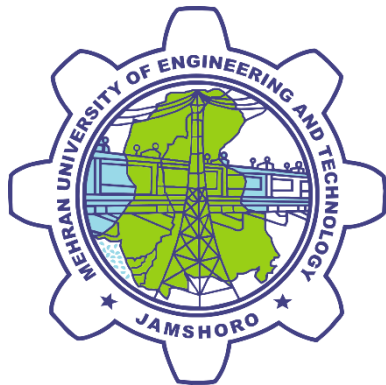# Final Year Projects
F16ES

**Department of Electronic Engineering
Mehran University of Engineering & Technology
Jamshoro**

Compiled by: **Engr. Qudsia Memon**
Edited by: **Dr. Attiya Baqai**
Prof. Dr. Arbab Nighat

Message from Dean FEECE

These past years have seen an interesting development in institution building in the country and amongst all institutions, the bedrock has been the education institutions that impart practical, technical, and research-based knowledge. Electronics in particular and ICT (Information and Communication Technologies) in general have a direct and great impact on our life. Electronic Engineering artifacts have played and continue to play a major role in the evolution of mankind and culture. It is an increasingly important engineering discipline that significantly affects the other disciplines of Engineering.

I am delighted to learn that Department of Electronic Engineering, as an innovative and forward-looking department, achieved laurels for imparting quality education with practical skills that has been at the forefront in the country and its graduates have risen to positions of great eminence. The success of the department owes much to collaborative efforts involving faculty, administration, students, students' alumni and the community as a whole.

It is a matter of immense pleasure and happiness to see that students have made such remarkable projects who have secured funding in NGIRI by ignite and have left their impact in various competitions at national level.

On this occasion, I would like to felicitate and express utmost appreciation to the Chairperson of the Electronics department, FYP Committee, all the faculty members and students for having kept up the standard of the department. The hardware demonstration, display and evaluation of projects is indeed a matter of integrity for the department. The crux of the matter is that I am proud of department of Electronics Engineering and its performance.

Long live Mehran! Pakistan Paindabad!

Prof. Dr. Mukhtiar Ali Unar

Dean FEECE

Message from Chairperson

The field of Electronic Engineering has witnessed overwhelming importance in almost every sphere of our lives and in fact it is the driving force behind the development of world's information technology. It has made revolutionary changes the way people interact with the outside world. It has deeply penetrated in every field of our existence.

Being one of the most dynamic and active departments in terms of arranging numerous curricular, extracurricular, and technical workshops and webinars, the Department of Electronics Engineering has maintained this tradition during difficult time of Covid-19 too and successfully completed their all scheduled activities. The Department of Electronic Engineering envisages to be nationally recognized for high quality academic programs and research through focused activities and excellence of its faculty, staff, graduates and facilities. This department aspires that its graduates be able to face the challenges diverse areas ranging from Information Technology, Artificial Intelligence, and Robotics to Healthcare.

To develop and encourage a competitive environment; Electronics Engineering department has organized Project Display for hardware demonstration, a platform to showcase final year students' projects since past few years, that not only polishes the technical skills of those who participate but also becomes an inspiration for students of other departments. This time around, final year students (F16ES) of Electronic Engineering Department have put in their invaluable efforts and technical expertise in designing real life application-oriented projects. These projects are mainly focused on today's societal needs such as assisting blind through vision device, smart energy efficient building, locomotives, healthcare, IoT, agriculture etc.

Indeed, the provision of sound technical environment to the students bore fruits when our 9 final year projects grabbed funding in NGIRI 2020 by Ignite and some got selected in various national level competitions.

It is a pleasure for me to look ahead to a future for our graduating students that is brighter than ever. I would like to express my gratitude to all faculty members and final year project committee who aptly played their part in mentoring and guiding students at every level.

Prof. Dr. Arbab Nighat

Chairperson

Department of Electronic Engineering

FYP Committee

The Final Year Project Committee at the Department of Electronics comprises of the following members:

S.No	Names	Designation
1.	Dr. Attiya Baqai	Convener
2.	Prof. Dr. Arbab Nighat	Member
3.	Dr. Farzana Rauf Abro	Member
4.	Dr. Farida Memon	Member
5.	Engr. Khuhed Memon	Member
6.	Dr. Shoaib Rehman Soomro	Member
7.	Engr. Qudsia Memon	Secretary

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Table of Contents

Training/ Workshops Sessions organized by Final Year Project Committee for F16ES

S.No	Training/ Workshops Sessions	Instructor	Date of Conduct
1.	OBE based FYP	Dr. Shoaib Soomro	03-02-2020
2.	Prospect Funding opportunities for FYP	Dr. Attiya Baqai	27-01-2020
3.	Academic Writing Techniques/Strategies and Plagiarism policy awareness (Turnitin)	Dr. Farida Memon	06-09-2020
4.	Research paper writing Review paper writing	Engr. Khuhed Memon Dr. Attiya Baqai	02-07-2020
5.	Mendeley (Referencing Tool)	Dr. Attiya Baqai	09-07-2020
6.	Android Development – An Introduction (0.5 CPD, Non FYP)	Engr. Khuhed Memon	15-08-2020
7.	Latex (Thesis Writing Tool)	Prof. Dr. Wajiha Shah	05-09-2020

Collaborative Projects

Projects in Collaboration with Industries:

The following Final Year Project (FYP) groups participated in various competitions and worked with industry:

1. Design and Implementation of A.I. based Ophthalmological Diagnosis of Eye Diseases using Optical Coherence Tomography (OCT) Machine and Image Processing. Supervisor: **Dr. Attiya Baqai**, Dr. Fahim Aziz Umrani. Students: Zeeshan Ahmed F16ES70 (GL), Shahbaz Qamar Panhwar F16ES46, Arbaaz Khan F16ES128 in collaboration with Institute of Ophthalmology LUMHS Jamshoro. (selected in DICE 2020 – Future of Innovation: A Smart World COMSATS University Islamabad, Lahore Campus, March 6-7, 2020)
2. Real Time based Melanoma Detection Using image processing and Machine Learning Through Low Cost Dermoscope, Supervisor: **Dr. Attiya Baqai**, Dr. Fahim Aziz Umrani, Dr. Sanam Narejo, Students: Uzma Akram F16ES03 (GL), Syed Farrukh Ali (F16ES29) Ammar Iqbal (F16ES59) (selected in DICE 2020 – Future of Innovation: A Smart World COMSATS University Islamabad, Lahore Campus, March 6-7, 2020)
3. Controlling the Locomotion of Railway Inspection Vehicle Wirelessly, Supervisor: **Dr. Tayab Din Memon, Engr. Ali Akbar Shah**. Students: Mr. Maryam Saeed F16ES32, Mr. Haider Ali F16ES10, Mr. Prithvi Raj F16ES68. Ignite NGIRI 2020 Funded Project, in collaboration with NCRA LAB and Pakistan Railways.
4. Track Monitoring Using WSSN and Cloud Networking, Supervisors: **Engr. Komal Khuwaja Dr. Farzana Rauf Abro/ Engr. Ali Akbar Shah**, Mr. Muhammad Hassan F16ES15 (Group Leader), Mr. Azhar Ali F16ES35, Mr. Muzafar Ali F16ES07, in collaboration with NCRA LAB and Pakistan Railways.

Incubation and MoUs

Also, this year (i.e. 2020) two of our Final Year Projects from 16ES Batch are in process to get incubated and sign an MoU with industry- academia collaboration.

Sr. No.	Name of Department / Institution / Organization	Type of Linkage	International / National	Date of Start	Duration
1.	Dr. Attiya Baqai Secured funding of Rs 2 Lac in Shark Session, DUHS-DICE Health Innovation Exhibition 2019 by Novartis (Pharmaceutical Company)- Expo Center Karachi- Oct 2019, for Project " Design of Digital Range of Motion (ROM) Measurement System"	Now incubated in Business Incubation Center Office of Research, Innovation & Commercialization (ORIC), Dow University of Health Sciences Karachi	National+ International	Feb 2020	MoU under process, delayed due to Covid-19
2.	Dr. Attiya Baqai Secured funding of 6 Lacs from COMSATS Lahore & Silicon Valley Investors USA for startup ASH Braille in DICE-IET 2020 COMSATS Lahore Campus, held on 6-7th March 2020	Academic+ Industrial	National+ International	March 2020	MoU under process with DICE Innovation center and COMSAT Lahore, delayed due to Covid19

Funded Projects

It is a matter of great pleasure and pride for the department and the University that students, through their diligence and hard work applied for research funding of their projects and remained successful. Successfully winning a research grant authenticates the vitality and importance off their research work. Following are some of the highlights.

The following Final Year Project (FYP) groups secured a research grant through National Grassroots ICT Research Initiative (IGNITE) in 2020:

1. Four View Holographic Display Using Semi Reflective Mirrors. Supervisor: Dr. Shoaib Rehman Soomro. Grant: 58,500/ Rs
2. Controlling the Locomotion of Railway Inspection Vehicle Wirelessly. Supervisor: Dr Tayyab Din Memon. Grant: 68,150/ Rs
3. Covert Electronic Communication Using DNA Based Steganography. Supervisor: Dr. Bhawani Shankar Chowdhry. Grant: 79,500/ Rs
4. Antibacterial Field Control Health Monitoring. Supervisor: Tufail Ahmed Waseer. Grant: 66,450
5. SEHAT Smart E Health App for Tele diagnosis and First Opinion. Supervisor: Dr. Shoaib Rehman Soomro. Grant: 67,300/ Rs
6. Control and Automation of Electric Wheelchair Using EEG and AI Algorithms. Supervisor: Engr. Khuhed Memon. Grant: 80,000/ Rs
7. IOT Based Mobile Robotic Arm. Supervisor: Engr. Kamran Kazi Grant: 39,200/ Rs
8. Real Time Implementation of Facial Expression Recognition for Blind People Using FPGA and LABView Platform. Supervisor: Dr Tayab Din Memon. Grant: 67,997/ Rs
9. Visual Assistant for Blind Person Via Voice Command Supervisor: Engineer Sara Qadeer Grant: 44,000/ Rs

Automatic Solar Cleaning Robot (ASCR)

Abstract:

The power generated through conventional energy like thermal energy is costly and has harmful effect on environment, so the need of some renewable and sustainable energy is increasing day by day. The most renewable energy is solar energy. The growth in installation of solar panel is increased rapidly in domestic as well as industrial sector but their maintenance and efficiency with time is main issue nowadays, these solar panels are fixed with specific angle under the sunlight so the deposition and accumulation of dirt, dust, soiling, snow falling, bird dropping and sand reduces the efficiency of solar panel which is major issue now a days. The major drawback of solar panel is the dirt accumulation which effect on efficiency of solar panel up to 31%. Manual, Anti-soiling and Di-electrophoresis cleaning method on photovoltaic array are risky and costly, in desert area water cleaning method also fail due to deficiency of water.

This project (automatic solar cleaning robot) is able to monitor the efficiency of solar panels by measuring output power of solar panels and then perform dry type cleaning with robot technology that move on solar panel array and it will clean the solar panel on demand basis as well as periodically. The blynk app (IoT platform) is used to acquire the data. Further ESP32 module is used to send and receive data with cloud.

Group Members: F16ES31
                       F16ES37
                       F16ES17

Supervisor: Engr. Bharat Lal
**Co-Supervisor:**   Engr. Aamir Patoli

DNA and Steganography Based Cloud Data Encryption

Abstract:

As a result of the notifiable and explosive rise of the internet, information protection and secrecy have been of prime concern and priority. However, many organizations are unenthusiastic to use cloud services due to cyber threats. Nowadays, sending confidential data is a difficult task because of third party attacks. Two widely used techniques in the field of communication and data security are Cryptography and Steganography. Cryptography is a method of changing and transmitting secret information in an encoded manner, so that approved and expected clients can acquire or deal with it. Steganography is a technique of hiding any confidential data into a cover file. Recently, the field of DNA based Cryptography and Steganography has emerged rapidly because of outstanding properties of DNA. DNA based algorithms are being developed day by to achieve a system that can ensure data confidentiality and integrity. This project aims to design a triple layer security system that can be used for covert communication as well as secure data storage. A triple layer system comprises of three protective layers. In the proposed system, the first layer is of DNA based Cryptography, second layer of DNA based Steganography and last layer of Image steganography. The major goal of this attempt is to contribute into the ongoing research for a better DNA based cryptosystem and to develop a system having low cracking probability, reduced payload and maximum accuracy.

Group Members: F16ES09
                        F16ES25
                        F16ES121

Supervisor: Prof. Dr. Bhawani Shankar Chowdhry
**Co-Supervisor:**   Dr. Fahim Aziz Umrani
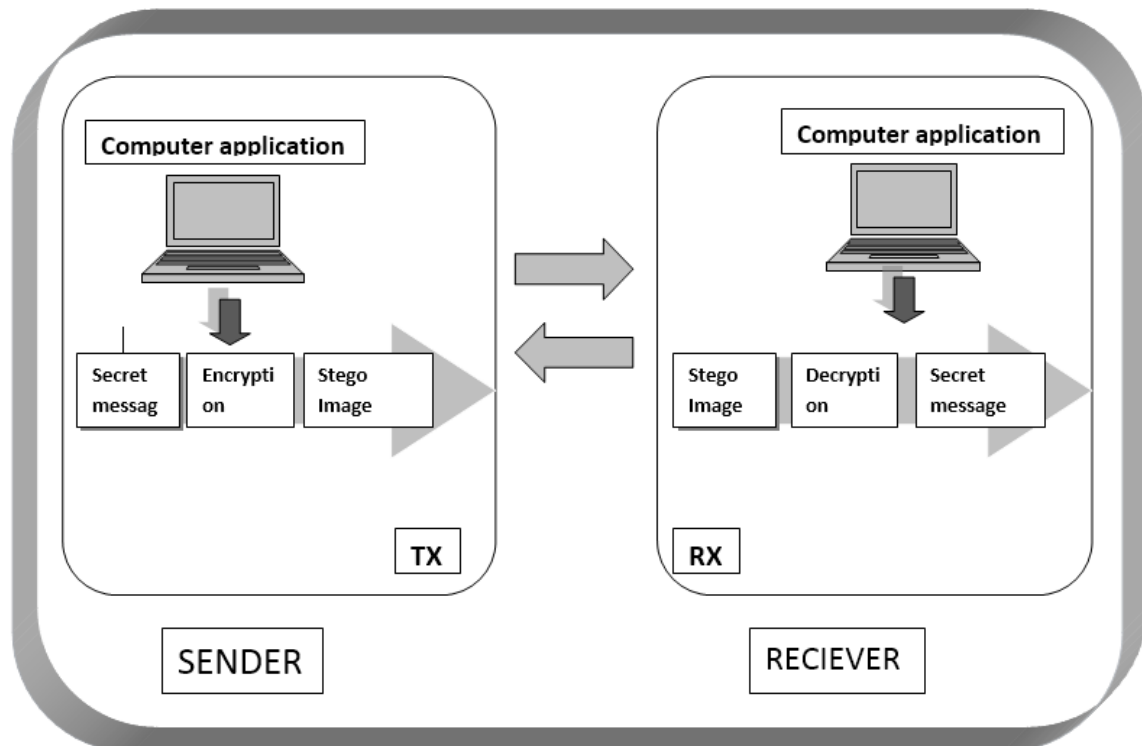
Four View Holographic Display Using Semi-Reflective Mirror

Abstract:

Holography is one of the emerging technologies in the world. Recently it has been profoundly investigated to support holographic video applications. In this project, we proposed a system for developing a holographic display and capture system for visualization of the 360-degree view of real object in real time. 360-degree three dimensional images are created using image capturing system consisting of four cameras at front, back, left, and right side of the object. Then the 360-degree view of the object was split up into four segments for 0,90,180 and 270 degrees, respectively. A python-based software application was used for processing, splitting, and rendering of views. Next, we visualized the holograms of digital animated objects generated using open-source animation software. A pyramid structure was designed and developed based on optical setup for four views generation using semi-reflective mirrors. At last the hologram capture and display parts was integrated together for the final demonstration of the holograms of the objects. Hence with various application this technology, it will significantly influence all the fields of life with business, education, telecommunication, and healthcare as a topmost priority.

Group Members: F16ES62
                        F16ES56
                        F16ES36

Supervisor: Dr. Shoaib Rehman Soomro
Co-Supervisor: Engr. Shoaib Hassan Khaskheli

LCD & SEMI REFLECTIVE MIRRORS   360 Capture of Object with Camera
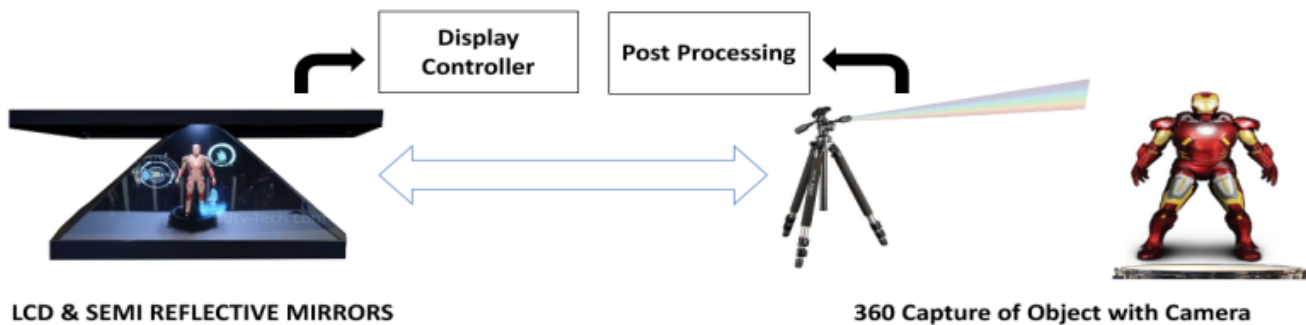
Real Time Implementation of Facial Expression Recognition System for Blind People Using FPGA-LABView Platform
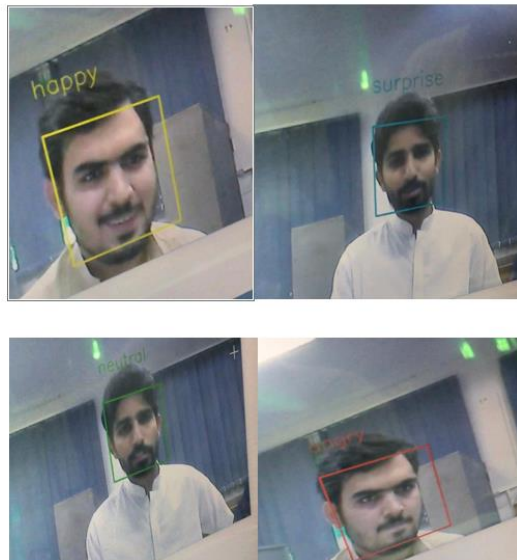
Abstract:

This project provides a feasibility to a blind person to recognize the emotions of human, the project relates with computer vision comparatively cover the part of artificial intelligence. Recognition of facial expressions is carried out with the help of image processing through open-cv and LabVIEW-FPGA platforms. The response is quick enough like live stream and can predict the sudden change of emotion within a limit of a second with least possible delay in time.

The application is built in MYRIO which is an Embedded device, has ability to deploy LabVIEW function in FPGA. It has Xilinx FPGA and Dual core ARM cortex A9 zinc processor with WIFI accessibility. The application is also deployed in raspberry pie for comparative and synthesis analysis. The algorithm works by Using CNN based pre trained data set from Kaggle which is comprised of 3589 images with resolution of 48x48 pixels grayscale images. The emotions predicted are angry, disgust, fear, happy, sad, surprise and neutral. Moreover, in LabVIEW we extract the features using machine vision development module, NI instrument recently released the NI VISION OpenCV utilities package which facilitate the integration of OpenCV algorithm with LabVIEW, which is used in image processing algorithms.

Group Members: F16ES42
F16ES24
F16ES50

Supervisor: Dr. Tayab Din Memon
**Co-Supervisor:** Dr. Shoaib Rehman Soomro

Health Care Application for Comatose Patient Using IOT and Raspberry Pi

Abstract:

Coma is a state of mind wherever the patient fails to respond anything. These patients need utmost care and 24*7 observations. This project is about a continuous monitoring and recording of patient data without human intervention. If there are any sudden changes that occur in the body parameters such as room temperature falls or rise, humidity falls or rise, pulse rates fall or rise, eye blinking. where these are not stable conditions for better health, and Cathetar Bag is filled up to 1500 cm^3 or not and motion of body(in some cases comatose patients body movement have been found abnormally) and if patient need feeding on which time (fixed by doctor when patient admitted in hospital) then it has facility to automatically alert the medical person. The DHT22 sensor detects the temperature and humidity of the room if temperature gets above 28C° then generates an alert message to the medical person and if temperature is below 22C° then it also generate alert medical person and same for humidity if humidity is above 60% or below 30% for both cases it will generate an alert message to medical person. As comatose patient cannot tell what he or she, but as human body requires food and water to live so for the feeding of comatose parient Peristaltic Pump is used. When comatose patient needs food, which is decided by doctor when patient is admitted to hospital after that decision only medical person work is to feed them through when they received alert message. In some cases it has been found that comatose patients blink their eyes in state of unconsciousness for monitoring eye is blinking or not blink Eye blink Sensor is used which detect eye is blinking or not if eye blinks then it will generate alert message to medical person. EMG (electromyography sensor) is used to measures small electrical signals generated by muscles when comatose patient moves them. This includes lifting arm up, clenching fist, or even the simplest of movements like moving a finger and anything mentioned above occur then it will generate alert message to medical person. Comatose patient losses their sensation for urination, medical person needs to continuously monitor urine output, thus ultrasonic sensor is used to check urine level. Medical person can keep the track of patient using login to the Firebase. System monitor shows six signs namely pulse rate, temperature, humidity, urine output, body movement, feeding status, eye blinking or not. While testing these all value gets updated over IOT and LCD display.

Group Members: F1616ES37
                        F16ES115
                        F16ES19

**Supervisor:**   Engr. Tufail Ahmed Waseer
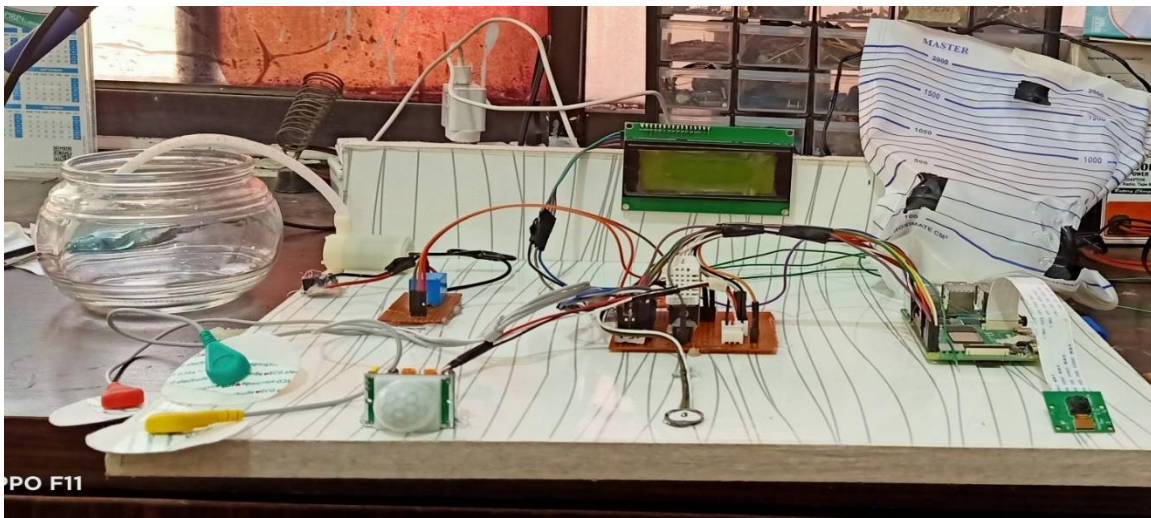
Condition Monitoring of 3-Phase Induction Motor Using Artificial Neural Networks (ANN)

Abstract:

Induction motor plays a major role in most of the industries. Previous research shows that the power consumption by induction motor in the industries is 60% which implies that induction motors are an essential part of the industry. Based on its structure layout, induction motor has several types, one of which is squirrel-cage induction motor, it is strong and jagged in its construction and is widely used in multiple industry based application due to its reliable and cost affective nature. Despite of its strong construction, induction motors are often prone to faults due to which it requires continuous monitoring and maintenance. There are different types of faults that occurs in the induction motor. Roll bearing are the most vulnerable part of the induction motor,40% of the total faults that causes serious damage to the motor is due to bearing faults. If the fault is left unnoticed it can cause major damages to the machinery, it costs huge amount of money for the repairing and eventually it causes the production to stop. To resolve these issues this project proposes an idea about a stand-alone system that will detect the roll bearing faults at the preliminary stage of a 3-phase induction motor using Motor Current Signature Analysis (MCSA) and classify it with aid of Deep Learning model approaches. The proposed system extracts the features using SCT-013-005 current sensors it further samples the features using ADS-1015 ADC and organizes the data acquired from ADC in CSV file using data acquisition system (DAQ), the organized dataset is fed to the deep learning model, the model train itself using the data and finally the real-time data is used to test the models and classify whether the motor is induced with bearing fault or not. This project also provides comparison between two deep learning models MLP and LSTM to analyze the accuracy of both models.
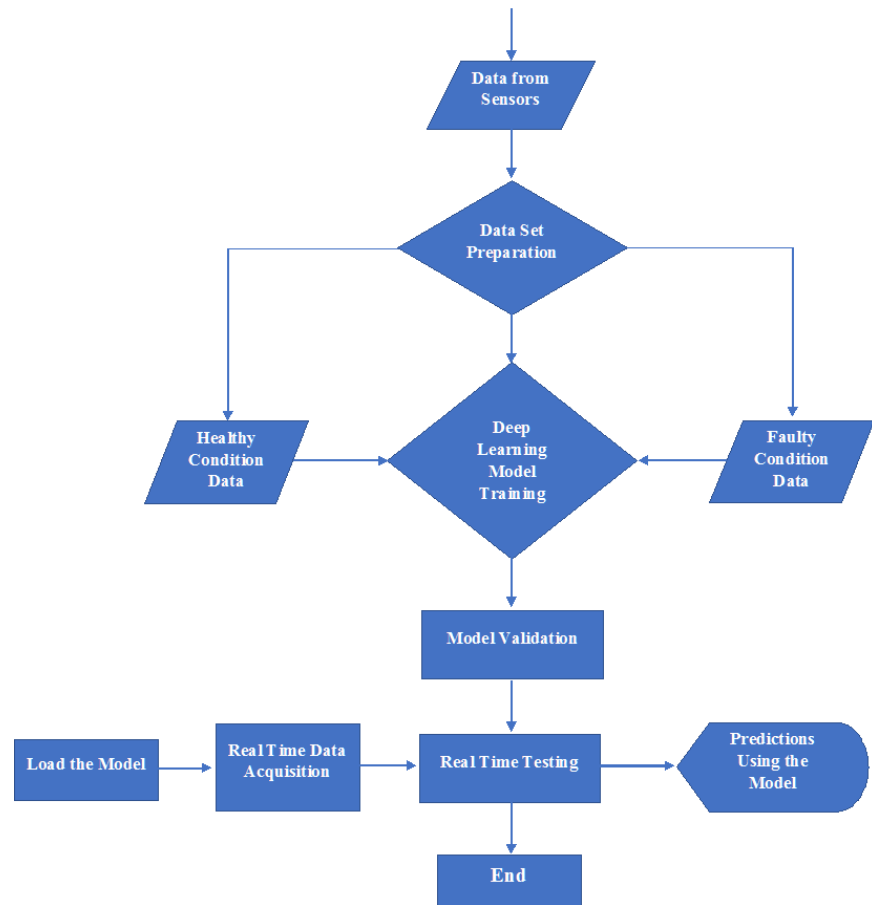
Group Members: F16ES04
F16ES06
F16ES28

Supervisor: Engr Mansoor Teevno
Co-Supervisor: Engr Bharat Lal
Consultant: Engr Dileep Kumar (NCRA)

# Virtual Reality Based Telepresence Platform

Abstract:

The concept of telepresence has emerged in every field of communication, which enables a user to experience virtual presence at a remote location, through a network link. Thus, this project evolves through the idea of overcoming drawbacks in current technology, such as its non-immersive experience.

The project proposes a virtual reality-based 3D telepresence system that enables the user to view, perceive, and move in the remote environment virtually. The system comprises a remote module and the local module. On the local user side, a virtual reality headset is used to have a 3D view of the remote location using stereoscopic vision. An IMU sensor attached to the headset provides the pitch and yaw data for the head-movement of the local user. The head-movement data at the user side is sent to the raspberry pi at the remote site via a network, which in turn provides these values as an input to the servomotor for the movement of cameras. In that way, the local user can perceive the remote environment using VR and can freely move inside it. The locomotion of the UGV at a remote location is performed by the user wearing a VR device.

This proposed system can be used for the business and in the educational institutions for the remote surveys and can enhance the experience of communication.

Group Members: F16ES23
F16ES33
F16ES75

Supervisor: Engr. Aamir Ali Patoli
Co-Supervisor: Dr. Shoaib Rehman Soomro
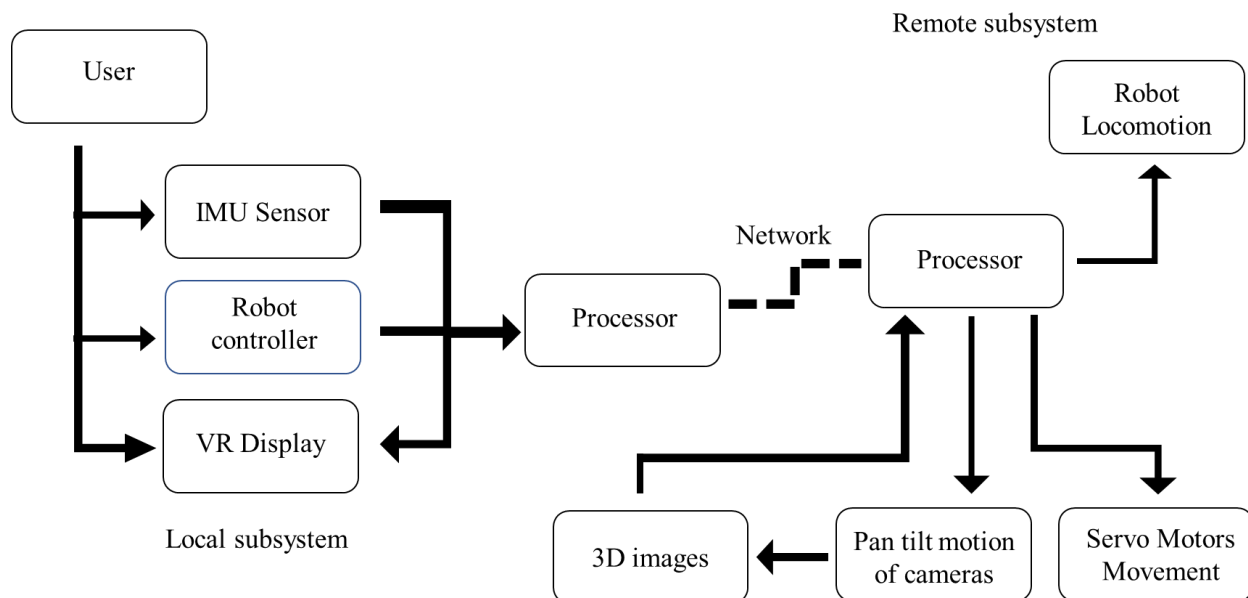
Smart Cap for Visually Impaired People

Abstract:

A little while back, the "World Health Organization (WHO)" and "International Agency for the Prevention of Blindness (IAPB)" published a report in a joint venture. According to the report, approximately 285 million individuals globally are visually impaired in which over 100 million folks are suffering from moderate or severe blindness. The problematic thing is that, out of these 285 million folks, 39 million are the ones who completely lost their vision and suffering from total blindness. The gravest problem we are facing nowadays across the globe is visual impairment and it is the major concern with respect to the disability among peoples. The number of people suffering from visual impairment has been skyrocketed and it is not going to bound here. The report has predicted that the number of visual impairment cases would increase in future. However, the main aim of this project is to develop a cost-effective, Smart Cap system for visually impaired that has the potential to guide the blind person while travelling around with preventing hurdles and detection of objects. This project would help folks to recognize objects and determine their next step dependent on the appearance of any barrier. This project "Smart Cap for Visually Impaired People" involves hardware components like sensors, processor, microcontroller, pi camera, buzzer, vibration motor, earphone, cap and software systems that would help blind people to perform their daily basis tasks such as travelling, shopping, working and, etc. All the ultrasonic HC-SR04 sensors are placed on the cap to cover all directions front, back, left, and right. The system is unique and it will warn the user in three different ways; whenever any obstacle comes in front of the user the system will start alerting the user by sending warning signals in a series by turning on vibration motor, buzzer and alert them through voice as well by telling the distance in centimeters using earphones. Half part of our project is based on Deep Learning Algorithm for the recognition of objects. Mask Regional Convolutional Neural Network (Mask R-CNN) is used with python programming language and other different AI libraries such as TensorFlow, Numpy, OpenCV, Matplotlib, and Keras for the identification of different objects. In future, we intended to implement some more voice functions in this project and indulge a guidance system which will offer absolute outdoor map-based navigation. We also intended to involve an emergency button in this device that would make it more reliable and throughout the event of any indoor and outside incident, the device will be able to transmit a request to the ambulance and it would also make an immediate communication link between the user and family member or friend.

Group Members: F16ES102
F16ES34
F16-16ES126

Supervisor: Engr. Tufail Ahmed Waseer
**Co-Supervisor:** Engr. Ali Arsalan Siddiqui

Smart Cap- "How it works"
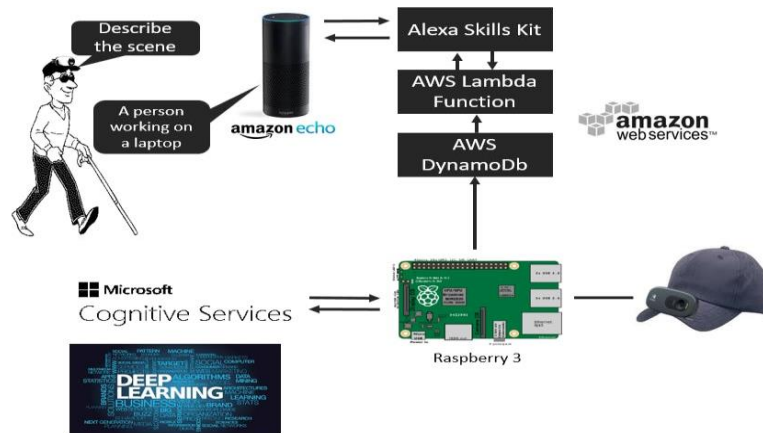
Design and Development of Online LIPO Battery Health Monitoring System

Abstract:

With advancements in technology, human lives are becoming increasingly digitized. By every passing day more ways are deliberated and developed to keep the power and energy supplies uninterrupted. Owing to this, our reliance on backup energy sources have increased manifold. Many batteries offer adequate amount of backup but particularly Lithium polymer (LIPO) batteries, although a new technology, has caught the eye of consumers. Unfortunately, here in Pakistan most of the people pay a very little heed to the health of their batteries which leads to reduction in performance of the battery, overheating, reduced lifespan, and an eventual failure of the battery. So, it has become indispensable to protect battery health. The main vision of this project is to develop an advanced battery health monitoring system that will improve the efficiency of battery, prolong its life span, avoid battery failures by constantly and wirelessly monitoring battery parameters. To achieve this goal a hardware system is designed with the help of NodeMCU and our own developed Android app. Voltage sensor, current sensor and temperature sensor are used to monitor voltage, current, temperature, respectively. The acquired data is then transferred to processor (NodeMCU) to evaluate the readings and take the decisions. NodeMCU is further connected to Android app through built in WIFI module in NodeMCU to transmit the data for displacing and monitoring of the battery parameters along with that additional commands can also be given through Android app. Having processed all that data, remaining functional life of a battery is estimated and calculated which is then shown on Android app. This whole system will transform the way battery's health is maintained and monitored. This system will be handy in protecting your battery's health and prolonging its life span.
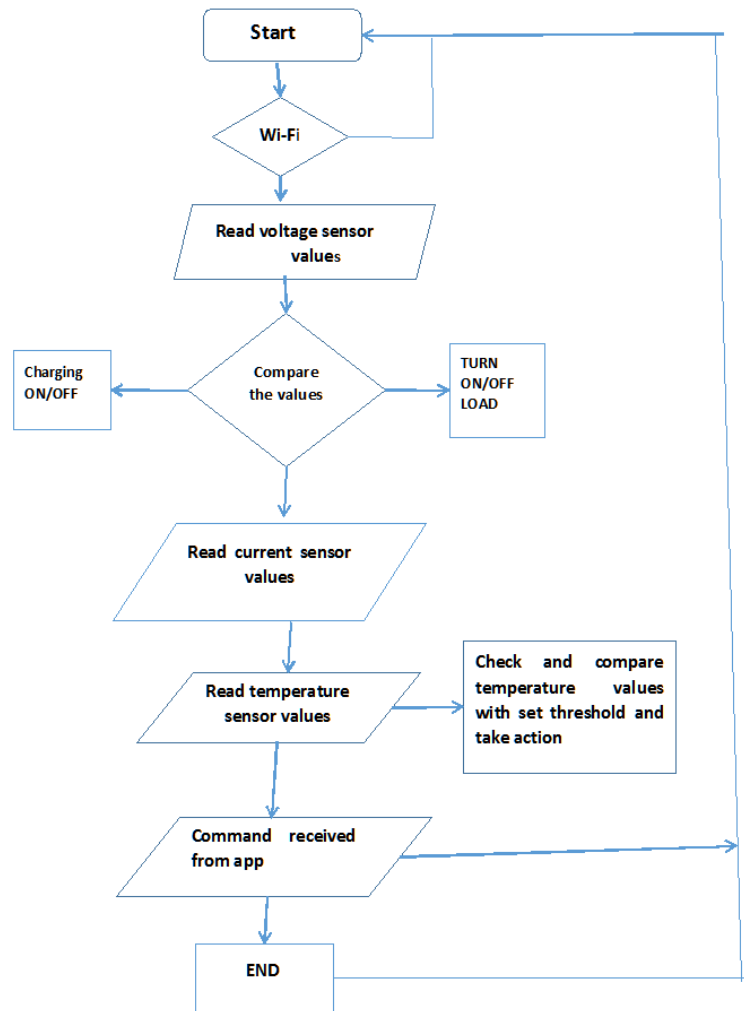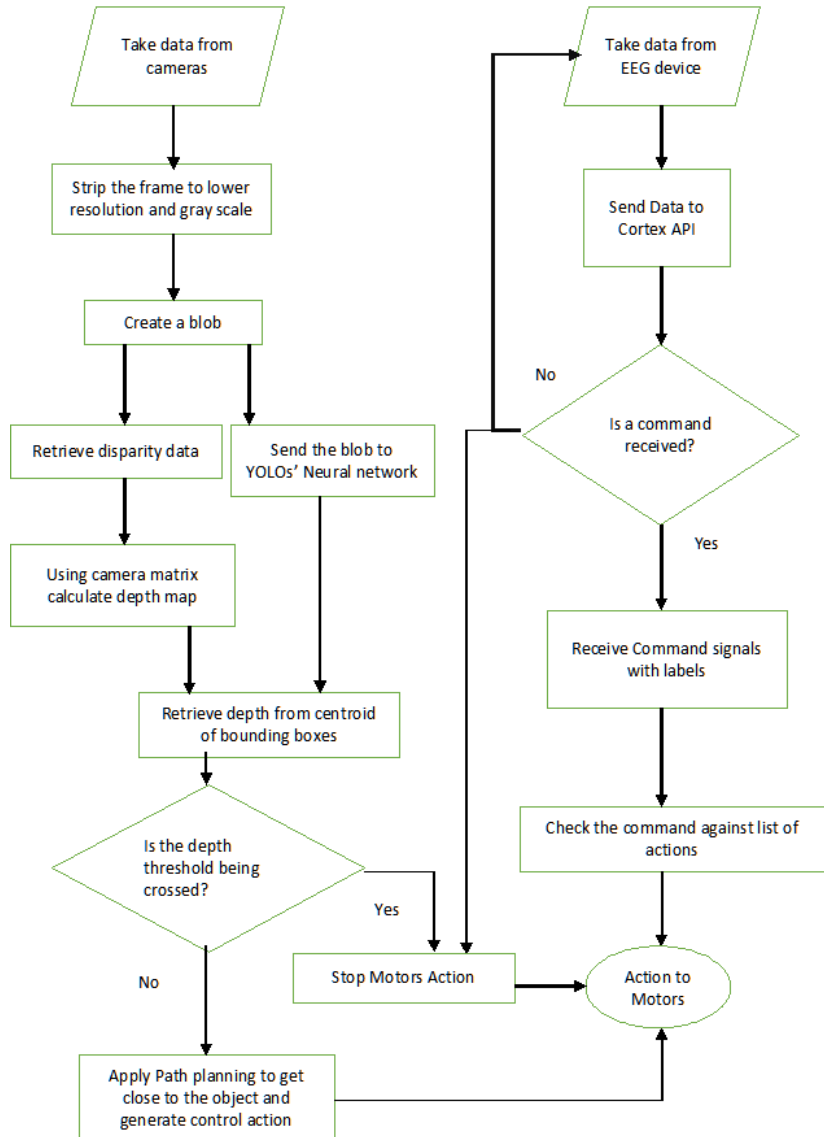
Group Members: F16ES02
                         F16ES74
                         F16ES38

Supervisor: Engr. Qurban Ali Memon
Co-Supervisor: Engr. Tufail Ahmed Waseer

Control and Automation of Wheelchair Using EEG and AI/Image Processing Algorithms

Abstract:

In the modern age with advanced technology, which can perform complex tasks, there is a lack of aid in the mobility of the disabled population. To overcome this several proposals have been given, one of which is a brain-controlled wheelchair. There has been extensive research on the topic, and many protypes have been put forth with various techniques, however most of them are either expensive or difficult to use. Our project aims to develop a wheelchair which will be both easy to use and less stressful on the user. We achieve this through EEG, which is non-invasive and portable. Through the EEG devices we take the control signals and move the wheelchair. This hands-off interaction provides a disabled person to control the wheelchair, regardless of the severity of their physical health as long as they are mentally sound. To further ease the user, intelligence is programmed in the wheelchair using cameras and a powerful SBC (Single board computer). The cameras help in detecting obstacles and avoiding them in real time using stereo vision (through depth perception). While the SBC is responsible for processing the signals and images, while simultaneously controlling the wheelchair. The wheelchair in our project is custom built, along with the control circuitry. The methods applied is effective, and the results show that the wheelchair can be moved with a consumer grade low-cost EEG device, and alongside the AI is shown to be both fast and responsive.

Group Members: F16ES27
                     F16ES61
                     F16ES39

Supervisor: Engr. Khuhed Memon
**Co-Supervisor:**   Dr. Tayab Din Memon

Track Monitoring Using WSN and Cloud Networking

Abstract:

The railway industry has a significant impact on the nation's economy and energy consumption as it takes less time in covering long distance at cheap rates. This leading industry can be responsible for fatalities if not monitored properly because now a days the tools that are used to monitor railway tracks specially at crossings are ineffective. Routine inspections of the railway tracks are still being performed manually or by specially designed inspection vehicle which creates higher expenditure and makes infrastructure difficult to maintain. This project aims to design a real time system based on acceleration measurements (IMU sensors). With the help of wireless sensor network (WSN), data will be logged from the sensors and will be send over the cloud platform where the data processing will be performed. The data will be processed in such a manner that it can detect any abnormality including squats and frogs if found on track. This project will be cost effective with accurate and precise measurements which results in good performance. Hence it will help the railway industries to monitor the railway track efficiently and accurately.

Group Members: F16ES15
                    F16ES35
                    F16ES07

Supervisor: Engr. Komal Khuwaja
**Co-Supervisor:**   Dr. Farzana Rauf Abro/ Engr. Ali Akbar Shah
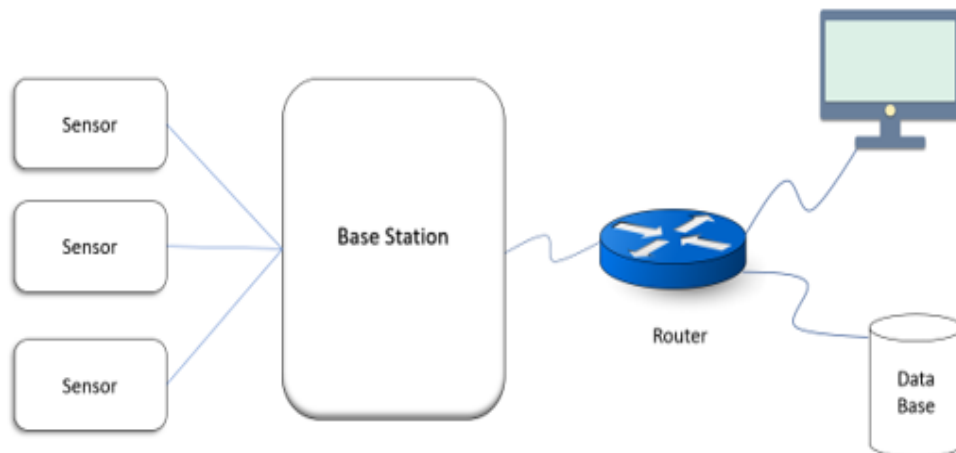
Motion Parallax Image Capturing and Display System for Virtual Museum Application

Abstract:

The involvement of technology in the fields of arts, archaeology and history has increased over the past few decades. The 3D imaging and displays systems are widely used to capture, record, and visualize the archaeological objects and artwork. We proposed a motion parallax display using 2D screen and head tracking system. The proposed multi perspective image capture system works by using one movable camera to avoid misconception in displaying of antique piece with three-dimensional (3D) view. The purposed work is based on two segments, one of them is image capturing which processed through web camera attached with timing belt through stepper motor, stepper motor is controlled through Arduino microcontroller which is responsible for movement of camera. The range of camera movement is fixed 1-70cm with step size 1cm. During the process of image capturing it captures images at every 1 cm and it takes image and saves in memory through python. The second part involves the viewer tracking and display of the rendered views. A flat panel 2D display is used for image display while a head tracking through web camera is used to track angular position of the viewer. The required view is rendered based on the angular position of the viewer and is displayed on the screen. Finally, we get 3D display with motion parallax which is proposed and implemented. The multi view images are stored in advance and projected according as the viewpoint of the user.

Group Members: F16ES63
                        F16ES01
                        F16ES21

Supervisor: Dr. Shoaib Rehman Soomro
Co-Supervisor: Engr. Mehboob Khuwaja/Engr. Qudsia Memon
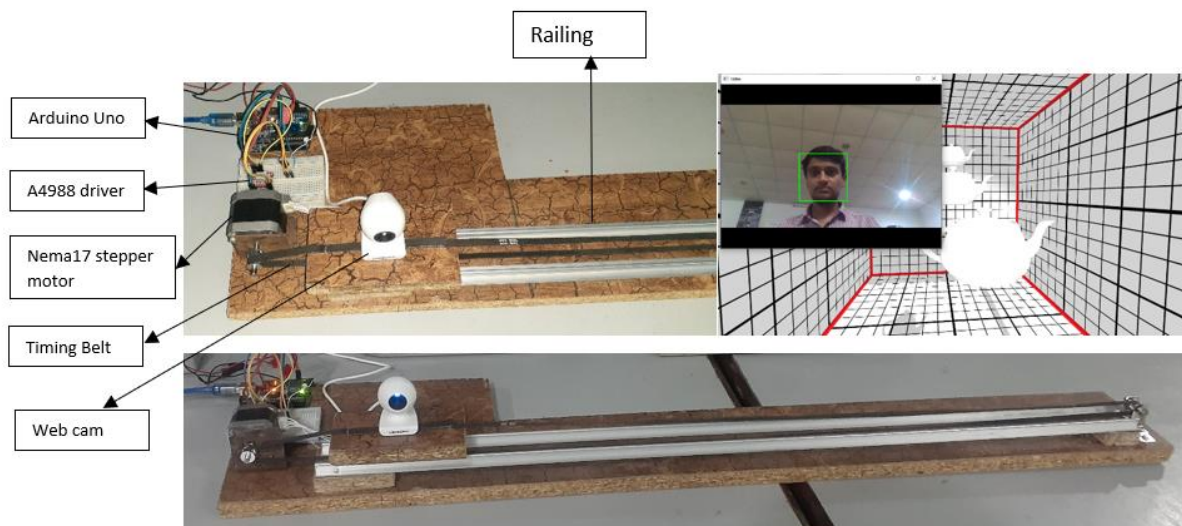
Design and Development of Cloud Computing of Bottle Filling and Capping Station Trough Bar Code Scanner on Basis of Industry 4.0

Abstract:

The paper gives essential way to deal with move towards automation at more elevated level and thoroughly digitize the business so we can get productive yield in less time. the automation business which depicts the specialized issues of automation control framework in activity advancement, improving administration level and high effectiveness measure in bottle filling plant. The principal assignment of the task is filling. Filling of tanks is controlled utilizing the PLC regulator which is additionally the mind of this undertaking. The transport line will move and move the filled tank with an unfilled container. The transport utilizes the outfitted dc engine. A sensor utilized at the transport is utilized to detect the measure of liquid filled in a container and supplant the following tank with the current situation of the tank. The undertaking utilizes a smaller number of frameworks, which diminishes the expense. Stepping stool Logic is utilized for the programming of the PLC. The product on which the program here will be composed to run is STEP7. The subsequent stage after the filling is the covering which is designed to play out the subsequent stage of this task and is to be filling the tanks. The expense of this venture is very less (after introducing a PLC in businesses) and the execution including the writing computer programs is very adjusting. Just it requires a little skillful work to utilize PLC. In the container filling plant different cycles should be controlled and observed consistently. Along these lines it becomes dull task to deal with the plant physically. PLC computerizes the succession of activity to maintain a strategic distance from human obstruction, so precision is improved, and speed of cycle has been expanded. Yet at the same time we require human exertion. The point of this project depicts execution of industry 4.0 to existing constant model of the water treatment plant utilizing PLC. This project is about how industry 4.0 ideas are valuable in packaging industry. The whole process is controlled through HMI. It is a connection between users and devices. HMI is most used in the context of industry process. And the whole data is logged through cloud computing.

Group Members: F16ES113
                      F16ES65
                      F16ES51

Supervisor: Dr. Farzana Rauf Abro
**Co-Supervisor:**   Engr. Bharat Lal

User Follower Trolley

Abstract:

In todays' world where the trend of supermarkets is getting more and more common, here for purchasing a shopping trolley or shopping cart is a necessary equipment. Traditionally, these shopping trolleys are being used by the customers within the shopping stores to carry multiple goods around until they are eventually paid to cashier. Considering the generic shopping trolley, the customer might find it inconvenient to move the trolley around the store while searching for a specific product. To resolve this hinderance, we have set a goal for the designing of a smart automated following trolley based on an android infrastructure. The hardware and software design of a user following trolley system is provided in this paper which will be capable of following the user while keeping a safe distance from any obstacle to avoid collision.

Our user following trolley uses Arduino microcontroller and Android smartphone as sensors and controller. The android smartphone will control the user following trolley by sending a signal to Arduino microcontroller paired with the motor system which operates the movement of the user following trolley and monitors the situation using the directional sensors such as IR, Ultrasonic, Gyro and Accelerometer. Furthermore, we exploited the smartphone sensors for user following trolley navigation. This method is additionally equipped with the indoor positioning system to detect user position which based on gyroscope and accelerometer. The communication of the user following trolley with the customer's smartphone is controlled and managed by Thing Speak network server and once the trolley is assigned to the consumer this communication is performed independently by using Firebase. Finally, the smartphone application will enable the user to enlist the items and their prices by simply scanning the barcode of the product. Ultimately, this project will eventually result in an efficient, hassle free, and comfortable shopping experience to all customers.

User Follower Trolley Flow Chart
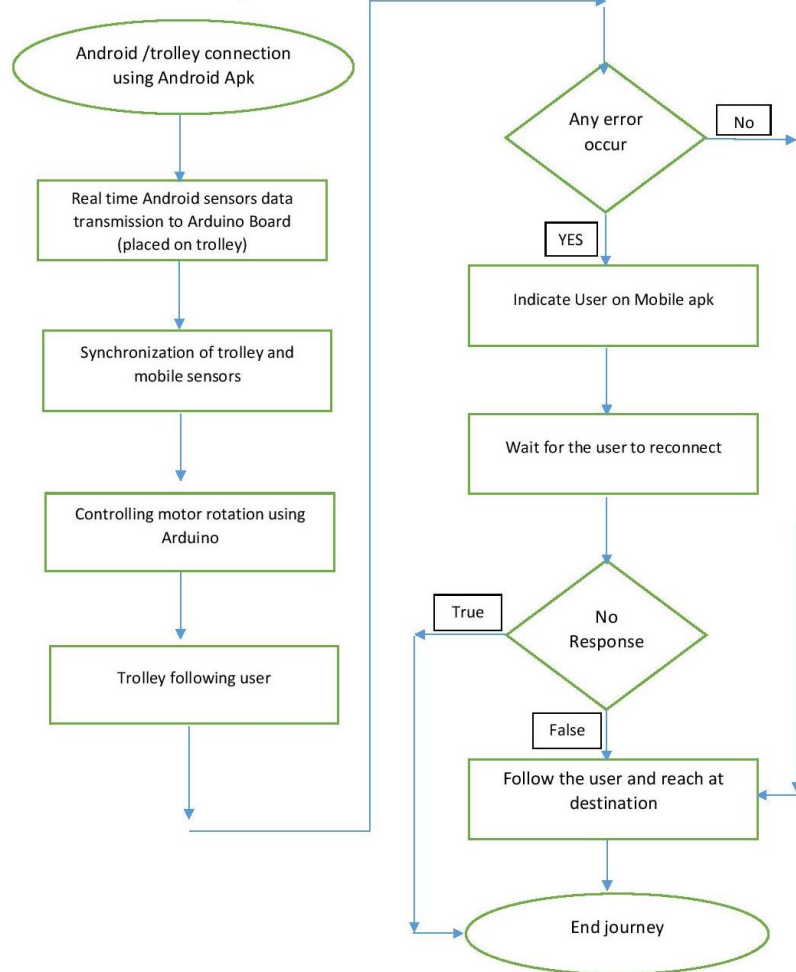
Group Members: F16ES11
F16ES49
F16ES57

Supervisor: Engr. Shakila Memon
**Co-Supervisor:**   Engr. Shoaib Hassan/Engr. Abdullah Memon

SEHAT (Smart E-Health for Telediagnosis and First Opinion)

Abstract:

According to "World Health Organization (WHO)", Telemedicine is the source to provide health care services to patients who are far from the treatment providers/doctors, it uses ICT for exchange of information to diagnose patient's health and provide them treatment. Telemedicine is mainly used to improve care delivery in those areas where doctors and medical staffs are not readily available. The vision of this project is "To treat patients at remote location with highly effective cost and best doctors". SEHAT "Smart E-Health App for Tele-diagnosis and first opinion" is another enhancement in the field of Telemedicine which provides secure and effective healthcare at home, office, hospitals, and everywhere else. SEHAT observes and measures human body vitals noninvasively, collects the vitals data, ask important queries like; Patient's age, gender, symptoms and provides with the best suitable doctor accordingly from the doctors pool, where doctor could provide first opinion in the form of prescription, suggestion or appointment. In order to develop this project, we have created an hardware-based system which is consist of sensors (such as Ultrasonic sensor, IR temperature sensor, pulse oximeter, BP device, Bluetooth module), and controller for measurement of vital signs in automated manner, and transfers the data to the mobile app, which eventually collects the patient's data and send it to the pool of doctors. The selection of medical consultants is based on the symptoms of the user and vital signs data. In Pakistan, various systems and apps have been developed for providing ease of finding the doctor and getting online appointments. However, no system or application provides remote diagnostics and doctor's opinion based on symptoms and vital signs. SEHAT is also solution of time saving problems, it provides doctors facilities at our own place by which we do not have to wait at clinics for our turn. We have built the prototype of the project's hardware, connected it to mobile app with the help of Bluetooth module and test it where we got expected results. In the future our goal is to further enhance this system by adding more vitals measurements capabilities and make it commercially available in all those areas where we are aiming it to be.

Group Members:	F16ES16
	F16ES64
	F16ES108

| **Supervisor:**	Dr. Shoaib Rehman Soomro
Co-Supervisor:	Engr. Bharat Lal
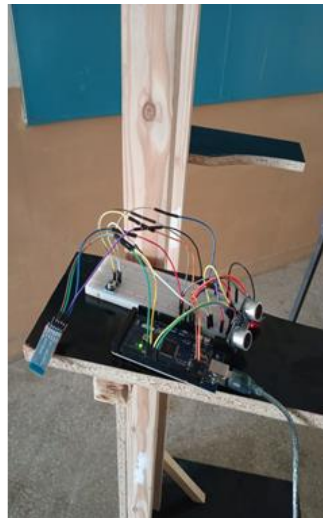
Smart Helmet Preventing Industrial Accidents

Abstract:

Industrial workers such as coal miners are not safe and secure in the industries. in Pakistan, many incidents are disregarded because of the loss of life. for example, the rate of horrible deaths in the local marble industry Mohammad, Khyber Pakhtunkhwa, and garments factory in Karachi Baldia area, etc. The mining is hazardous, and it requires the mastery during this operation a lot of gases released into atmosphere. As a result, suffocation, roof-collapse, gas poisoning, and gas explosions occurs dramatically. It is a matter of fact that there is a lot of malpractice, mismanagement, and carelessness of factory owners who are not providing any such safety measures to workers for their survivability. However, industrial workers are in bitter conditions and they are not procured protective measures. Thus, modern mining methods must be implemented to ensure the safety and security of the workers. In this regard, this project is viable to ensure the safety of the workers inside the factories and industries. There are many international laws regarding the labors that are pursued globally. So, keeping all the aspects we designed a system i.e. smart helmet using Arduino technology for monitoring detrimental gases, erratic temperature, and humidity levels in the air. The revamped safety in our system increases the life expectancy of industrial workers by alerting them about the hazards. If any dangerous situation arises the WIFI module transmits the information to the control center or station as an alerting system to safeguard the workers. therefore, it is our social responsibility to develop and build this project for the well-beings of industrial workers. our circuitry has five sensors i.e. gas, DHT22 (digital temperature and humidity), LDR, vibrate and flame sensors to monitor and analyze conditions in the mines and factories.

Group Members: F16ES12
                    F16ES122
                    F16ES66

Supervisor: Prof. Dr. Wajiha Shah
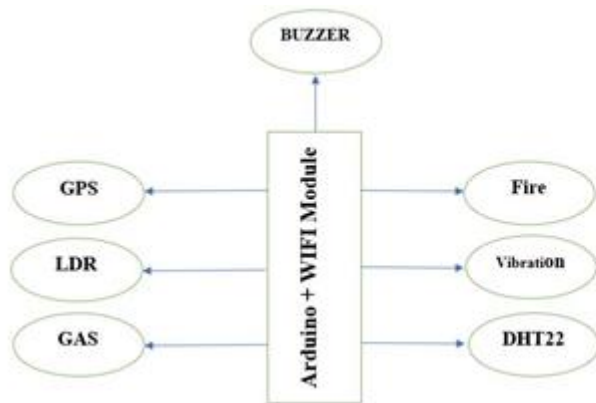
# Radiation Avoiding Smart Projector Through Image Processing

Abstract:

Two related problems of front projection display which occur when users obscure a projector is projected light falling on and distracting the users. This project provides a computational algorithm for solving these problems based on projector and camera. The system detects when and where shadows are cast by occluders and can determine the pixels which are occluded in different projectors. Through a feedback control loop, the contributions of unconcluded pixels from other projectors are boosted in the shadowed regions, thereby eliminating the shadows. In addition, pixels which are being occluded are blanked, thereby preventing the projected light from falling on a user when they occlude the display. This can be accomplished even when the occluders are not visible to the camera. The project presents results from several experiments demonstrating that the system converges rapidly with low steady-state errors.

The objective of this project is to develop facial recognition algorithms to recognize face on presentation screen. This report explores different techniques used for the recognition of faces. Different stages involving image processing like the preprocessing stage, segmentation and feature extraction will be studied and discussed. Finally, the product of the algorithms will be written in the software called Python.

Group Members: F16ES08
                       F16-16ES120
                       F16ES20

Supervisor: Prof. Dr. Wajiha Shah
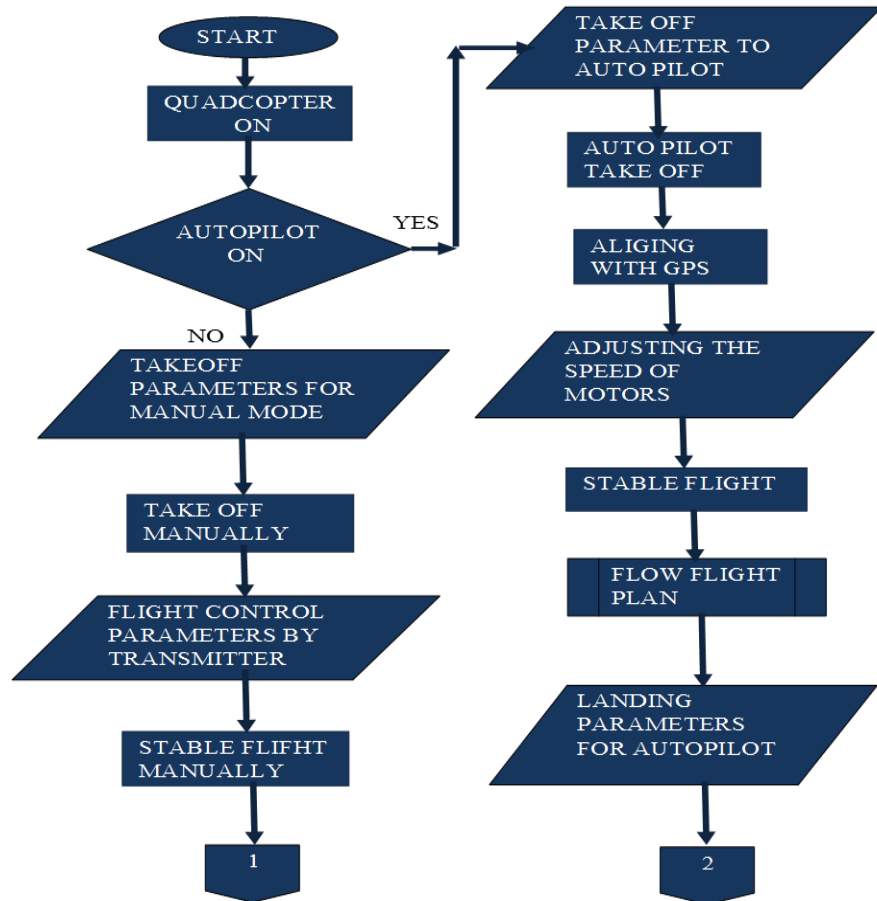**Co-Supervisor:**   Engr. Mehboob Khuwaja

HARDWARE ARCHITECTURE
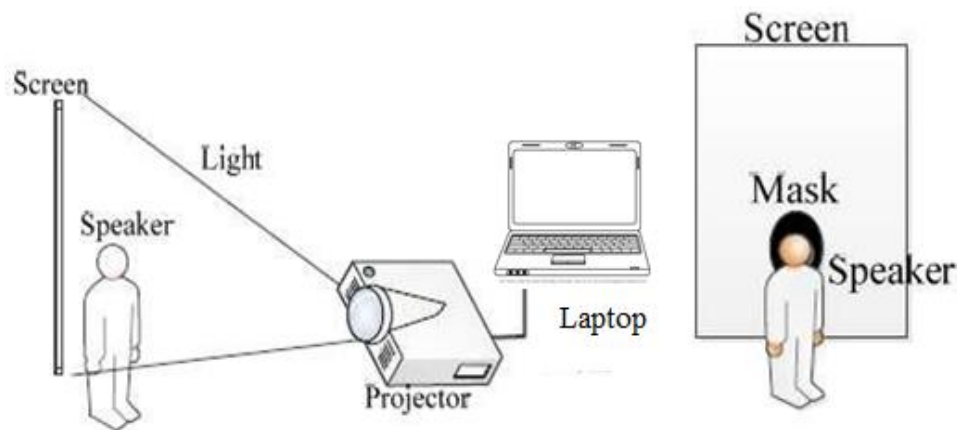
IR Camera Based Recue Drone

Abstract:

We are witnessing the era of UAV's that can fly in natural and as well as in manmade environments. The type of UAV upon which our project/thesis is based on Autonomous Rescue system using IR camera with GPS system and often associated with defense and civilian applications. Based on number of surveys, the most common type of UAV available in markets are the ones which are controlled by conventional handheld Transmitter and Receiver. Thus, our contribution will be to bring autonomy to the drones or to fly it autonomously. As per the same reason in our project we are trying to take controls from conventional hand held remote and receiver by integrating appropriate modules with our flight controller with the calibrations of different flight sensors which will make it capable of flying autonomously along the predefined waypoints in the flight plans and the vehicle will be able to follow that flight plan with the help of GPS module ,These flight plans can be updated frequently not just it, but the drone will be capable of undergoing further modifications as per the requirements over the times, providing a upper hand to the users to use it in most efficient ways with less time delays, accuracy and precision. Also, by interfacing the camera with it and make it more efficient by visualization process that may results in rescue operations and many other applications.
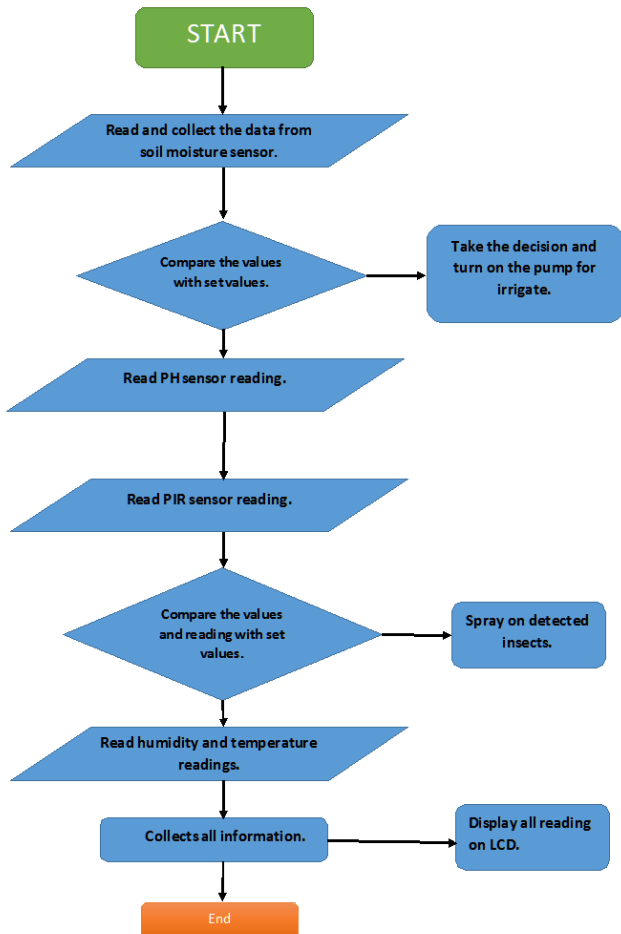
Group Members: F16ES126
                       F16ES124
                       F16ES26

Supervisor: Prof. Dr. Wajiha Shah

Low Cost Anti-Bacterial/ Anti-Insects Field Control Health Monitoring System

Abstract:

With the passage of time and advancement in the development of smart and self-regulated sensor strategies have accomplished huge consideration in the context of agriculture. These systems are installed in agricultural field to implement various operations and functions appropriately by employing restricted assets with negligible human intervention. The supply of water to the farmland is the most essential part of agriculture and for the growth of crops and this can be done by the utilization of Irrigation system. The amount of water required by the soil relies upon various soil parameters for example, soil dampness and soil temp. For the effective flourishing of crops water necessity of the plants must be fulfill and it is possible by the utilization of current innovation in automatic water supply system called Irrigation system. These systems have the potential to control and monitor the supply of water to the agricultural field. Generally, most of the water system frameworks have not the capability to work/function automatically. However, there are various flaws in the current techniques of monitoring the agricultural land. The detection of insects/bacteria is also a harsh task and timely identification and response required to protect the crops and that is the challenge facing by many farmers nowadays. The bacteria/insects can damage the crops like other parameters do including the inadequate pH values of water, soil dampness level, temperature, and humidity present in the atmosphere. Therefore, we developed a smart system for the monitoring of agricultural field and detection of insects/bacteria present in the farmland. The project is composed of different sensors for the monitoring and detection purposes. The pH sensor, PIR detector, DHT11, and soil moisture sensor are employed for the purpose of perceiving the condition of the agricultural land and then this data is processed by the Arduino micro-controller. Whenever the moisture level of soil is low the controller turn On the DC pump integrated with Arduino Uno to supply the water to the land and if an insect/bacteria detected by PIR sensor then the spray is utilized to kill them. The results of the measured values will also display on the LCD screen. The current conventional strategies can be supplanted with the proposed technique in this thesis to utilize the water proficiently and adequately for the growth of yields. In future, we would endeavor to build a system that would be based on AI algorithms for the monitoring and controlling of agricultural works in the farmland.

Group Members: F16ES30
                    F16ES54
                    F16ES130

Supervisor: Engr. Tufail Ahmed Waseer
Co-Supervisor: Dr. Khalil-ur-Rahman Dayo

Cyber Threat Detection and Prevention Using Machine Learning
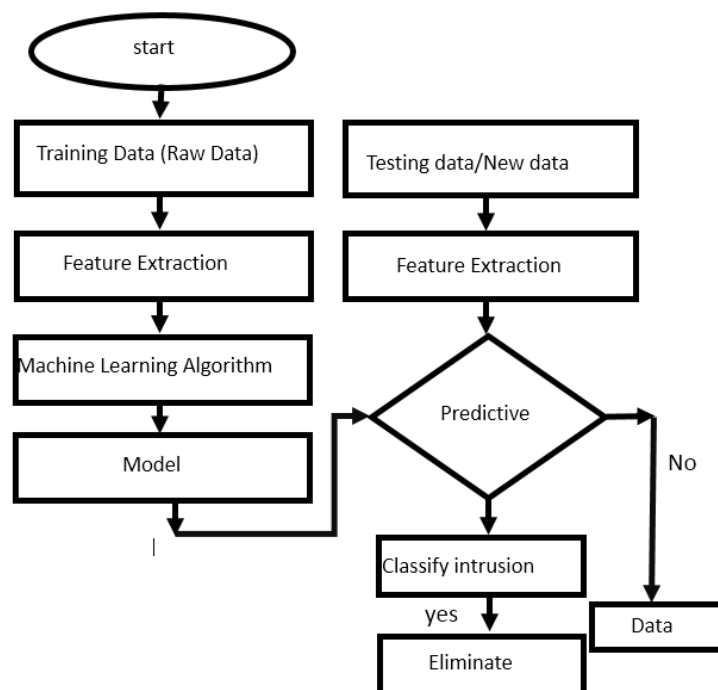
Abstract:

The intrusion or malware attack are increasing day by day with the increased usage of internet. Antivirus software are insufficient to evade cyber-attacks due to code obfuscation techniques and creation of new polymorphic variants every day. Generic cyber-attacks vectors are also not robust enough for detection as they do not completely track the specific behavioral patterns shown by any intrusion families.

A hazard can be anything that may cause the network system to experience possible harm. Such threats could turn out to be a machine attack. Threat can occur for obtaining information in any form such as viruses, outright attack, hacker phishing attack and intrusion attacks. Information security helps to defend the device from threats such as unwanted access to the network, intrusion threats etc. This offers a new Cyber Threat Detection and Prevention architecture using Machine Learning (ML) to predict network security malware which requires execution in a similar domain. Modified Machine Learning challenge to prevent the attackers from subversion of the system.

The idea is to implement Intrusion Detection System (IDS) based on Machine Learning (ML) Algorithm such as Random Forest (RF), Support Vector Machine (SVM), Logistic Regression (LR), Naive Bayes (NB), and Decision Tree (DT) algorithms to detect and classify known and unknown cyber-attacks. To evaluate the performance of ML based IDS, KDD Cup'99/NSL KDD intrusion detection data-set will be explored to train and test the model. Later, to improve the accuracy of prediction, feature selection or feature extraction method would be employed to prevent the probability of False Positive and / or False Negatives.

Group Members: F16ES05
F16ES73
F16ES129

Supervisor: Dr. Farzana Rauf Abro
**Co-Supervisor:** Dr. Faheem Yar Khuawar/ Dr. Mohsin Memon

Real Time-based Melanoma Detection Using Image Processing and Machine Learning Through Low Cost Dermoscope"

Abstract:

Our project is about the diagnosis of Melanoma type of Skin Cancer at early stage through non-invasive method in that the main objective is to fabricate "Dermoscope" a cost-efficient device and machine learning model trained on dataset provided by International Skin Imaging Collaboration (ISIC) containing 3600 images of melanoma (malignant as well as benign). The device will capture lesion image and a trained machine learning model will predict either the lesion is cancerous or not, because of the low cost it will be available locally and will be in reach of common people as well. The project basically comprises three phases, fabrication of a prototype, machine learning model using Convolution Neural Network, and cloud (Google co-lab) for storing the captured images that will be called as a testing image in a trained model. In addition, these pictures can be used as data base for testing images for the further improvement in the model. This project is going to help doctors for diagnosing the deadliest type of skin cancer (melanoma) in less time this early detection might be key to patient survival.

Group Members: F16ES05
                      F16ES73
                      F16ES129

Supervisor: Dr. Attiya Baqai
Co-Supervisor: Dr. Sanam Narejo/ Dr. Fahim Aziz Umrani
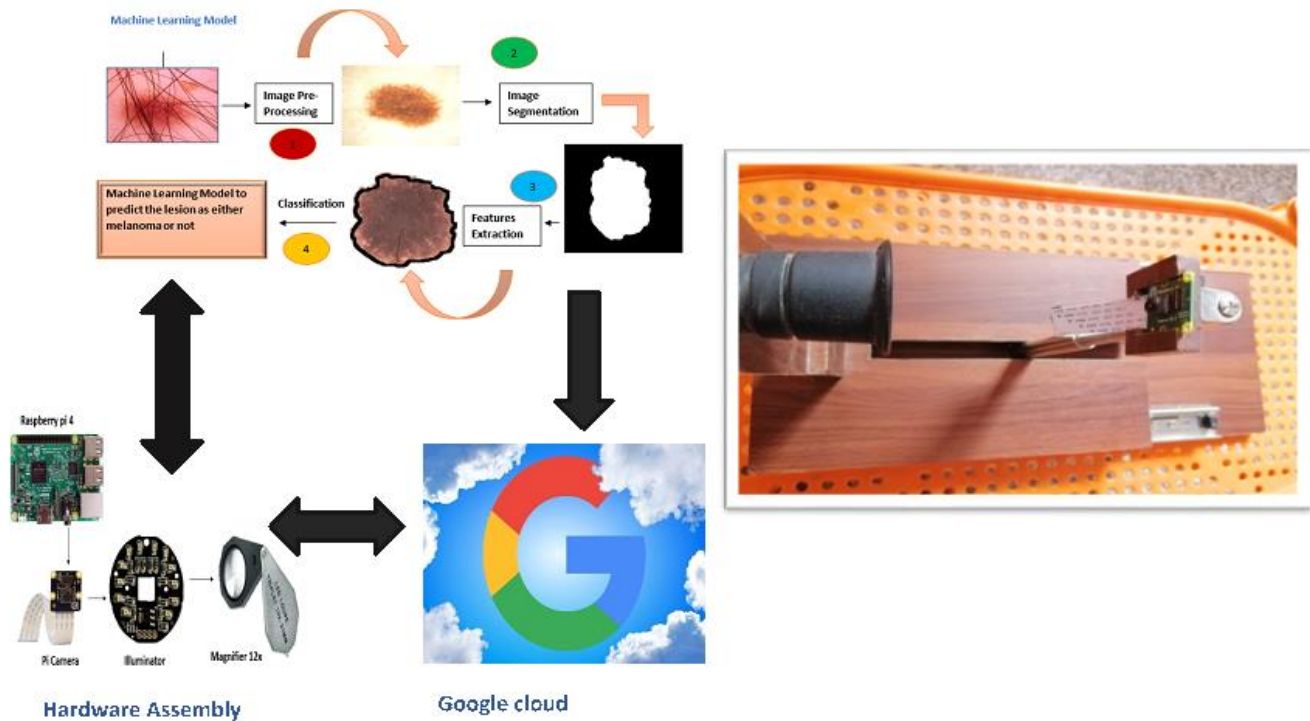
Design and Implementation of A.I. Based Ophthalmological Diagnosis of Eye Diseases Using Optical Coherence Tomography (OCT) Machine and Image Processing

Abstract:

The aim of project is to detect, quantify and analyze differences in retinal images for the disease "Diabetic Macula Edema" (DME) using deep learning technique, with the aid of OCT Machine. Such that to design a deep learning and image processing-based application that can process OCT images and implement best possible algorithm to predict Intra-Retinal Cystoid (IRC) fluid regions in DME eye disease.

The method proceeds in sequential order through these stages using deep learning algorithm, i.e. Image Preprocessing, Image Resizing, Image Dilation, Image Denoising, Image Deconvolution, Image Contrast, Feature Extraction, Semantic Segmentation by manual masking of images, finally predicting the disease by comparing the region of interest (ROI) with the threshold values.

Different Machine and Deep Learning algorithms like; CNN, FCN and U-NET were used, out of which U-NET shows best results and hence, it is used.

Plots and calculated values from the Tensorboard metrics like; Accuracy, Binary Cross Entropy (BCE), Loss, Dice Coefficient (DC), Jaccard similarity coefficient score (JSC), Precision, Recall and Area Under the Curve (AUC) are used to validate the performance of the model.

In the end, a report is automatically generated which will show a diagnosed percentage of fluid accumulation in DME, as an accurately diagnosed result compared to the conventional approach used by physicians.

Group Members: F16ES70
F16ES46
F16ES128

Supervisor: Dr. Attiya Baqai
Co-Supervisor: Dr. Fahim Aziz Umrani
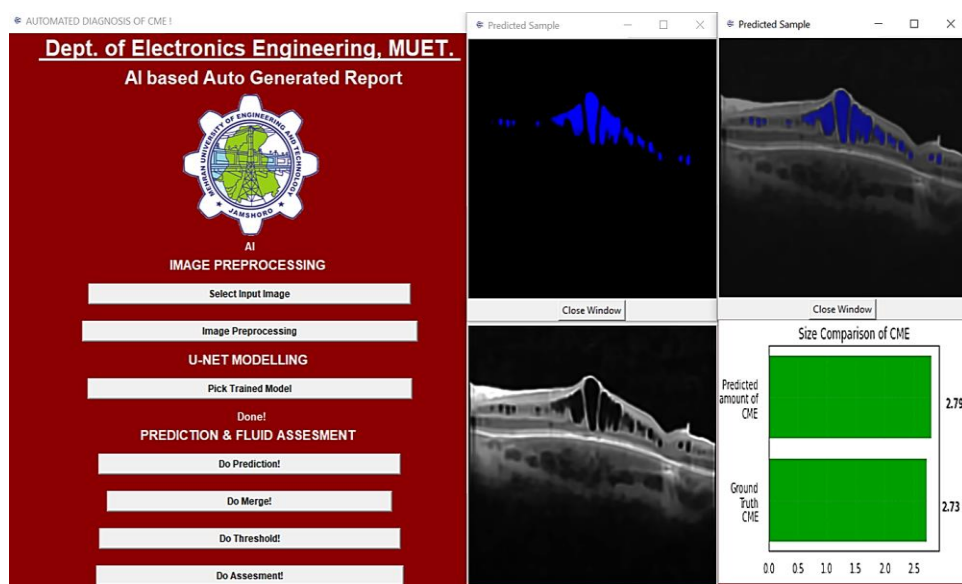
Terrain Recognition System Using Convolution Neural Networks

Abstract:

In autonomous path navigation robots especially industrial, and military purpose robots, operating the autonomous mobile robot along the uneven terrain have been a problem and relies on each perfect perception of terrain recognition. In this context, many new strategies have been developed from those one of which is machine learning technique through which the outputs achieved are quite good and reasonable; but still most of them accompany classifier, acquisition unit and signal display unit, show a poor performance in a new environment. One of the best techniques to recognize and handle the performance problem is to make the system used of Convolution Neural Network technique which is quite efficient with software such as i.e. MATLAB, Python and over all improves the accuracy of the terrain samples.

Our proposed method works on frequency spectrum analysis and power spectral density (PSD) which will help to learn and train our convolution neural network, all experiments have been carried out where we have complete control over our system and knowledge about the path of robot.

This proposed work is the attempt to develop a terrain recognition system using convolution neural network with the minimum component and software such as MATLAB, laptop and a simple webcam device which will capture the image of the terrain and process result from the system proposed will be shown on the laptop screen, shows the frequency response, 3D response and the grayscale image output of the input captured image.

In this, our system is being trained by the help of approximate 400 terrain input images, but in futures, the mission to work on it and implement it on the real time working and travelling robot can be accomplished by using more data available to increase the accuracy. By the help of this system, the enhancement in the functionality of the moving robot would be seen clearly ahead. The future work can be carried out on python with RGB-D sensor, Raspberry Pie and Kinect Camera v2 which will work on depth measurement as it has infrared sensor, by this also the dependency on the single sensor would be minimized by the increasing of the secondary sensors.

Group Members: F16ES22
                      F16ES58
                      F16-16ES53

Supervisor: Dr. Tayab Din Memon
Co-Supervisor: Engr. Kamran Kazi
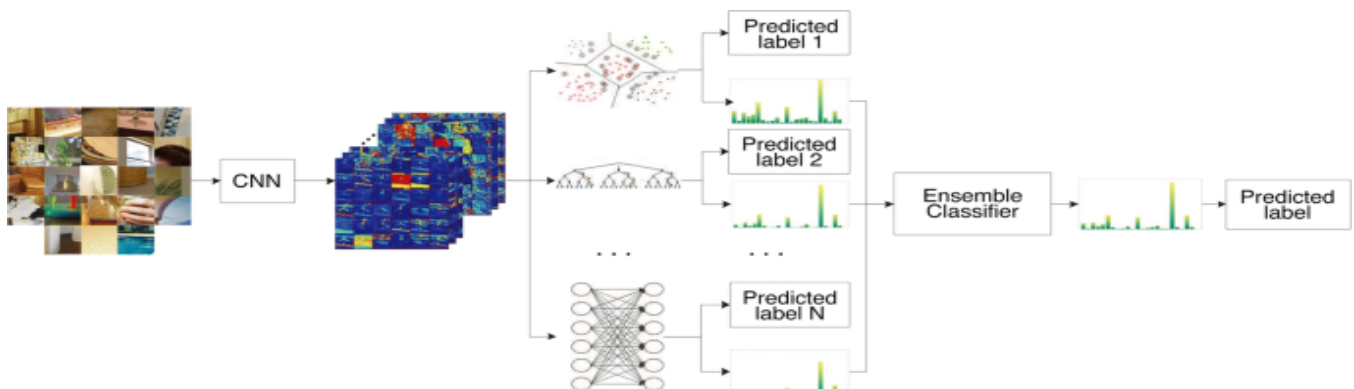
# Visual Assistant for Blind Person Via Voice Command

Abstract:

Vision is one of the most essential senses of a lifetime. Millions of people are struggling with visual disability living in this country. Such individuals find it challenging to navigate independently and securely, facing challenges with accessing knowledge and communicating. The goal of the proposed work is to turn the visual world into an audio world by telling blind people about the objects in their path. This will enable visually impaired individuals to navigate independently without any external aid just by using the object detection system in real time. To determine real-time artifacts through the camera and warn blind people about the object and its position through the audio output, the program uses image processing and machine learning techniques. The inability to distinguish between artifacts has resulted in several drawbacks to the current method, including less precision and poor efficiency. The main goal of the proposed work is to provide visually impaired people with good accuracy, best performance outcomes and a realistic choice to make the world a better place for them. The aim of our thesis project is to make a device which become a helping hand for visually impaired persons and make them strong enough to face the hardness of time and life. This project is helpful in following Aspects,

1. Object Detection Recognition.
2. For Finding Path.
3. Reading Printed Text

Group Members: F16ES69
                        F16ES71
                        F16ES127

Supervisor: Engr. Sara Qadeer Rajput
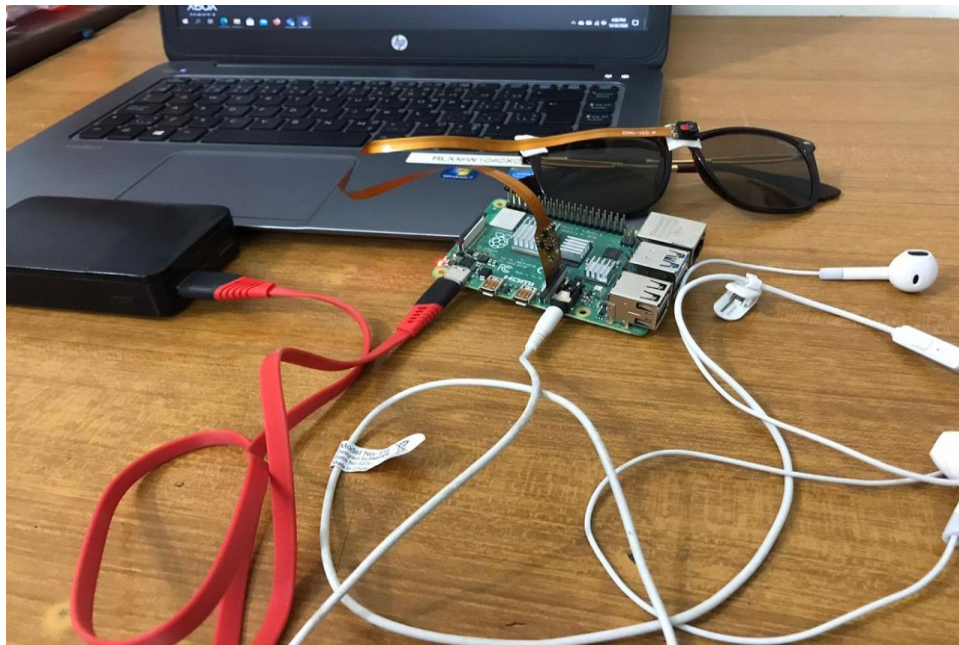
Controlling the Locomotion of Railway Inspection Vehicle Wirelessly

Abstract:

The current inspection vehicle being used in Pakistan is not much reliable and requires enhancement to prevent severe accidents. It is based on manual inspection and human-work, and we know that humans are always susceptible to errors. Resultantly, there is often room for lagging and miscalculations. This fact is also proven by the accidents that happened in 2019, as it was a drastic year for Pakistan Railways. Many accidents happened, and many lives were lost. Proper mechanism for inspection is what Pakistan Railways desperately need now for effective operation of railway tracks. Otherwise people will eventually lose their trust in Pakistan Railways. The vision of this project is to improve the inspection system of railway tracks by controlling the locomotion of railway inspection vehicle wirelessly, which will be able to inspect longer tracks requiring less manual work, and less labor besides being an environment-friendly vehicle as it uses electrical energy(the battery that can be rechargeable) rather than the chemical energy used by old inspection vehicle. To achieve this task hardware system is developed with the help of controller NodeMCU(esp8266) and Blynk app (IoT platform). Wiper motors on tires will be controlled, which makes its locomotion wireless and controllable. Moreover, it will also make the vehicle turn accordingly. The instructions given by Blynk app and ESP32 are also utilized. Technically it is gathering accelerometer sensor's data and uploads it on ThingSpeak so that it can monitor each data sample which is uploaded on ThingSpeak after 15sec delay, then that data is read by MATLAB on which FFT(Fast Fourier Transform) has been applied to detect errors properly. If the fluctuation rate is high then there is an error in track, otherwise the track is in fine condition and the train can easily run on it. This whole mechanism will replace manual inspection with an automatic inspection system. This new railway inspection vehicle will surely be the first step in making the Pakistan Railways safe and a reliable source of transportation.

Group Members: F16ES32
                          F16ES10
                          F16ES68

Supervisor: Dr. Tayab Din Memon
Co-Supervisor: Engr. Ali Akbar Shah

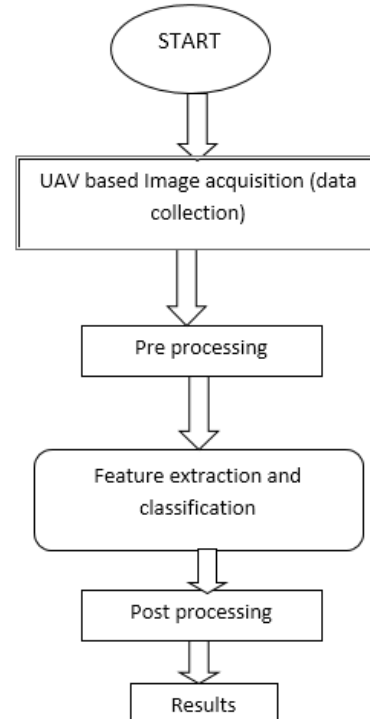# Crop Disease Detection Using Unmanned Aerial Vehicle (UAV)

Abstract:

Unmanned Aerial Vehicles (UAV) commonly referred as Drones. UAVs are mostly associated with military, industry, and civilian applications. Now a day, recent developments in sensors and information technology makes UAV more important in many areas such as health sector, surveillance, and agriculture. Disease on plant leads to the significant reduction in both the quality and quantity of agricultural products. Therefore, health monitoring of plant plays an important role in successful cultivation of crops. The existing crop health monitoring methods often rely on manual inspection of disease symptoms.

The aim of this project is to use the UAV for crop monitoring and identify the plant disease through data processing.

In this project, wheat crop which is most important part of food consumption is taken as crop and UAV (quadcopter) based data of wheat crop in form of images are collected and then data processing is done to detect the plant disease on wheat crop. Yellow rust in wheat is a widespread and serious fungal disease, resulting in significant yield losses. Therefore, data processing is done based on healthy and diseased crop i-e yellow rust infected wheat plants.

Group Members: F16ES47
F16ES67
F16ES107

Supervisor: Prof. Dr. Arbab Nighat

START

UAV based Image acquisition (data collection)

Pre processing

Feature extraction and classification

Post processing

Results

# IOT Based Mobile Robotic Arm

Abstract:

In the world where the work is never expected to stop, Internet and Robots have overtaken everything. In Industries, robots have replaced humans in most of the areas such as to pick and place objects. In modern times, this task can be controlled at long distance via internet.

The simple robotic arm can only cover small distances, yet it replaces the human to pick and place heavy items efficiently to save human efforts. The purpose of this study is to design the wheel-based mobile robotic arm that can move in different directions and can be controlled using mobile App via Wi-Fi module. This robotic arm comprises of servo motors each of the servo motor is used with pulse width modulation (PWM) so that motors can individually be controlled. The control system has been implemented on Arduino.

Group Members: F16ES41
                    F16-16ES23
                    F16-16ES139

Supervisor: Engr. Kamran Kazi
Co-Supervisor: Engr. Qudsia Memon
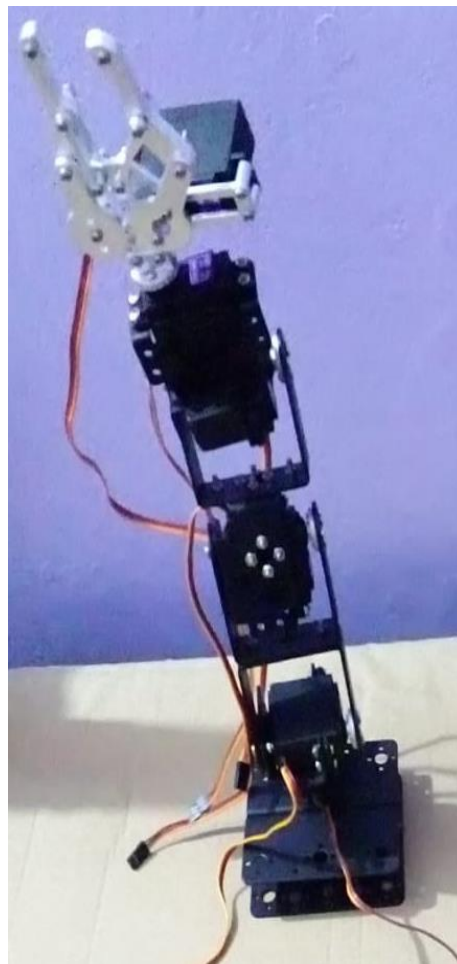
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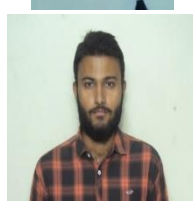Mr. Muhammad Abdullah
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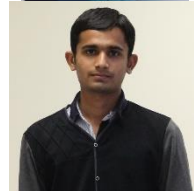Mr. Uzair Ali Shaikh
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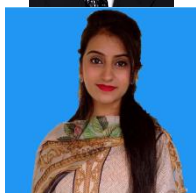
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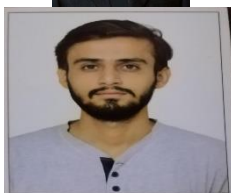
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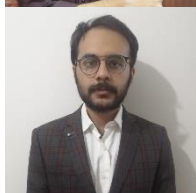
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