smart cars, wearable devices and even human implanted devices, home automation systems and lighting controls; smartphones which are increasingly being used to measure the world around them. Similarly, wireless sensor networks that measure weather, flood defences, tides and more. The motivation for this wearable comes from the increasing need for safety for little children in current times, as there could be scenarios of the child getting lost in the major crowded areas. This project focusses on the key aspect that lost child can be helped by the people around the child and can play a significant role in the child's safety until reunited with the parents. Most of the wearables available today are focused on providing the location of the child to the parents via Wi-Fi and Bluetooth. But Wi- Fi and Bluetooth seem a very unreliable source to transfer information. Therefore it is intended to use SMS as the mode of communication between the parent and child's wearable device, as this has fewer chances of failing compared to Wi-Fi and Bluetooth. The platform on which this project will be running on is the Arduino nano microcontroller board based on the ATmega328P, and the functions of sending and receiving SMS, calls and connecting to the internet, which is provided by the Arduino GSM shield using the GSM network. In addition, additional modules employed which will provide the current location of the child to the parents via SMS.

Technology and applications

Wearable technologies: Wearable technology, wearables, fashion technology, smart wear, tech togs, streetwear tech, skin electronics or fashion electronics are smart electronic devices that are worn close to and/or on the surface of the skin, where they detect, analyze, and transmit information concerning e.g. body signals such as vital signs, and/or ambient data and which allow in some cases immediate biofeedback to the wearer. These are example of the IoT, since "things" such as electronics, software sensors, and connectivity are effectors that enable objects to exchange data (including data quality) through the internet with a manufacturer, operator, and/or other connected devices, without requiring human intervention. It appears prominently in consumer electronics with the popularization of the smart watch and activity tracker. A popular activity tracker called the fit belt is widely used in the fitness industry to track calories and health related goals and smartwatch is the Apple watch. Apart from commercial uses, wearable technology is being incorporated into navigation systems, advanced textiles, and healthcare. As wearable technology is being proposed for use in critical applications, it has to be vetted for its reliability and security properties.

Summary

The proposed kid's safety device aims at proving complete security to kids in current scenarios. The Location is used as unique identifier for the user so that the user can send their location in critical crisis. To provide comprehensive security, SMS mode is included in the design, so that Unreliable source of transmission is avoided about the mis-happening. Sending text messages ensure that close relatives and police with the current location of victim.

OLA E-SCOOTER

Kelangi Manoju- 21345A0212

Introduction

Ola is the world's biggest electric scooter manufacturing factory. Their factory is targeting a future disruption in the market with their recent electric scooter model the Ola S1 pro scooter. It can easily take over the market with its affordable price and high performance. This machine's peak torque value is impressive (58 Newton-meters) and its peak power is 8.5 kW. The ola scooter runs on an internal permanent magnet (IPM) as shown in Fig. 1. IPM motor electric motors have permanent magnets embedded deep inside their higher rotors. There is a great choice as it has a high torque to weight ratio. When we compare the IPM motor with the BLDC surface mount motors used in most other E scooters, the IPM motors give higher torque for the same volume because of the additional reluctance toward the IPMs. The IPM motor requires an AC supply for state or under to supply this power and a banana battery pack, which is a collection of tiny cylindrical NCA cells. Obviously, we have to use a three-phase inverter in between to convert the battery DC supply into an AC supply. The controller is also used in the scooter. Its main duty is to control the frequency of the alternating current. For example, when you are accelerating, the controller gets the signal and commands the inverter to increase the AC current frequency. The greater the frequency, the greater the IPM motor speed. The controller not only commands the inverter to change its frequency, it is the ola scooters' brain. The controller handles this scooter is amazing software controls such as:

- Password enabled driving
- Navigation
- Speed modes control and many other cool features.

It produces very little noise as compared to other electric scooters. The reason for the noise difference between the Ola and other electric scooters is the transmission. As you can see in figure 3, the IPM motor is placed in the centre of the ola scooter in which rotational energy is transferred to the rear tyre via belt transmission. This is a single-stage transmission. A third, for example, uses a two-stage transmission system to get high torque, so the increased number of gears results in extra noise. However, a lot can be managed with a single-speed transmission because the IPM motor inherently produces a high torque output. This scooter automatically switches to normal mode after some time due to the heating of the motor and battery. In hyper mode, the motor draws high power for a longer duration. This overheats the motor and battery. If this overheating continues, the motor winding may burn in the battery, causing a fire. To avoid this result, a smart battery management system is employed. It is integrated with the battery pack itself. This electronic system signals the controller to switch back into normal mode as soon as the battery temperature goes beyond safe limits. This solution eventually saves the motor as well. This control is particularly important in India's warm environment.

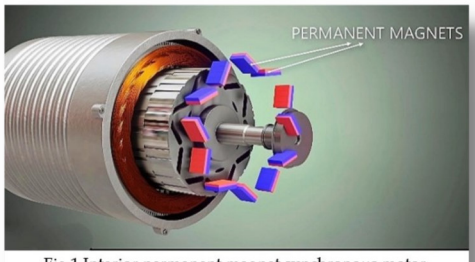


Fig.1 Interior permanent magnet synchronous motor.

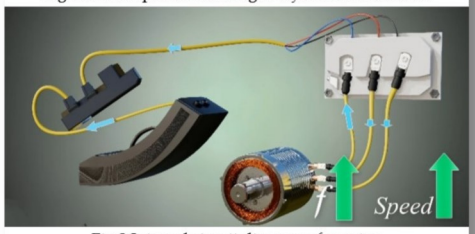


Fig.2 Internal circuit diagram of scooter.

PANTOGRAPHS

B. Mojesh- 19341A0212

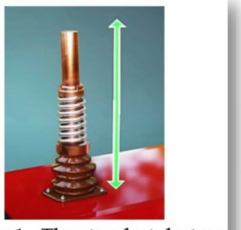
Introduction

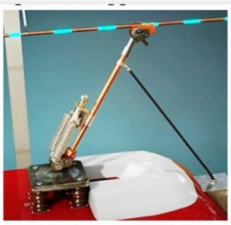
A pantograph (or "pan", "panto", or "pantomime") is a device placed on the roof of an electric train, tram, or electric bus to receive electricity from an overhead line. A typical kind of current collector is called a pantograph. A single or double wire is often utilized, with the return current going through the rails. Figure 1 depicts the simplest pantograph, which consists of a copper conductor with a compressed spring arrangement that begins collecting current when allowed to rise. The current is then supplied to the motor. In a pantograph, the circuit can be easily completed by connecting it to the ground through the wheels. However, this simple collector will easily fail due to the lack of lateral stability. To improve its stability, let's lean the rod in the direction shown in figure 2. Rearranging the spring allows this collector to stay in contact with the line. However, too much force on the spring can break the tensioned overhead line. To counterbalance the spring force, a rope may be used to tie the collector in the other direction. This method balances the collector perfectly. For precise alignment, we can attach a grooved copper head as shown in figure 2. This current collector design idea is called a trolley pole collector and was first invented by Frank J Sprague. This collector will inevitably undergo wear and tear due to continuous running of the train. Regular friction can break this groove head in as little as two to three weeks. However, the overhead line can undergo wear and tear. This can be managed by introducing a carbon strip as shown in figure 3. This modified design can run smoothly at increased speeds of up to 35 to 100 kmph. This design, along with additional side horns, is called a "bow collector."

The horns are quite useful for when the train switches tracks. During track switching, the pantograph also needs to switch the overhead line. The horns help in smooth switching between overhead lines. Otherwise, the line could have stuck below the collector head. As the speed increases, this design has one major drawback that becomes apparent. Due to air resistance and vibrations, the path will be complicated as the bottom air particles must take this design. This will lead to a net downward force in loose contact. The vortices as shown in figure 3 also cause vibration.

Diamond pantograph

To overcome these issues, in 1903, John Q. Brown patented a device called the diamond pantograph. The springs in the middle of the mechanism as shown in figure 4 are compressed. When released, the spring will try to reduce the pantograph's heigh. The output motion of the pneumatic pistons is connected to the mechanism as shown in figure 5 in such a way that when the driver increases the air pressure, the height of the mechanism also increases.


Figure 1 - The simplest design


Figure 2 - Rearrangement of Spring

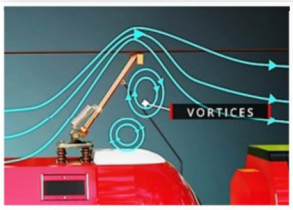
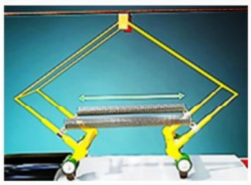


Figure 3 - Air resistance and vibrations


Figure 4 - Diamond Pantograph

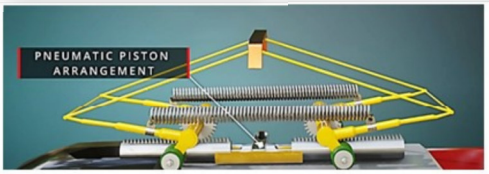


Figure 5 - Pneumatic piston arrangement

SOLAR DEHYDRATOR

K. Aastha- 19341A0245 & K. Tejaswi- 19341A0242

Introduction

Drying is a multi-step process that involves both heat and mass transfer. Many factors influence the amount of energy required to dry a product, including the initial moisture content, final moisture content, drying air temperature, relative humidity, and velocity. To optimize the drying process and design efficient dryers, various mathematical models describing the drying behavior of various food materials have been proposed. Modeling is advantageous because full-scale testing of various products and drying system configurations is time-consuming and costly. Traditional natural sun drying must be replaced with modern drying methods to improve quality. To improve quality, specific product drying characteristics should be determined.

Types of solar drying systems

1. Direct type dryers

The agricultural products are arranged in shallow layers in a darkened cage with a clear cover in direct or natural convection type dryers. Solar radiation is absorbed immediately by the product. When a food item gets hot, the water in it evaporates and leaves through natural convection and circulation.

2. Indirect type dryers

The new method of product drying is indirect sun drying, also known as convective solar drying. It is a more efficient method of solar drying than the direct approach. The ambient air is heated in a flat plate collector or a concentrated type solar collector in this manner. The heating method might be passive or aggressive. The air is then directed into the storage compartment. As a result of convection and diffusion, moisture from the product may be lost. To avoid direct exposure to sunlight, this drying process is utilized.

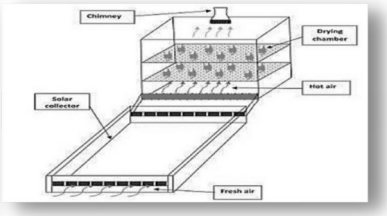
3. Forced circulation type dryers

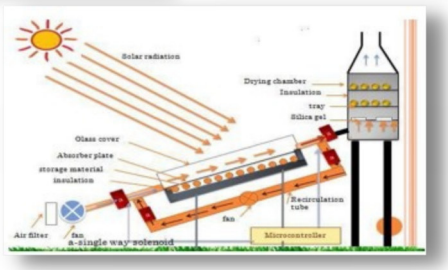
A sun dryer with indirect forced convection and air recirculation has been created. A flat plate solar air heater with a lens and recirculation tube, a drying chamber, and a micro controller make up the system. Hot air is continually pushed over the food products in these dryers. The food goods are continually or periodically loaded or unloaded. These dryers are more efficient in terms of thermodynamics, are speedier, and may be used to dry huge agricultural products. There are three types of dryers: cross-flow, concurrent flow, and counter-flow.

Applications

Direct solar drying is mostly utilized in agriculture. It's also useful for small farmers in remote regions without access to electricity. This drier is better for drying modest quantities of crops, fruits, and vegetables. In rural locations, a locally produced indirect natural convection dryer is ideal for drying fruits and vegetables. Jackfruit bulb sand leather may be dried in a solar tunnel drier. The mixed-mode dryer is inexpensive, widely accessible, and simple to construct by local farmers. This fan-powered dryer may be used to dry tomatoes, mango slices, and cereals. As a result, agricultural items are dried at room temperature in a short period.







PRODUCING ELECTRICITY FROM GREEN PLANTS

A. Purna Chandra Rao- 20341A101 &
L.N. Shriya -20341A0159

Introduction

Electricity is one of the most important blessings that science has given to mankind. It has also become a part of modern life and one cannot think of a world without it. Electricity has many uses in our day to day life. The use of electricity is increasing day by day. Researchers are going to find an alternate method of generating electricity. Plants have been one resource for producing electricity. So this model has been designed to show that plants will also produce electricity. Imagine charging your phone using the electricity generated by the plants in your windowsill. Our research aims at making this a reality with the technology introduced by Wageningen University at Netherland in 2007. This is based on a natural process and safe for both the plant and environment. Over the past centuries, the world has got polluted due to the usage of hydrocarbon energy sources such as petroleum, coal and other fossil fuels. The increase in the use of these fuels will lead to their extinction in the near future. The ever rising cost of fossil fuels hinders the economic growth as the production of goods and cost of shipment are dependent on the cost of fuels. The increasing demand and rising cost affect the trade and causes poverty. The energy is obtained from coal and other natural gases by combustion. Due to this, emission of carbon dioxide takes place which causes green house effect. This result in the increase in temperature and leads to the deterioration of the global environment. The government encourages to provide an opportunity for mitigation of green house gas emission and reducing global warming by using conventional energy sources. In this paper, we present a method of harvesting electrical energy from living plants. Plants store chemical energy in their roots in the form of chemical sugar bonds. When electrodes are placed in the roots, the ions move towards the electrodes and this flow of ions produce electricity. The electrodes used in this research are copper and iron. The overall purpose of this research is to produce electricity using more sustainable sources. The plant used for this research is Aloe Vera.

Apparatus

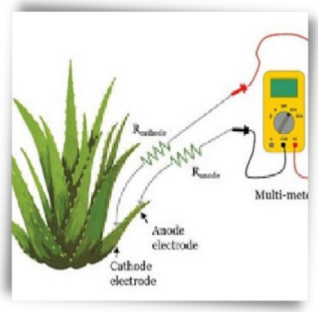
Aloe Vera, Multi meter, soil, connecting wires, Zinc, Copper.

Methodology

Electricity can be harvested from living plants by generating a reaction between the plant and a pair of different metals. The electricity is generated from electrons which are generated from plants during photosynthesis. The bacteria present in the soil oxidize the organic matter produced by the plants and release protons, electrons, and carbon dioxide. These electrons flow from anode to cathode, generating the electricity.

Result and conclusion

This idea helps people to generate electricity from green living plants. This project reflects the sustainable development for the future.





SMART WATER SUPPLY SYSTEM AND UTILITY MANAGEMENT

Ch Nikhil- 20341A0117 & D Naveen- 19341A0121

Introduction

Water scarcity in the present world is a major concern to be concentrated upon. As per the growing population, the demand of fresh water is rising high and is needed to be satisfied with the constant supply and its conservation to be taken place simultaneously. Thus, in order to meet the same, this model has been designed aiming at automatic bill generation system during the supply of water to any particular household and on the other hand treating the grey water being produced from it. This project helps to regulate the proper maintenance of water tank information to monitoring section with proper updation of records. problem affects various processes in water management, such as water consumption, distribution, Water dust formed in the water tank. These problem can overcome by implementing proper monitoring system and information update system. Set of sensor like Turbidity, Salt sensor, pH sensor and Water flow sensors were used. This sensor informs about the water level tank and communicate to the monitor section. To maintain the tank without bacteria and microbes the Chlorine powder is sprayed if there is any changes in the pH value is found. If the water level reaches minimum position the motor automatically starts and when it reaches the maximum the motor stops automatically. A wireless sensor network is formed by connecting two and more water tanks using RF radio channel transceiver with monitoring section.

Methodology

Using the concept of internet of things, the flow sensor has been used to find out the amount of water that is being passed through the inlet and a code has been executed to calculate the bill in rupees for the water utilized. The grey water that is being out from a house is treated in the small scale treatment plant installed at the same location. This plant consists of three different stages of its treatment, the filtering, disinfection and storing.

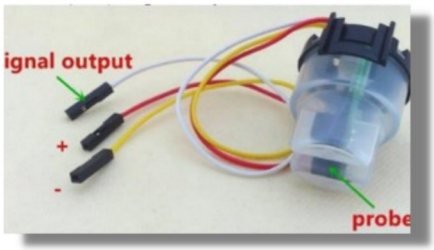
Result

As little things make big difference, this idea aims at installation of the same at every individual unit bringing out a huge conservation utilization of the treated water and restricting the citizens to reduce the consumption.

Discussion

- India is the largest user of the groundwater in the world with almost 90% being used for drinking water and almost 60-70% for irrigation.
- Current statistics also show that nearly 50% of urban water supply comes from groundwater.

So considering the above situation, implementing such SMART WATER supply systems is essential in order to increase the ground water table.



Turbidity sensor



Ultra-sonic sensor

FABRICATION AND MECHANICAL BEHAVIOUR OF AL-KAOLINE METAL MATRIX COMPOSITE FABRICATED THROUGH POWDER METALLURGY TECHNIQUE

Ch. Bindhu Saisri- 20345A0306

Introduction

Metal matrix composite is the combination of hard reinforcement and softer matrix material which processes higher hardness and tensile strength at room and elevated temperatures. With the advancement of manufacturing techniques, light weight composite materials are achieved everlasting demand in automobile industry for manufacturing of automobile pistons, body frames etc., Monolithic Aluminium alloys processes higher ductility and lesser hardness which are not suitable for specific operational conditions. The mechanical properties of these monolithic alloys need to enhance by incorporating hard ceramic reinforcements. Different matrix materials are available to fabricate MMC like Al, Mg and Ti. Among these matrix materials Al is widely used because of its light weight and anti-corrosive properties. Incorporating hard ceramic reinforcements like B4C, SiC and Al2O3 strengthen the Al matrix material and improves the wear resistance ofcomposite. Many modern fabricating methods are available for manufacturing of composite like stir casting, squeeze casting, powder metallurgy technique and liquid metal infiltration technique. Out of these methods powder metallurgy technique is inexpensive and produces lesser defects in the composite samples.

Fabrication of composite

Powder metallurgy technique used for fabrication of the composite. The Aluminium matrix is reinforced with 5% kaoline, 10% kaoline, 15% kaoline, 20% kaoline. First required quantities of matrix and reinforcement powders are placed in RESTECH 100 ball mill. 10 mm diameter tungsten carbide balls with powder to ball ratio 1:10 were taken to prepare metal matrix composites.

Results and discussion

The UTS and compression strength of the composite increases with kaoline percentage. The improved properties might be ascribed because of existence of hard ceramic constituents like SiO2, Al2O3 in kaoline reinforcement. These ceramic particles act as barriers for dislocations movement between grain boundaries of matrix and reinforcement elements. The improved compression strength is due to the alloy strengthening mechanism of the Aluminium. Reinforcing kaoline clay upto 20% leads to improving the tensile and compression strength of 54.8 % and 55.1 % respectively compared to unreinforced kaoline particles. Matrix and the grain size reduction of matrix and reinforcement material due to the difference in coefficient of thermal expansions of Al matrix and Kaoline reinforcement particles.

Composition	Mass of the sample in air (gr)	Mass of the sample in water (gr)	Density (g/cm^3)
Al	6.062	2.816	2.701
Al-5%Kaoline	5.976	3.756	2.692
Al-10%Kaoline	5.726	3.562	2.671
Al-15%Kaoline	5.682	3.548	2.662
Al-20%Kaoline	4.286	2.663	2.641

During heat treatment the grain boundary surface area increases and the dislocations are impeded near the grain boundary and requires higher energy to climb the dislocation movements which enhances the strength of the composite. Maximum tensile strength of 312 MPa was obtained for 20% kaoline which was higher than the 20% SiC reinforced Al matrix.

Conclusion

In the present experiment mechanical behaviour of Al- Kaoline metal matrix composite was investigated and the results are summarized below. The hardness of the composite increases from 77 VHN to 187 VHN with increase in kaoline reinforcement from 0% to 20%. Adding reinforcement from 0% to 20%, The compression strength was found to be increased 54.8% and tensile strength was enhanced 55.1% when compared to monolithical pure Aluminium.

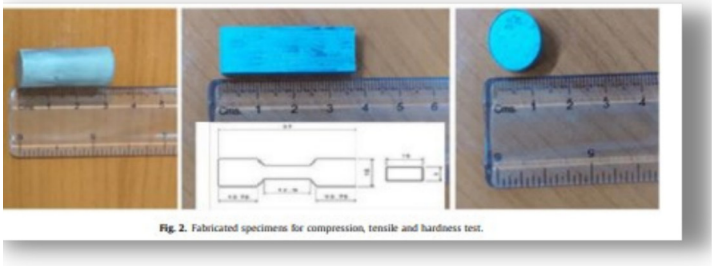
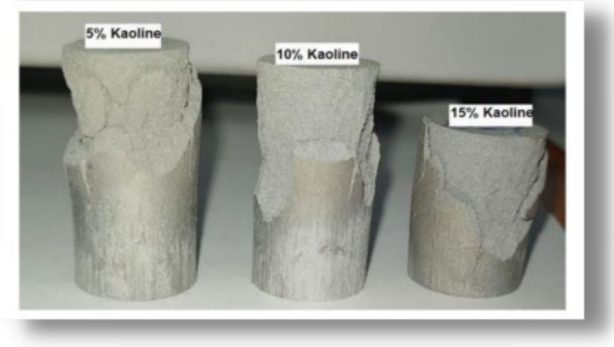


Fig. 2. Fabricated specimens for compression, tensile and hardness test.



Fractured specimens after compression test

SYNTHESIS OF HYDROXYAPATITE FROM LABEO ROHITA FISH SCALE FOR BIOMEDICAL APPLICATION

Ippili Sriram- 21345A0317

Introduction

Tissue engineering plays a vital role for fabrication of scaffold for the treatment of bone defects. Scaffold is defined as temporary or permanent matrix that supports cell growth and repair of damaged tissues. Compounds developed from calcium and phosphate is attracting the researchers for its effective use in the fabrication of bone scaffold. In this regard, Hydroxyapatite (HAp) is a major component for scaffold development as it is non-toxic, osteoconductive and highly biocompatible. Moreover, it forms the main constituent of human hard tissues such as bone and teeth. Fish is consumed as food and their scales are discarded as waste. Scales of fish contain high amount of calcium and phosphate which is a major source of hydroxyapatite. Thus, fish scales can be an economical source of HAp which reduces the undesirable environmental impact with adding value to the fishing by-products.

Materials and Methods

Extraction of HAp from fish scale: Scales of Labeo rohita fish (commonly known as Rohu) are collected and washed with tap water for removing the debris attached to it. The scales are dried in ambient condition. De-proteinization of the fish scales is performed using 1(N) HCl solution for 24h to remove the organic materials. The scales are then washed thoroughly using distilled water for 5 times and oven dried for 12h at 50°C. Calcination is conducted at 1000°C for 4h to synthesize HAp.

Material characterization techniques

Fourier transform infrared radiation spectroscopy (FTIR): FTIR analysis is executed to evaluate the functional groups presents in the synthesized powder. KBr pellet technique is employed using Perkin Elmer Spectrum1 FTIR instrument for recording the spectrum at a range of 400- 4000 cm-1.

Scanning electron microscopy (SEM): Surface morphology and particle distribution pattern of HAp are investigated using a scanning electron microscope Quanta 200F made by FEI equipped with an energy dispersive x-ray spectrometer (EDX) analyzer. The samples are gold coated using Cressington-108 gold sputtering machine with a model no 7006-8. The analysis has been done on the coated samples at 20 kV with a magnification range of 100-30000X.

Transmission electron microscopy (TEM): The nature and size of HAp crystals formed are investigated from TEM analysis. It is performed at 100 kV using JEM-100 CX II. The detailed information of HAp crystals and its crystal orientation in the lattice structure is found from the TEM images.

Results and Discussion

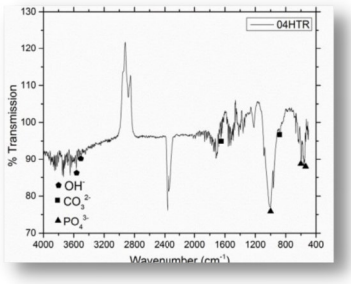
FTIR Analysis: FTIR spectrum of the calcined fish scale powder is presented. The absorption bands found at 559 and 600 cm-1 correspond to ν4 symmetric P–O stretching vibrations of the PO4 group whereas at 1002 cm-1 correspond to ν3 vibration which is due to the asymmetric stretching of PO4 group . The absorbance peaks corresponding to carbonate ion (CO3 2-) is observed at 875, and 1652 cm-1. The absorption spectra at 3500 and 3569 cm-1 confirms the presence of hydroxyl ion (OH-). The existence of CO3 2-, OH- , PO4 3- confirms the formation of HAp in the calcined powder.

TEM Analysis: The TEM micrograph of the HAp synthesized from the fish scales is depicted. The figure indicates the formation of dense agglomerated particles with particle size ranging from 0.7-1.4 µm. The micro sized HAp particle can be suitably used as bio-filler for scaffold development . The Selected area electron diffraction (SAED) pattern shows discrete rings which confirm the polycrystallinity of the Hap.

Yield percentage: The yield percentage has been calculated by evaluating the ratio of weight of the HAp obtained after calcination with respect to the weight of the fish scale before pre-treatment. The entire process is repeated thrice and the mean of the three results are considered. The final value obtained is tabulated below and presented in Table 1. It can be seen that the yield percentage obtained is around 24.336±3 % which shows high productivity of the HAp from fish scales.

Conclusion

The study explores the extraction of HAp from scales of Labeo rohita fish. The results obtained from FTIR and XRD analysis confirms formation of crystalline HAp. The isolated HAp is found to be thermally stable at elevated temperature of 800˚C. SEM analysis confirms highly porous morphology of the synthesized HAp. TEM analysis reveals formation of polycrystalline HAp powder with particle size 0.7-1.4 µm. The properties are ideal for different biomedical applications and will have great scope to be utilized as a biomaterial in various bone tissue engineering applications. HAp derived from biological sources can be a possible material in converting industrial by-products into value added products by the use of simple, effective and noble methods.



FTIR for extracted HAp

UTILIZATION AND REGENERATION OF CORN COVER AS A NOVEL ROBUST AEROGEL AS AN OIL ADSORBENT

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Introduction

The ongoing energy demand reciprocates the rapid rise in the oil industries, increasing crude oil exploration, and processing. However, owing to seepages of oil through the occasionally developed cracks underneath the earth's surface or during transportation and processing in the offshore industries, recurrent oil spillage occurs. This causes severe jeopardy for the aquatic animals, vegetation in the coastal area, and the environment with an enormous economic loss. Moreover, the oil spill over the earth's surface causes a huge humus loss with additional groundwater and soil pollution, thereby increasing the demand for an opposite method for effective cleaning oil spills with good recovery. Multiple methods were developed, however, owing to the effective removal and recovery of oil, the sorbent method has gained significant attention among researchers. Adsorbents viz. resin, natural materials, and aerogels have gained lots of attention. The resins possess a high absorption capacity; however, the high cost involved and the non-biodegradable nature restrict their further application. Natural materials, being low cost and eco-friendly adsorbents have attracted the researchers; however, the hitches of low adsorption capacity, poor reusability need to be resolved before its usage. In the sense of oil/water selectivity, hydrophobicity, reusability, and oil recovery, aerogels have emerged as an efficient sorbent for the adsorption of organic solvents from the aquatic environment.

Experimental Method

The collected corn cover was washed with distilled water, sun died and chopped into small pieces, and it has grounded, the further sundried to obtain corn shell fibers. The obtained fibers (2 wt.%) were treated with NaOH solution (1 wt.%) by volume at a temperature of 80 c in hot air oven to introduce the hydroxyl to remove the lignin content. The dried fibers will treat with hydrogen peroxide (10% by vol/vol) and PH was maintained at 12 with the further addition of NaOH solution. Finally, the fibers will immerse in distilled water and dry at 70 C for 24 hours to obtain functionalized corn stalk fibers.

Synthesis of corn cover aerogel (CCA)

4g of PVA will charge into 100 ml of hot distilled water (50 C) to obtain a PVA solution. The solution will then sonicate in a probe sonicator for 1h until a clear solution was obtained and cooled down to room temperature. Then 1g of functionalize corn cover will add to the as-prepared PVA solution and mixed in a magnetic stirrer at 400 rpm for 30 min. Furthermore, the crosslinking of corn cover fibers will be done by adding 2 ml of the cross linker with control addition of HCl to maintain the pH at 3. The resultant mixture will sonicate for 1h at 750 W and 50 kHz to ensure the homogeneity and removal of the air bubbles, and then transferred into a plastic mold. To obtain better crosslinking the solution will be treated under 90 C for 6h in a hot air. Then the prepared solution was freeze-thawed to 20 C and then sublimated in a lyophilizer at 50 C and 0.001 mbar pressure for 48h to obtain CCA (CCA1). Further, different CCA samples will be synthesized with the different masses of CC as 2g, 3g, and 4g, further label as CCA2, CCA3 and CCA4, respectively.

Results

The obtained CCA has a water contact angle of 142.5, thus hydrophobic. Further, the FTIR spectra revealed the absence of hydroxyl group.

Applications

- For oil spill cleaning.
- For thermal and acoustic insulator.



BIO-WASTE TO VALUE ADDED PRODUCTS

K. Nikhil- 20345A0805

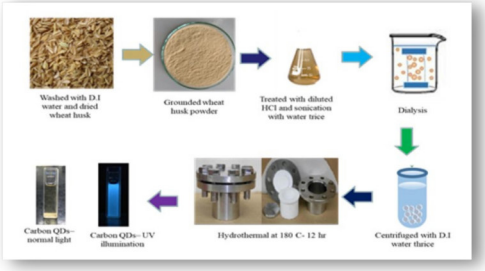
Introduction

Bio-waste is a sustainable natural energy source that can be created from a variety of feedstocks, including municipal and industrial solid waste, paper manufacturing, sewage treatment plants, agricultural output, and forestry residue. Exploring effective and low-cost activated carbon could help future commercial applications while also helping the environment. In recent years, the usage of AC made from agricultural, municipal, industrial, and forestry bio-waste has grown in popularity. Activated carbon has an incredibly large surface area per unit volume, and a network of sub-microscopic pores where adsorption of foreign substance takes place also due to the fast rising cost of coal and the scarcity of coconut shell, there is a pressing need to find alternate resources for producing low-cost air conditioning. Wood, bamboo, rice straw, soybean hulls, sugarcane bagasse, nutshells, and fruit stones have all been examined for their ability to create AC. Activated carbons made from wood, bamboo, and nutshells are currently commercially accessible. Traditional AC products are ineffective at absorbing heavy metal ions, so different product changes, such as sulfurization, phosphoric acid activation, and surfactant impregnation, have been tried to boost heavy metal carbon uptake in water.

Technical Gap: Historical and Forecast Trends, Industry Drivers and Constraints, Historical and Forecast Market Analysis by Segment (Type, Application, Feedstock, and Region) drives an emerging valuable product from the bio waste.

Applications of the Activated Carbon from Bio waste

1. *Water treatment in industrial processes:* It is a simple method for this compound to remove organic pollutants from drinking water or surface waters.
2. *Tertiary wastewater treatment:* This mineral-based activated carbon can entirely eradicate the molecules of tertiary process water from wastewater using its spectrum of pores, which includes micro, meso, and macro pores, where only complicated color and odour molecules need to be reduced.
3. *Purification of air and industrial gases*: Organic contaminants in the air or gases that pass through activated carbon are retained or adsorbed on it, much as they are in water.





ACHIEVEMENTS





PLACEMENTS


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SPORTS



JNTUK INTERCOLLEGIATE ATHLETICS CENTRAL ZONE CHAMPIONSHIP (MEN & WOMEN)- 400M, 200M, LONG JUMP, JAVELIN THROW, 10000M, 4X100 RELAY(M & W): GOLD MEDAL- 03, SILVER MEDAL-08, BRONZE-02



JNTUK INTERCOLLEGIATE POWERLIFTING (MEN &WOMEN) AND BEST PHYSIQUE CHAMPIONSHIP: GOLD MEDAL -12, SILVER MEDAL- 14, BRONZE MEDAL- 07; MEN & WOMEN POWER LIFTING JNTUK INTERCOLLEGIATE TEAM CHAMPIONSHIP WINNERS, MEN WEIGHTLIFTING JNTUK TEAM CHAMPIONSHIP RUNNERS.

HIGHLIGHTS



ACCREDATIONS



RANKINGS

NATIONAL INSTITUTIONAL RANKING FRAMEWORK

Ranked in the band of 201-250 at National level

Ranking

1. NIRF (National Institutional Ranking Frame work) in the band of 201 to 250
2. ARIIA (Atal Ranking of Institutions on Innovation Achievements) in the band of 50 to 75
3. India Today (2021) Best Engineering Colleges (Private): India Rank: 73 / AP State Position: 2
4. CSR GHRDC (2021): India Rank: 14 / AP State Rank: 2
5. Career 360: In AP graded "AAAA"
6. Education World (2021) India Pvt Engineering Colleges India Rank: 43 / AP State Rank: 2
7. Data Quest (2021) Top T Schools in India India Rank 32 / AP State Position: 3





ABOUT US

Established in 1997, GMR Institute of Technology has come a long way since its inception and has carved a niche for itself in the corporate world. It is currently placed among the top 50 colleges in the country and among the top 5 colleges in the state of Andhra Pradesh. It offers Nine under Graduate and Six Post Graduate programs. All B.Tech programs are accredited by NBA under tier-1 complying with Washington Accord and the college is accredited as an 'A' grade institution by NAAC for the three consecutive cycles. In the ranking done by NIRF-MHRD, GMRIT was put in the rank band 201-250 at the country level for the years 2020 and 2021. Further, GMRIT was declared as the 1st best Clean & Smart campus by AICTE during 2019-20.

GMRIT emphasizes collaborative learning between industry and academia as a means of reinforcing its curriculum with practical experience relevant to industry needs. To make students more industry ready, industry driven elective are being offered as add on courses during 6th and 7th sem. Introduced Career path approach in the curriculum by offering the sequential elective courses from 5th semester onwards, ending up with a capstone project in the final semester eventually leading to expertise in the trendy core domains. Further, to enable the student and to have exposure to the industry and research labs during the course period, GMRIT has introduced full semester internship during 7th and 8th semester of B.Tech. GMRIT had MOUs with University of Technology, Petronas, Malaysia; National Formosa University and Asia University, Taiwan giving its student an opportunity to learn about the contemporary technologies and understand the ecosystem that exists in the global picture.

For more details please visit www.gmrit.org