



UNIVERSITY
OF WOLLONGONG
IN DUBAI




UOWD

INNOVATION FAIR

Monday, 4 July 2022

University of Wollongong in Dubai
Dubai Knowledge Park, UAE

CONTACT US

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UOWD – YOUR AUSTRALIAN UNIVERSITY IN DUBAI

UOWD

INNOVATION FAIR 2022

Welcome to the 15th Annual UOWD Innovation Fair (IF) organized by the Faculty of Engineering and Information Sciences (FEIS). This region-wide Innovation Fair aims to provide an opportunity for undergraduates, both teams and individuals to compete, communicate and showcase their academic interests by presenting the software, hardware or research-based projects undertaken at their respective institutions. Contestant majors include Mechanical, civil, Electrical, Computer and Telecommunication Engineering.

The competition is designed to raise the profile of UAE University students by giving students incentives and encouragement to work hard and excel in their projects. IF 2022 is also an opportunity to network and engage in meaningful exchanges with peers around the UAE. Winners are decided by an independent judging panel consisting of Industry and Academic representatives. Judging criteria includes Innovation, Research, Real-world applicability and benefits, Integration of technology, Effectiveness in achieving stated goals.

There are three categories of contest for IF 2022:

- **A: Early Engineering**
- **B: Advanced Engineering**
- **C: Research (individual only)**

Prizes will be awarded to winners in each category.

Thank you for being a part of this year's contest and we look forward to see you in the coming years.



IF 2022

PROGRAM SCHEDULE

Monday, 4 July 2022



REGISTRATION OPEN

Time: 12:30

OPENING CEREMONY

Time: 13:30

GUESTS TALK

- Dr. Ray O. Johnson, CEO of the Technology Innovation Institute
- Mr. Fadi Shanaah, Senior Director at Etisalat (5G, IoT, Smart cities and Digital Transformation)

Time: 13:40 – 14:00

PROJECT DEMONSTRATION

Time: 14:15 – 17:15

PRIZE GIVING AND CLOSING CEREMONY

Time: 17:30 – 18:00

DINNER

Time: 18:15 – 19:30

Visitors can vote for the publicly nominated popular prize award. Public voting is available at the registration desk and voting closes at 17:30.

ORGANISING COMMITTEE

DR HAILE-SELASSIE RAJAMANI

Director Engineering | Faculty of Engineering & Information Sciences

DR OBADA AL KHATIB (Chairman)

Discipline Leader | Faculty of Engineering & Information Sciences

DR MOHAMED FAREQ MALEK

Associate Professor | Faculty of Engineering & Information Sciences

KIYAN AFSARI (Vice-Chairman)

Lab Engineer | Faculty of Engineering & Information Sciences

MAJID MUNAWAR

Lab Engineer | Faculty of Engineering and Information Sciences

RAHUL BIJLANI

Faculty Lead Administrator | Faculty of Engineering & Information Sciences

AMNEH JARBOU

Administrative Assistant | Faculty of Engineering & Information Sciences

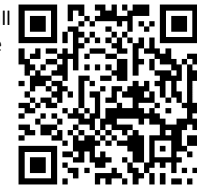


PROJECT LISTING

Code	Project
EARLY ENGINEERING	
A01	Gas Leakage Prevention Association
A02	Arduino security alarm system
A03	The sustainable plant
A04	Park My Spot
A05	Smart Cooling System
A06	UV Auto Room Sanitation
A07	Aviation Innovators
A08	Farhad 1618
ADVANCED ENGINEERING	
B01	ARC Robot
B02	SAMS
B03	ARX Technology
B04	H.A.S Improved Security Scooter
B05	Concrete Sustainability Using Crumb Rubber and GGBS
B06	The Chairmen
B07	Artificial Intelligence Robotic Vacuum
B08	FireOut
B09	Gosmart
B10	Factors Affecting the Bid-or-No Bid Decision in Sustainable Construction
RESEARCH	
C01	Ahmed Alketbi
C02	Mhd Riadh Alkharrat
C03	Arya Anil Kumar
C04	Eva-Denisa Barbulescu
C05	Manav Deepak Chawla
C06	Edwin DSouza
C07	Dana Ghibeh
C08	Syed Ijlal Hussain

Code	Project
RESEARCH (cont)	
C09	David Indrawes
C10	Nikhil Menon
C11	Mostafa Ashraf Helmy Imam Mohammed
C12	Athena Romaine Mopera
C13	Muhammad Saad Munawar
C14	Khalifa Qaed Abdallah
C15	Lakshay Naresh Ramchandani
C16	Sachin Suresh Paul
C17	Daniel Wazz
C18	Savio D Silva
C19	Khushal Khan Liwal
C20	Avishkar Sharma
C21	Talha Khan
C22	Anousha Khan
C23	Rubayith Tasbha
C24	Zaroka Liwal
C25	Nayab Shah
C26	Aafrein Begam Faazil

Scan the QR for full
Biographies of the
judges



JUDGING COMMITTEE



DR RAY O. JOHNSON

CEO OF THE TECHNOLOGY INNOVATION
INSTITUTE, ABU DHABI

INDUSTRY JUDGE



MR FADI SHANAAH

SENIOR DIRECTOR AT ETISALAT (5G, IOT,
SMART CITIES AND DIGITAL TRANSFORMATION)

INDUSTRY JUDGE



DR AYMAN ELNASHAR

VP AND HEAD - TECHNOLOGY ARCHITECTURE,
RESEARCH AND DEVELOPMENT AT DU

INDUSTRY JUDGE



DR MOHAMED ALMUSLEH

ASSISTANT PROFESSOR AND PROGRAM LEADER
AT HERIOT-WATT UNIVERSITY

ACADEMIC JUDGE



MR AYAZ ALWARE

SENIOR MANAGER - ENGINEERING
SHARAF DG ENERGY

INDUSTRY JUDGE



MS AURELIA KHISAF

MEMBERSHIP DEVELOPMENT OFFICER FOR MENA
AT INSTITUTION OF CIVIL ENGINEERS (ICE)

INDUSTRY JUDGE

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Biographies of the
judges



MR AHMAD ALMULLA

DIGITAL TRANSFORMATION ADVISOR AND
BOARD MEMBER AT CIOMAJLIS

INDUSTRY JUDGE



MR BASIL AYASS

LEADER - EDUCATION AND HEALTHCARE
AT GOOGLE CLOUD

INDUSTRY JUDGE



DR AMINA AL SUMAITI

ASSOCIATE PROFESSOR AT KHALIFA UNIVERSITY
ABUDHABI

ACADEMIC JUDGE



MR CLIFF ERNEST WACHIURI

SOFTWARE AG GULF AND LEVANT DESIGNATION:
SOLUTIONS ARCHITECT, IOT AND ANALYTICS

INDUSTRY JUDGE



DR APURV YADAV

PROGRAM LEADER AND ASSISTANT PROFESSOR
AMITY UNIVERSITY DUBAI

ACADEMIC JUDGE



DR SAMEER KISHORE

CAMPUS PROGRAMME COORDINATOR, ROBOTICS,
HEAD AND FOUNDER, IMMERSIVE VRX LAB

ACADEMIC JUDGE

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Biographies of the
judges



MS MARGARITA SAJONS

ENGINEER & SUSTAINABLE DEVELOPMENT
EXPERT - BUSINESS DEVELOPMENT

INDUSTRY JUDGE



DR ABIGAL COPIACO

ASSISTANT PROFESSOR AT UNIVERSITY
OF DUBAI

ACADEMIC JUDGE



MR AOUN LUTFI

SENIOR DATA SCIENTIST AT EMIRATES
ALUMNI

INDUSTRY JUDGE



MR SEAN KURIAN

SOFTWARE DEVELOPER AT YELLOWPAGES UAE
ALUMNI

INDUSTRY JUDGE



MR ZINEDDINE HAITAAMAR

OPERATIONS ENGINEER AT EXPO2020
ALUMNI

INDUSTRY JUDGE



MS AKSHA SAJEEV

WEB DESIGNER AT BFOUND.IO
ALUMNI

INDUSTRY JUDGE

EARLY ENGINEERING

(1ST OR 2ND YEAR)



A01: Smart Gas Leakage Detector

Gas Leakage Prevention Association

Yasmine Abualroos, Fardin Alam, Obai Alashram, Mohamad Waly

Supervisors: Dr Mohamed Fareq Malek, Mr. Kiyan Afsari

Nowadays, carbon monoxide poisoning is one of the most significant intoxications and is one of the main causes of non-fire-related deaths. Fortunately, CO poisoning can be easily prevented by taking simple safety measures, therefore, we designed a small portable device that can detect various harmful gases such as CO and other flammable gases and then alerts the user via the app.

A02: Arduino Security Alarm System

Team B

Clayton D Gama, Nada Abdelhafez, Alharith Darwish, Talal Faisal

Supervisors: Dr Mohamed Fareq Malek, Mr. Kiyan Afsari

The Arduino security alarm system is a portable series of alarm devices connected through a network. Being an electrical system, the components are independently made up of circuits incorporated with an ultrasonic sensor. If the ultrasonic sensor detects motion, the LED buzzers would instantly go off from any location. This is made possible through the blink app, an ingenious platform that relays the network and communicates to the client. For security reasons, our system incorporates a password assimilated using an app.

A03: The Sustainable Plant

Team C

Khadija Jumbe, Syed Wahaj Asim, Mohamad Afraz Khan, Taha Yunus Dohadwala, Khaled Issa

Supervisors: Dr Mohamed Fareq Malek, Mr. Kiyan Afsari

The project is dedicated to the wellbeing of house plants and to ease the process of raising plants in the household as a stress-free experience for its users. According to the teams research it was found that many houseplants die due to underwatering or overwatering and the sustainable plant project aims to tackle that exact issue efficiently through the help of a prototype that can sustain and even prolong the life of the plant. The sustainable plant project is built around the Arduino system which helps relay the code effectively and executes commands based on the code. It consists mainly of a soil moisture sensor, a motor and a battery pack for the motor. The soil moisture sensor relays if the soil is moist enough for the potted plant or not to the system which then checks for moisture level contents and classifies it as 0,50 or 100% moist for it to determine its moisture content. Once the check is done and if the plant is dry, the motor starts watering the plant till appropriate levels are achieved and noticed by the soil moisture sensor after which the motor is cut off and the watering stops. If the plant is already watered, then the motor does not start at all. All this information of watering and the soils moisture content is also conveyed to the user via the blynk app which allows them to be at peace with their plant's health.

A04: Park My Spot

Team D

Razveen Kashif, Karthik Bharathraj, Mohamad Safwan, Mohamad Abuklal

Supervisors: Dr Mohamed Fareq Malek, Mr. Kiyan Afsari

The general idea of the smart parking system is to display the status of the parking slots, occupied or free which then allows the user to park into the slot they prefer. Once the user decides which slot they want to park into, by seeing the LED's, the user can then drive towards that direction and park their vehicle. The sensors in the parking slot will then detect if the car is present and update the status by displaying a blue LED, if the slot is not occupied in contrast to a red LED if the car has been parked and so on. The user can enter the parking through the gate which automatically opens once a car is detected. Further on, if the parking slot is full, the gate will not open. Further on, an LCD screen will be used to display the amount of parking slots available at the entrance.

A05: Smart Cooling System

Team E

Suraksha Kotte, Mahmoud Kakouri, Mohamad Ziad, Chisom Madu

Supervisors: Dr Mohamed Fareq Malek, Mr. Kiyan Afsari

The title of this project is called Smart Cooling System and its function is to control the speed of the fan attached to the device using according to the temperature read by the temperature sensor on the device. The device can be used in various areas which includes server rooms, pharmaceutical labs, homes etc. We added functionalities in our project that would help the user control and monitor the temperature when they are away from the device using Blynk which therefore fulfils the theme of the project which is the Internet of Things (IOT).

A06: UV Auto Room Sanitization

Team F

Mohamad Taha, Adham Soliman, Rebeka Zerga, Bassam Barbar

Supervisors: Dr Mohamed Fareq Malek, Mr. Kiyan Afsari

The Internet of Things is a revolutionary realm with the potential to revolutionize our lives and the world as we know it. Several IoT applications have been proposed to provide users with data-driven and smart applications. Sanitation and sterilization have become inextricably linked in our everyday lives. When it comes to meeting room sanitization, there is a problem: we can't directly participate in the sterilization process because we risk entering a contaminated meeting space. However, we can solve this problem by developing an efficient sanitized meeting room system that can sterilize a space quickly and without exposing ourselves.

A07: Design and Fabrication of Retractable Landing Gear System

Aviation Innovators

Samira Alkindi, Mouza Alruqaishi, Khlaithem Alnuaimi, Buthaina Saeed, Nouf Alshamsi

Supervisor: Dr Sheharyar Malik

The landing gear system is a primary system and critical system in the aircraft that is designed to absorb and distribute the kinetic energy of landing impacts and decreasing the impact stresses on the aircraft. This project is developed to provide the structural model of designing a new retractable landing gear system in a UAV. The main difference between the retractable landing gear systems in aircraft is hydraulically operated while in our project is electrically operated. Our drone retractable landing gear system design consists of three sliding doors, three linear actuators, two main landing gear struts with spring load, one spring-loaded nose, one spring-loaded nose landing gear, three retracts mechanism (Motors), one controller, main wheels with an electromagnetic brake for main landing gear, one nose wheel, steering mechanism for nose landing gear, and battery.

A08: FARHAD1618

Farhad 1618

Farhad, David, Fiyez, Mazed

Our project starts with the idea of opening doors and with a secure access card. We believe this idea creates much better security and convenience, while also adding new features like knowing who is accessing. by using the following resources: RFID, Arduino ide Software, ELVIS Breadboard, Arduino uno, Access cards, Electric wires, Server motor, PIC Microcontroller, Wood and Steel.

Advanced Engineering

(3rd or 4th Year)



B01: ARC Robot

Habiba Ahmed Mina Elzik, Joanna Jose, Afnan ElGohary

Supervisors: Dr Haile-Selassie Rajamani, Mr. Abdelrahman Shata

The A.R.C. Sanitization Robot is aimed for the use in Food Courts to aid in the overall cleanliness and peace of mind by sanitizing tables which ensures a high standard of cleanliness. Through the use of ultrasonic sensors which are used for distance detection, a servo motor which is attached to the sanitization bottle using an innovative application, and image recognition with a trained data set, the A.R.C. robot completes the sanitization task effectively and accurately.

B02: SAMS

Akhila Muhammed Chathanattu, Ibrahim Zidan, Mohammed SohailUddin Quadri

Supervisors: Dr Haile-Selassie Rajamani, Mr. Abdelrahman Shata

Our projects mainly focus on drainage system in Gulf country we are aim for any blockage of roads during the winter/rainy season which it will prevent over flooding of roads to minimize the road damage and as well as the safety of the passenger. Drainage system has been built for maintaining a clean and sustainable environment. It is the sole responsibility of the municipal corporation to clean and maintain the underground drainage. If it is not maintained properly, the wastage will block the drainage pipelines. As a result, people are facing a lot of issues in the city. The workers have to go and clear the blockage in the drainage. So, we are using ultra sonic sensors to detect the blockage in the drainage and we have rain sensor which will detect the rain when it starts raining and we have GPS module which will show in which area the blockage is detected we can monitor all this used the app which will show the all the data stream which show all record all the history of what have happened hourly.

B03: Monitus

Syed Mohamed Atef, Ali Alsuwaidi, David Indrawes

Supervisors: Dr Haile-Selassie Rajamani, Mr. Abdelrahman Shata

Arx Technology has designed and developed Monitus - a robot that detects hazards such as fire, gases, and temperature changes within its set environment. It navigates around a preset path and detects the hazards on its path. Fire detection will be done with the use of advanced image processing, powered by the Nvidia Jetson processor. It can also autonomously navigate around its environment using an array of sensors using the Arduino microprocessor. The robot's duty is to identify these hazards and notify the respective authorities/parties present in the building to undertake appropriate investigation or action. With the robot being an IoT connected device, has a range of remote features. If the robot needs to be manually accessed, it can also communicate with the user remotely and transmit data regarding respective hazards. An alarm system is also set in place, notifying the nearby people of any detected abnormalities.

B04: H.A.S - Improved Security Scooter

Stephanie El Bash, Amr Assar, Hamzah Mujawar

Supervisors: Dr Haile-Selassie Rajamani, Mr. Abdelrahman Shata

The I.S.S or Improved Security Scooter is a system that consists of two subsystems, one that uses a camera and a microcomputer (Nvidia Jetson) for object detection and an Arduino to get the distance from objects, the second one is the helmet system which will use a buzzer to alert the rider in case of any hazards. Together these subsystems enhance the security of the rider on the road with the help of an Object Detection AI based off COCO dataset running on TensorRT which will detect cars, pedestrians, trucks, stop signs, traffic lights and the detector can be improved thanks to the use of the general detector we are using (COCO DATASET). Once an object is detected by the object detection AI, the distance from the ultrasonic sensor which is connected to the Arduino is sent to the Nvidia Jetson via Serial Communication. If the distance is close and an object is detected, the Nvidia Jetson sends the command to the buzzer to sound it. We are using two NodeMCU ESP8266, one which is connected to the Nvidia Jetson and the other which is in the helmet and connected to the buzzer.

B05: Concrete Sustainability Using Crumb Rubber and GGBS

Raed Tariq, Seif Abbas, Mazen Abdelkhalek

Supervisors: Dr. Jamal Abdalla, Dr. Rami Haweeleh

The implementation of sustainability within the construction industry is of high importance in our current times. Due to this fact, this project focuses on the use of waste material in the production of concrete and how it can be designed to be more environmentally friendly without compromising its structural integrity. The use of Crumb rubber, which is a by-product of shredding disposed automobile tires, and Ground-Granulated Blast furnace Slag (GGBS), a by-product of the iron industry, will be used in various percentage combinations. The mixes were tested for their mechanical, fresh, and durable properties. The obtained results were split into two parts and consisted of different scopes. The scope of part A was based on the use of higher percentages of crumb rubber. On the other hand, part B was focused more on using lower percentages ranging from 0-10%. For part A, the compression strength test our control mixes had up to standard values ranging between 30 and 85MPa over 58 days. Meanwhile our crumb rubber concrete had disappointing results ranging between 2 and 6MPa, which is an average decrease of 93%, the same conclusions were made for the split tensile and flexural strength tests, averages of 90% and 85% decrease were found respectively. The CR concrete had an RCP value of over 5000 C and a slump value of around 70mm on average. For part B we had huge improvements. The compressive strength after 7 days was ranging between 16-30MP, and after 14 days the average compressive strength was 30MPa.

B06: The Chairmen

Ashith Farhan, Sabbir Alam, Farooq Mirza, Joel D'Souza

Supervisor: Dr. Ra'afat Aburukba

With a large portion of the workforce engaged in desk-based jobs or being relegated to their homes during the COVID-19 pandemic, most white-collar employees spend most of a workday seated. An improper sitting posture, especially for extended durations of time, can negatively affect the structure of the person's spine, leading to the formation of permanent deformities over time. This paper proposes a smart chair system that can detect such deformities by detecting, recording and classifying the posture of the user. Furthermore, by analyzing historical data and tracking variations over time, the system detects anomalies that may indicate a deformity in spine structure. Specifically, the system attempts to predict the early onset of spinal diseases, such as anterior neck syndrome, that commonly arise as a result of poor sitting behavior. The system collects spinal readings from the user through sensors embedded on a smart chair and uses machine learning algorithms to classify the readings and detect anomalies over time that are indicative of variation in spine structure. The users are provided with a mobile interface that displays relevant information and alerts regarding their spine health. Using a multi-class classification model on six distinct postures, a testing accuracy of 97.4% was achieved, demonstrating the effectiveness of the system in identifying the position and orientation of the user's back. Furthermore, using a time-series regression model trained on interpolated data, which simulates gradual aggravation of a hunched back across the span of one year, the mean absolute percentage error in prediction was 17.4%, on

average across all the sensors. The low error margin indicates the system's predictive capabilities in identifying trends and detecting anomalies. Thus, by providing a preliminary indication about the onset of such spinal deformities, this paper offers a solution for preemptive diagnosis of severe spine diseases, thereby preventing exacerbation and avoiding the need for expensive surgical corrective procedures.

B07: Artificial Intelligent Robotic Vacuum

Mariam Majdi, Nouf Mohamed, Shaikha Mohamed, Bushra Mohamed, Khadeeja Saqer

The first robot vacuum cleaner was made in 1990 and was called "iRobot". Since that time, companies produced many types with different features and shapes. This project is about a Robotic vacuum with AI, which will help detect a specific object. Students applied python and C++ language to be able to program the robotic vacuum. This project has assumed an indoor environment and the availability of microcontrollers and required sensors. In addition, the project has been completed in four months. The main idea of this project is to design and develop a robot vacuum cleaner using Artificial Intelligence AI to help people save their time and effort in cleaning. The robotic vacuum moves over the floor, collecting dust and grime. Artificial Intelligence will be used to detect and identify objects as (money, toys..), which will enable the vacuum to differentiate between the objects while cleaning. This will prevent losing valuable items. The innovative part of our project is using artificial intelligence (AI) by programming the vacuum to distinguish the valuable items between the scanned object, such as money, toys, liters... etc. Additionally, Also the shape of the vacuum will be designed in such a way to improve the performance of cleaning of the vacuum, especially for the room corners since the circle shape cannot reach the corners and clean them well.

B08: FireOut

Eman Rashid, Tasneem Nawar, Deenah Sabaahat, Zahrah Tungekar, Zahid ur Rehman

Project FireOut focuses on controlling wildfires and is an industrial sized design which uses electrical components to serve its function. It includes a main station with a sensor camera and seven substations situated at uniform distances away from the main station to monitor wildfires. In an event of fire detection, the sensor camera sends data to the control room using the communication system, which consists of PLC, radio modules, and antennas, that then forward the information to the respective substation to begin extinguishing the fire until the first responders arrive. At the specific substation the pump is switched on automatically and the sprinklers begin operating to control the fire. The system collects rainwater in underground tanks and towers and uses it to extinguish the fires in the region. Water levels are monitored using sensors and in case of maximum capacity the retractable roof of the tower is closed automatically. The entire system is built using recyclable materials and is powered by solar panels making the project environment friendly.

B09: Gosmart

Mohammad Faieq Mohammad Daoud, Hajer Ben Mnaouer, Joud Ayasi, Issraa Ben Mnaouer

The aim of our project is to produce a smart delivery robot called Gosmart, which will facilitate the transport and drop off of items such as office supplies, food, documents etc. The incorporation of delivery robots can effectively boost productivity by allocating mundane tasks to the robot so that the humans can focus on more high-profile work; it can also reduce errors and redundancy of labour. Furthermore, increasing employee safety in high-risk work environments can be achieved with the help of a delivery robot. The robot (Gosmart) functions using multiple components, such as an IR sensor for line following technology to determining its movement and RFID technology to establish the approximate location of delivery points. Ultrasonic sensors will be added for obstacle detection and ensuring the path is clear. For the manual option, the robot will be connected through wifi. Additionally, the robot will be equipped with two cameras; one with the sole purpose of driving and navigation, and the second will be a 360-degree camera which allows the robot to be aware of its surroundings. In case of emergency, the human operator can have a 360 view of the robot. Arduino will be the main controller and will use a wifi and Bluetooth module. Other components that will be used include motor controller, 12-volt batteries, 12-volt motors, and a programmable keypad. Furthermore, the robot will have the ability to recognize faces using facial recognition technology which can determine the happiness of the customers. In addition to that, it will be equipped with pattern and sign recognition technologies. Finally, all the components will work together to bring about a fully functional smart delivery robot.

B10: Factors Affecting the Bid-or-No Bid Decision in Sustainable Construction Projects

Afreen Fathaq, Omar Binshakir, Lulwa AlGhanim, ALSharif Mohammed, Salma Megahed

Supervisor: Dr. Sameh El-Sayegh

The environmental harms that the construction industry has caused are significantly detrimental and apparent. These harms include, but are not limited to, the emittance of a substantial amount of carbon dioxide and inducing ground and water contamination. Fortunately, these adverse environmental impacts can be minimized and counteracted by carrying out the ever so favorable sustainable construction projects. As sustainable construction projects gain more popularity and demand, it is crucial for those who will execute these projects to be knowledgeable in the nature of sustainable construction projects and be able to determine whether to bid for these projects or not. The bidding decision is one of the critical decisions that contractors have to make due to the complexity and uncertainty surrounding this decision. Given the above challenge, this research aims to identify the factors that affect the bidding decision of construction contractors through a comprehensive literature review and the distribution and analysis of a survey that will be sent to United Arab Emirates (UAE) construction

professionals. A questionnaire survey consisting of 40 factors was constructed to achieve this goal. Using the weighted average approach, the top 10 ranking factors are as follows client's financial capabilities, client's payment history, client's reputation, project risks, contractor's financial capabilities, project complexity, experience in similar projects, project type, contractor's access to technologies required to execute sustainable projects, and material availability. The findings of this research would benefit contractors and subcontractors by increasing their understanding of the major factors affecting the bidding decision in sustainable constructions. Contractors armed with such invaluable information will be better equipped to reach more effective bidding decisions.

RESEARCH

C01: Wearable Antenna to Monitor Dubai Policemen

Ahmad Al-Ketbi

Supervisor: Dr Mohamed Fareq Malek

In a wireless communication system, the antenna is the most crucial component for transmitting signals through free space. Tracking and monitoring systems have been actively developed in recent years for a variety of sectors and applications, including in military and police department. Police officer location tracking systems are critical for ensuring their safety and promptly initiating search and rescue operations in the case of emergency. In this project, a proposed wearable antenna is used, where a policemen or policewomen with a GPS antenna, GPS module, and RF transmitter can utilise an RF receiver to send his or her location to the headquarter monitoring system of Police in Dubai. This wearable antenna is located to the badge of the police officer. The performance of the textile antenna has been measured using Vector Network Analyzer and Antenna Rotator system. The reflection loss (S11) and radiation pattern results are outstanding, making the fabricated textile antenna suitable to be placed and integrated with Dubai policeman and policewoman badges on the clothing.

C02: Pursuit Learning Inspired Approach for Optimized Resource Allocation in LoRa Networks

Mhd Riadh Alkharrat

Supervisor: Dr Obada Al Khatib

LoRa is a Long-Range wireless network technology, it has been recently invented yet widely utilized in monitoring applications due to its low power consumption, it belongs to the low power wide area networks (LPWAN) family, making it an attractive option in IoT applications. The transmission of LoRa signal has several configurable parameters, these parameters define the nature of the transmitted signal, and can determine the transmission speed, data rate and communication distance. With the appropriate selection of parameters, LoRa can reach a distance of more than 40 km in open space. One of the critical parameters of LoRa is the Spreading Factor, in most cases, signals that are of different spreading factors do not collide with each other making them orthogonal, however, the availability of spreading factors is limited to a specific range, making the assignment of the parameter a challenge in large networks, also, assigning the highest spreading factor to the furthest transmitter device is not always the best option. This research explores and studies the algorithms that have been created to solve the resources allocation challenge in LoRa, additionally, it covers the essentials of LoRa physical and network layer, and it proposes a new algorithm which is Pursuit Learning inspired to solve the resource allocation challenge in LoRa networks. Finally, the results of the algorithm are analyzed and compared to the results of existing methods.

C03: EV-PV System to Offset Carbon Emissions in Houses and Vehicles

Arya Anil Kumar

Supervisor: Dr Mohamed Nasserddine

Many Net-Zero building concept goals have been set to reduce carbon emissions by implementing various renewable resource systems to produce pure energy for residential households' power consumption, electric vehicles (EVs) embedded with charging stations within households also contributes to non-polluting environment. Climate changes also add to greenhouse gases. The net-zero emissions must also consider people who own combustible vehicles as most of the carbon produced in the atmosphere is more from Internal Combustion Engine (ICE) vehicles than residential buildings. Many different systems are adopted to carry out emission-free production in houses, but this thesis explores carbon offsetting between EV cars and buildings. The research in this paper discusses the importance of considering greenhouse gases in buildings, electric vehicles (EVs), and gasoline vehicles and outlines the most optimal hybrid system to offset CO₂. The system proposed is a hybrid PV - EV system that is grid-connected to the household for power consumption which is required to offset CO₂. The results will show the power consumed for the house per year, and the power generated by solar panels (PVs) that will offset its equivalent CO₂. For electric vehicles (EVs), the MATLAB GUI application records the distance traveled per 150 km per day, and the power consumed with its equivalent CO₂ will be calculated and compared with gasoline vehicles. Furthermore, the results will also show how the emissions of the solar panels (PVs) compensate for the emissions of electric vehicles (EVs) and house consumption together in the SAM (System Advisor Model) software.

C04: Bifacial PV panels to advance PV system productivities: A comparison between Vertical Bifacial PV modules and Monofacial inclined PV on green roof in Dubai

Eva-Denisa Barbulescu

Supervisor: Dr Mohamed Nasserddine

Roofs can provide users with security and protection, but they also have sustainability functions, such as the generation of renewable energy by photovoltaic panels and the insulation of heat by green roofs. Conventional solar installations cover the majority of the flat roof area, the green roof effect is considerably diminished if asphalt or gravel is not used from the start. Particularly in densely populated countries such as the UAE, the use of flat roofs for PV may be a crucial way to increase the installed capacity. The ground cover ratio (GCR) of a photovoltaic (PV) system is reduced and the annual yield is diminished by a green roof design that facilitates maintenance access. PV installations on green rooftops are currently uncommon. A green roof provides a variety of benefits, some of them including water retention, peak runoff reduction, roof seal protection, additional insulation, ambient air cooling and humidification, and pollution filtering. Bifacially mounted vertical PV have great potential to eliminate environmental factors such as sand and dust deposition which influence solar photovoltaic systems' energy generation capacity. Flat tilted modules oriented south or east-west on green roofs typically require intensive maintenance to avoid being shaded by vegetation and frequently cover a large portion of the roof surface.

Numerous researchers have attempted to integrate photovoltaics and green roofs into the same surface using lightweight construction. Vertically mounted bifacial modules can be used to combine photovoltaic and green roofs, as well as facilitate cost-efficient maintenance. In this paper, the design and performance of a system that is subdivided into two groups with differing albedos will be examined.

C05: Early Detection of Parkinson's Disease using wearable sensors & machine learning

Manav Chawla

Supervisor: Dr Soly Mathew

Parkinson's Disease (PD) is a neural disorder that leads to a series of unconventional involuntary movements in the human body. This aggravates over time, extreme cases include the complete paralysis of the body and a series of side effects such as depression, anxiety, dementia & sleep disorders. This paper dives into the results of a pilot study to assess the efficiency of using surface electrodes with a Machine Learning algorithm to detect if an individual has PD or not. The main symptoms of the disease include tremor (i.e., involuntary movement of the hand in a resting phase), bradykinesia (i.e., slow movement), rigidity (i.e., resistance to naturally induced movement) & impaired postural balance. The deficiency of dopamine due to neural degeneration of neurons in the substantia nigra pars compacta leads to the primary abnormalities of Parkinson's disease. Amongst the existing symptoms, tremors are one of the earliest. Once the dopamine secretion stops in the brain, tremors eventually begin to start. The early detection of the disease is researched based on tremors, which happens to be the most common motor disorder for the same. A glove designed for healthy individuals prone to PD made using the Arduino mega, and Myoware 2.0 muscle sensor, will be implemented along with an application to be able to get a visual representation of the tremors sensed by the surface electrodes using electromyography. Each signal sample will be augmented using a series of signal processing processes. A generated dataset will be used as the primary dataset of comparison for parkinsonian tremors. An ML model will be implemented on edge within jupyter labs, that evaluates the extracted features from the signals imported from the EMG to determine logically whether an individual has parkinsonian symptoms or not.

C06: Autonomous Robot

Supervisor: Dr Abdsamad Benkrid

Edwin Dsouza

The project is centered around designing and building a low-cost robot prototype that can move autonomously, monitors actions of staff and students, and reports any violation committed by students and staff members. The robot moves autonomously by creating a virtual path using information and interpolating the desired ROI's extracted from an image frame. The design incorporates a fusion of sensors in order to avoid dynamic obstacles and be able to determine whether the robot deflects from its routing path by using an IMU. The

location of the robot can be determined or predicted by using existing features present in the environment. These features tend to remain unchanged over a long period of time such as doors, direction, signs etc. The features which help segregate different objects (path, people, doors, signs etc) are trained using a convolutional neural network. The trained network is then used to extract these features consistently whenever the robot encounters it. To determine the shortest route from the robot's current position to the desired destination it implements the A star algorithm.

C07: Novel approach for Diabetes Health Management System

Dana Ghibeh

Supervisor: Dr Mohamed Fareq Malek

The development of a Diabetes Health Application that is easily accessible has a great potential to reduce the negative side-effects of the diseases that might develop. Several studies suggested that health monitoring applications greatly improved a diabetic patients' lifestyle. The current applications developed lack the aspects of providing an accurate food recognition capability, and they do not provide the intelligence to support the distribution of body fat. Assessing the fat distribution in the body, can evaluate the risks of developing certain diseases.

Furthermore, these applications developed are only suitable for a fully functional diabetic patient. Therefore, this research proposes a method that provides easier access for all types of patients. The proposed system contains three parameters. The first method will offer the user to input the physical parameters and gender. After inserting these values, the user will get their Body Mass Index (BMI), Waist to Hip ratio (WHR), and Waist to height ratio (WHtR) calculations. The application will let the user know if their calculated values put them at risk for certain diseases and obesity. The application will give recommendations on how to improve their lifestyle habits to become efficient and healthy. The second parameter will allow the user to upload any image previously taken and will classify the image by using a pre-trained network called inceptionv3. The image uploaded, will be rescaled to have the same input size as the network. The third parameter of this application is to calculate the nutrients based on the number of grams consumed. Thus, allowing the user to know if the right amount of nutrients is included in the meal.

C08: Microwave Dielectric Spectroscopy method for Fish authenticity

Syed Ijlal Hussain

Supervisor: Dr Mohamed Fareq Malek

Condensed phosphates are deliberately added to fish and processed seafood products to increase the weight of the product. However, excessive consumption of overwhelming body homeostasis can lead to phosphate toxicity, such as mineral and bone disorders, associated with chronic kidney disease and cardiovascular events. Rapid analysis of condensed phosphates is necessary to detect illegal adulteration of processed marine products. An analytical method has been optimized using ion chromatography for the rapid

and selective detection of condensed phosphates using microwave dielectric spectroscopy in various types of processed fish and marine products. The complex dielectric spectra were measured at known temperatures and at 31 frequencies between 0.2 and 12 GHz using an automatic network analyzer (ANA) and a 3.0 mm open coaxial sensor. Measurement in the frequency domain can be performed with laboratory instruments, such as an open coaxial line with a VNA, and takes advantage of the wide frequency range of microwaves, a number of investigations have been carried out performed with dielectric spectroscopy for fish authenticity measurement.

C09: Solar PV System with Battery Storage for Remote Housing

David Indrawes

Supervisor: Dr Mohamed Nasserddine

The amount of sunlight reaches relatively high levels in the Middle East, making solar power one of the region's most plentiful and reliable sources of renewable energy. On the other hand, Egypt that have many rural areas have not made considerable use of it as a source of energy among other sources. Therefore, the installation of an off-grid solar system in rural areas in Egypt renders its energy-independent. PV solar system will need batteries that would allow homes in to work during storms, rains, winds, cold, and heatwaves, which can directly affect power by causing damage to power lines or by raising energy demand. This research project provides a solution that will solve the lack of energy in rural areas. A PV solar system prototype is build using a solar panel which has a dimension of 700*360*23mm that has a maximum power of 30W. The use voltage sensor along with a current sensor that is connected to Arduino which is programmed by MATLAB will be used to obtain the solar panel voltage information that will be utilized as a parameter along with the solar panel current value to calculate the solar panel's electrical power and absorption efficiency. The solar system was tested in the south position, to receive the most sunlight during the day, successfully the system was working. Furthermore, SAM software along with a weather datasheet is used to show the solar resource at a particular location in this case its Egypt (Al Ayatt).

C10: Designing a Smart Controller for Electric Vehicle Chargers

Nikhil Menon

Supervisor: Dr Haile Rajamani

The increasing amounts of greenhouse gas emissions and pollution arising from use of vehicles has led to negative impacts on the planet, which has led to an increase in desirability for more environmentally-sustainable forms of transportation. Thus, electric vehicles (EVs) have seen an immense increase in demand in recent years as they are perceived to be more environmentally-friendly as compared to traditional vehicles, which would lead to less pollution. However, one drawback to EVs is that they require batteries to function, and these batteries take a longer time to recharge as compared to the internal combustion engines that are used by more standard vehicles. It is also challenging to ensure that batteries are being charged efficiently to satisfy the demands of the owners, as electricity demands rises over a period, and it could easily lead to overloading of the power grid if peak demand limits are

exceeded. This paper researches the use of a fuzzy logic-based algorithm to create a controller that will create the optimal scheduling conditions for the batteries of EVs. The algorithm is created and tested through Matlab, where the simulation is created through utilizing provided data sets and obtaining outcomes as outputs from the algorithm after certain rules are met, which will then help the user determine whether the EV's battery is charged or discharged or if there is no change in operation to be conducted at all. To help increase the accuracy of results through the algorithm, the system includes solar power which is an input that is generated on the roof of the building. The obtained and validated results demonstrate that it is feasible to use a fuzzy logic-based system to handle batteries in EVs.

C11: Building Integrated Photovoltaic System In the Middle East

Mostafa Ashraf Helmy Imam Mohammed

Supervisor: Dr Mohamed Nasserddine

Photovoltaic (PV) solar technology is a technology that uses semiconducting materials to convert light into electricity which then exhibits what is called a photovoltaic effect. With its clean energy, moving parts, no emissions of harmful gases, PV demands minimal maintenance and is easy to install, experiences negligible material depletion, and does not cause any noise while producing energy; it is projected to be a key and promising means of energy production. The development of Building Integrated Photovoltaic (BIPV) technologies involves replacing the conventional building materials with components that can generate energy while still maintaining the structural functions of the building, has become a trending breakthrough in the production of solar energy. In the Middle East, the rising power demand is pushing the government to think of alternative sources to maintain or increase their export of fossil fuels. The hot climatic condition of the Middle East places it in an advantageous position in the generation of solar energy. However, key challenges remain in if the installation of the BIPV technologies will be a good investment while covering the initial costs or will it be a waste of resources. Using the weather data of the United Arab Emirates to simulate expected PV panels power return yearly is a task that should be done before implementation. The use of the System Advisory Model (SAM) allows for the expected returns, losses, and displays such data for the user to read. With this information it is then easier to deliberate whether it is a feasible option to install BIPV or not. Overall results indicate that based on the building and the direction of the sides the return of power varies, if installed in a heading where the panels have access to the sun for a longer duration of time, the returns are greater as expected.

C12: Wearable IoT-Based COVID-19 Patient Monitoring

Athena Romaine Mopera

Supervisor: Dr Mohamed Fareq Malek

Coronavirus disease 2019 (COVID-19) is a highly infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The symptoms of COVID-19 may vary from person to person and so does its severity. The World Health Organization established some guidelines to mitigate the transmission of the virus, one of which is the isolation of

patients who are confirmed COVID-19 positive. Patients with severe initial symptoms are admitted to the hospital however those whose symptoms vary from mild to moderate are required to adhere to home isolation guidelines. However, there is still a need to constantly monitor those patients who are in home isolation as symptoms change drastically for the worse. The main objective of this research project is to create a wearable IoT-based COVID-19 patient monitoring system that will constantly monitor various physiological parameters namely body temperature, pulse rate, and oxygen level saturation using various sensors. Additionally, WiFi technology will be used as a geofencing strategy to ensure that the patient stays within a defined boundary to confirm that they are following the home isolation guideline. The proposed design includes three layers: the perception layer, the transmission layer, and the application layer. The perception layer is the data gathering layer that includes various sensors that will monitor the patient's physiological parameters and geographical location. The transmission layer is responsible for the transmission of data using WiFi. Lastly, the application layer is responsible for the real-time visualization of the data gathered through a Web Server. In the case of any emergency with the patient's condition, the doctor and caregiver will be notified through email using a Simple Mail Transfer Protocol (SMTP).

C13: Haptic Force-Feedback for Telepresence Control

Muhammad Saad Munawar

Supervisor: Dr Abdsamad Benkrid

The growth and development of telepresence and haptics has merely just begun. The idea of operating or getting a feel for an environment has opened many doors for future development of technology. The robotic telepresence/teleoperation and haptics allows people to work and perform tasks safely in environments that would otherwise harm them. The integration of haptics in teleoperation will allow workers to work with more precision as they won't be relying on just data but they're on senses too. In this research paper we present contribution to the further development and improvement of haptics by suggesting a novel proposed model for a force feedback glove. In this research, we embark finding an efficient alternative solution to already researched and produced haptic gloves. This was done by critically analysing other research and formulating a structured strategy. The proposed model incorporates the use "elastic servos" to provide force feedback to the operator. This actuator mitigates the need of incorporating any type of force sensor to the manipulator/robot as the actuator itself provides force feedback. This also mitigates the need of any type of flexion sensors to control the movement of the manipulator. The final components of the glove will be 3D printed, assembled, and proceeded to testing with a robotic hand, which will also be built if time favors it.

C14: Monitoring the Health Status and Different Vital Signs of the Elderly Through Smart Vest

Khalifa Qaed Abdallah

Supervisor: Dr Mohamed Fareq Malek

Considering the large increase in the population of all age groups, we focused in our project on the elderly category, and healthy life will be managed for them through our knowledge that it is the largest percentage of age groups that suffer from health problems. This is a vest that reads the vital signs of the elderly through sensors, including sensors to calculate the rate of body temperature and sensors to calculate the heart rate and it also contains a tracking system used to know the location of the user. It will use a smart program to track the three vital signs by connecting it to the Wi-Fi servers, which will allow the elderly user to stay at home and send medical reports through the Vest without the hassle of going to the hospital. One of the main objectives of building this project is to relieve pressure on health departments, including hospitals, and to provide rapid support to the user in the event of any problem such as a high temperature or a high heart rate, and through that the crisis assistance will be sent and the creation of new job opportunities, which is the health data analysis job, which depends on reading data for thousands of patients, tracking cases, and solving any technical problem arising from the device itself. Finally, the use of technology in the health sector is one of the priorities of all countries to preserve human lives and also facilitate that people working in the health sector and save users the trouble of waiting in hospitals and also saves them the costs of going to the hospital.

C15: DepthPark: Intelligent Vision Based Indoor Parking Management System Utilizing Single Monocular Depth Maps

Lakshay Naresh Ramchandani

Supervisor: Dr Abdsamad Benkrid

Almost 30% of automobiles accessing parking spots take an average of eight minutes to find a parking spot. There is a need for a cost effective and efficient indoor parking management system, particularly in cities like Dubai, which is renowned for its high-rise buildings, malls, and other structures consisting of indoor parking. A variety of existing sensor technologies might be utilized to create a cost effective and efficient indoor parking management' system. The adaptation of each of these sensors have their own set of challenges, such as weather sensitivity, difficult installation, pricey hardware, and ongoing maintenance. Due to their high cost and difficulty in implementation, the few indoor parking management systems that do exist are not extensively used. One of the most effective alternatives to construct an indoor parking management system was to use deep learning and convolutional neural networks on image data collected by cameras, vision sensors, etc. This thesis includes a thorough research review of the algorithms and models that are currently in use for real-time object detection, parking slot classification, number plate classification and recognition, monocular depth estimation for controlling slider movement,

and the shortest path algorithm, as well as a design proposal to implement an cost effective vision based indoor parking management system that achieves the thesis' deliverables. The proposed model uses the following models and methods in accordance with the review conducted in the study. For classifying parking slots, the proposed model uses a convolutional neural network called mAlexnet. In order to detect license plates, SSD (Single Shot Multibox Detector) is employed, and in order to recognize characters, the Convolutional neural network RPNet is used. The proposed model uses the Convolutional neural network Midas for real-time monocular depth estimation and incorporates the use of A* algorithm to find the shortest path.

C16: Advanced Smart City for PV and EV Deployments

Sachin Suresh Paul

Supervisor: Dr Mohamed Nasserddine

The exponential increase in gas prices has led people to decrease the amount of transportation services used because of this normal people started to stop using their cars and started looking for the other methods of transport due to the hike in prices. Many engineers have created many substituent petrol cars to combat these prices for people to get a good mileage but some of them were a success where others had its disadvantages. These methods were faced with a barrier; hence this thesis paper focuses on people using electric vehicles which are not only charged by the electricity given by the grid but by also using solar panels as a source which promotes to clean and sufficient energy. A lot of cross-references was taken place to understand how electric vehicles are used as a substitute for gas vehicles and how the solar panels can act as clean energy to charge the car in three Levels which are Level 1, 2 and 3 which also is known as slow, medium, and fast charging. The Simulink model of the circuit is created in MATLAB which analyses how much power is given as the output, the irradiance of the sun and the state of charge of the electric vehicle battery shown by the three levels. The results created shows how much power is given by the sun for charging the vehicles and level 3 can finish charging electric cars within 30 minutes. This study concludes that using solar energy is efficient for charging electric cars and people prefer level 2 and level 3 charging for faster purposes.

C17: A Fall Detection System for the Elderly and People with Special Needs Using Computer Vision

Daniel Wazz

Supervisor: Dr Abdsamad Benkrid

In an ever-aging population, the number elderly and special needs people increase on a day-to-day basis. One of the main causes of injuries for these people is falling, whether it'd be a small trip, loss of balance, or a short fall from a chair and so on. However, most of these accidents occur in homes where residents are more vulnerable since they are on their own. Enhancements to already existing fall detection systems have great potential of minimizing or potentially eliminating the risks that come with a faulty or failing fall detection system. Reliable

surveillance is required to monitor these injuries so that they can be attended to as quickly as possible. In a world where technology is developing ever so rapidly, the demand for fall detection increases throughout hospitals and other relevant areas. This project proposes a computer vision method of fall detection system that uses an open-source network called OpenPose to detect key points of the human body to form a skeleton is used to tackle the issues.

C18: Intelligent Monitoring and Detection of Persistent Coughing Of Workers To Protect From COVID-19 Infection

Savio D Silva

Supervisor: Dr Mohamed Fareq Malek

COVID-19 outbreaks have been shown to be extremely difficult to suppress with existing testing procedures until region-wide isolation procedures are maintained during this time. This is due in part to the limits of existing viral and serological assays, as well as a lack of complementing pre-screening techniques. The challenge is identifying suitable machine-learning features; some work has been done in the literature, but in the instance of COVID-19, it has to be seen whether traits, trademarks, and signals (i.e., features) uniquely identify COVID-19. As a result, the major problem is to ascertain the finest qualities which distinguish COVID-19 coughs by a portable and wearable device in order to decrease manpower and danger for paramedics. In addition, for each sort of trial, such as examining COVID-19 and whooping coughs, we want to determine the combination of attributes that performs best. As a supplementary pre-screening strategy, a lot of research have started to work on the building of machine-learning algorithms to identify COVID-19. These are based on voice analysis, as well as the noises we create when we breathe or cough, and how these sounds alter once our respiratory system is compromised. These alterations range from large, audible shifts to minute shifts (known as micro signatures) that seem to be undetectable to the untrained ear but nonetheless there. The purpose of this research is to establish a pre-screening strategy that might lead to automated COVID-19 identification by analyzing coughs time-frequency representations (TFR) with comparable performance. TFRs allow non-stationary signals to be analyzed by observing the growth of the time and frequency components over time. Furthermore, because this representation preserves the time dependency of signal characteristics, it allows for the introduction of more related aspects than interpretive approach.

C19: Frequency Selective Surfaces for Enhancing Connectivity in Rural Areas

Khushal Khan Liwal

Supervisor: Dr Mohamed Fareq Malek

Frequency Selective Surfaces (FSS) have been around for almost a century with usecases and research efforts in a very wide domain. This study applied FSSs to enhance connectivity technologies employed by smartphones for people living in rural areas. The proposed FSS

design has multiple passbands for technologies such as GSM, LTE, Wi-Fi 2.4 GHz and Wi-Fi 5 GHz. Both single and multi-layer FSS designs including non-FSS based solutions for enhancing connectivity were meticulously studied and compared to find the most suitable structure. Compared to Non-FSS enhancers, the FSS approach does not require extra connections and can be specifically applied in situations where the user does not own the network. The research fills gaps related to fabrication and employing the newest techniques such as 3D-printing using CopperFill and laser cutting flexible materials such as Copper Taffeta. Ansys HFSS was used to simulate infinite periodic arrays of different unit cells using the materials mentioned. The unit cell designed for CopperFill material initially had good simulation results, but after fabrication, did not coincide with the experimental results. Thus, a second design was proposed using Copper Taffeta fabric which provided very good 10-dB bandwidths for all the frequency bands considered. Unfortunately, this prototype was not fabricated using a laser cutter, but in its place, two hand cut mock designs for WIFI using the same materials were successfully simulated and produced. Out of the two, only the 5GHz FSS provided a favourable response of approximately 3 dBm when measured with a power meter and 5-7 dBm when using a smartphone.

C20: Smart Health Monitoring Band Utilizing Wireless Body Area Networks

Avishkar Sharma

Supervisor: Dr Obada Al Khatib

Smaller doctor-patient ratio further accelerated the issue to overexertion and exhaustion of existing human and healthcare resources. Thus, this project aims to develop the SHMB (Smart Health Monitoring Band) that monitors a person's vital parameters to enable efficiency in virtual medical consultations, prioritizing patients based on rough readings, monitoring patients during isolations and post recoveries. The system works by using various sensors to get a rough reading of parameters such as temperature, ECG (Electrocardiogram), EMG (Electromyogram), heart rate, and SpO2 (Blood Oxygen Level). Two prototypes are designed to achieve various functionalities depending upon usage. The first, prototype comprises an Arduino Uno board that enables on-site monitoring of the patient for doctors to prioritize patient admission based on certain parameters and availability from distance via virtual video conferencing. On the other hand, the second prototype comprises of Arduino Uno Wi-Fi Rev 2 board along with similar sensors to enable multiple monitoring of admitted or post covid recovery patients throughout a certain period to monitor stability. The outcomes achieved were the development of two prototypes each with its own limitation and usages. Arduino Uno prototype would be used during initial stages in case of emergencies to allot beds or required medical services based on readings and limiting to real-time data values no record available. Conversely, the Arduino Uno Wi-Fi Rev 2 prototype was designed to be used during isolation and post-recovery records but was limited in terms of accuracy compared to the Arduino Uno prototype.

C21: Decentralized Car Rental Systems

Talha Khan

Supervisor: Dr Mohamed Fareq Malek

The Project is model for a decentralized car rental business idea that allows users to rent day to day cars of other users while they are not being used. the issue with such a model is that most users don't feel comfortable in letting other users rent their cars hence the project proposed is a car abuse monitoring system that utilizes a range of sensors such as a vibration sensor, heat sensor and impact detection sensors. for the model to correctly work the sensor values are to be taken from real cars. the data is then compared to the data collected from the person who was driving and an accurate assessment of the persons driving can be made. such as if the person was being a reckless driver. such a system can help more people have faith in the system and allow their cars to be put on rent allowing for more cars to be available for rent. the benefits of such a system may include steady source of revenue for car owners, in the number of car parking, cars won't be idle, more availability of cars to the public which may lead to fewer purchases of new cars meaning less traffic and congestion. the project aims to utilize concepts learnt from engineering to a decentralized car rental system that can potentially be revolutionary in the car rental industry.

C22: Plastics to Plants

Anousha Khan

Consumption of plastic has become a daily necessity, as plastic waste accumulates and increases where recycling has become a must which leads to affecting the environment during the process of plastic incineration. However, harmful byproducts have the potential to reverse their environmental impact if they are controlled and maintained. This report highlights the aim of our project which revolves around the issue of plastic accumulation, whereas the goal is to eliminate plastic permanently; and implement it into agricultural areas. In addition, literature review and possible design alternatives are covered. Moreover, safety and environmental issues plus possible estimated costs are considered. Progress work plan, task assignments, and project recommendations are discussed. Finally, safety and environmental risks are illustrated, as well as HAZOP studies for different process units are applied. One of our main goals with this project is making the prototype as functional and ergonomic as possible. While our project is generally quite easy to use and comfortable for the user, our aim is to make more improvements enhancing the user experience after we perfect the prototype design and initial experimentation.

C23: The Effect of Electric Vehicle Penetration on Power Quality

Rubayith Tasbhia

Supervisor: Dr. Joel Kennedy

The ever-declining availability of fossil fuel reserves and the increasing greenhouse gas emissions have encouraged governments to consider the electrification of the transport sector. Statistics suggest by 2040, 33% of the global cars on roads will be Electric Vehicles (EV). However, since Electric vehicles operate using electrical energy, increased penetration of EVs into the market will result in an upsurge in the electricity demand of the power grid. Consequently, mass penetration is assumed to violate Power quality standards, among other grid problems. Failure to address the power quality issues due to random load patterns could result in increasing the infrastructure and maintenance cost for the network operators, expanding the consumer cost plus degrading both the commercial and industrial user's experience. Despite these problems, the progression of the road transport mediums to an environmentally friendly sector by electrification is crucial. The main aim of the thesis is to study existing literature, model the power grid's behavior, and investigate the variability, if any, in voltage imbalance across the grid for various electric vehicle penetration levels. User behavior data was modeled using the "My electric avenue" projects database. The database held driving behavior patterns over a time span of 18 months for 215 cars. IEEE European Low Voltage Test Feeder was used as a grid model. The model was validated using the load data provided initially. The voltage imbalance variance for different scenarios was compared for various grid nodes to establish a correlation, if any, between the voltage imbalance and the bus admittance.

C24: Heap Bioreactor Modelling for Copper Ore Bioleaching

Zaroka Liwal

Supervisors: Dr. Vandana S., Dr. Faheem S.M.

Copper can be extracted from its ore using microorganisms by a process known as bioleaching. A heap setup has ore arranged in a trapezoidal prism onto which the microorganisms are irrigated. A heap bioreactor model is proposed to relate the copper recovery to irrigation rates applied to the heap. Another variable considered is the heap height and its effect on copper recovery. To better understand the bioleaching process and collect data to integrate it into the model, laboratory experiments were conducted with copper ore and bacteria. Samples of copper ore were collected from an ancient copper mine in Ras al-Khaimah, UAE. Four different bacterial species were isolated from various sources. The preliminary research carried out with the pure bacteria cultures on copper ore resulted in a copper recovery of 60 mol% and 59 mol%. It was essential to carry out the bioleaching study to adapt the model to the bacterial species and ore characteristics native to the U.A.E region. This preliminary work requires more studies toward identifying the bacterial strains and building a working prototype of the heap bioreactor system to increase the validity of the heap bioreactor model proposed.

C25: Detecting the Ripeness and Freshness of Watermelons using Microwaves

Nayab Shah

Supervisor: Mohammed Fareq Malek

With the rising level of technology, the effort put into any kind of work being generated has been steadily decreasing. When adopting better designs, the resources required to achieve the desired performance can be efficiently and economically minimized. A technical rise has accompanied the demand for better food quality. This aspect enriches the prospect of growing and improving the quality of agricultural products, contributing to healthier fruit and vegetable production and consumption. For this reason, the dielectric properties of fruits and vegetables need a better electrical classification. This research focuses on the use of these dielectric properties to determine the level of fruit freshness and maturity (to be unique to watermelon). A dielectric probe and VNA (Vector Network Analyzer) are used to conduct this research. The plan also focuses on finding the right time to use the same knowledge to grow every fruit and understand the right time to harvest it.

C26: An Anomalous Method of How a Camera can be Used in Quantifying the Velocity Profile Inside a Wind-tunnel

Aafrein Begam Faazil

The study proposes a novel technique of how a camera can be utilized along with a pitot tube in determining the velocity distribution inside a wind tunnel facility. The technique involves traversing a pitot tube laterally against the incoming air flow in a wind-tunnel and simultaneously imaging the water column variation of the connected manometer. Further post processing of the captured images yields the pressure distribution and further the velocity values. The technique finds useful in overcoming the prominent disadvantage of a pitot tube of only providing velocity values at one spatial location at a temporal instant.