



# FINAL YEAR PROJECTS – 2013

Department of Electronic and Telecommunication Engineering

University of Moratuwa

## GROUP1 INTERNET OF (MY) THINGS

**SUPERVISOR: PROF. DILEEKA DIAS**

Internet which was used to connect people with people and people with machines has now evolved to connect things with things. We provide a web interface to track user items (things) for the following scenarios.



- Anti theft application: User can search items' locations and is notified immediately if specified items get detached from the vicinity.
- Vehicle checklist application: User is notified immediately about the left items.
- Smart kitchen application: User is notified on the shopping list.
- Smart attendance application: Lecturer gets notified on the attendance.

## GROUP2 VEHICULAR TRAFFIC MONITORING VIA MOBILE NETWORK

**SUPERVISOR: PROF. DILEEKA DIAS**

Unpredictable traffic conditions cause numerous problems in people's daily routines. Due to the increase in the number of vehicles on the roads more and more congestion is caused. However we are unable to get information of congestion in advance. Hence we need a method to monitor the traffic condition before reaching that area, in order to use alternative routes. But the available solutions in the market are not up to the requirements and also consume excessive power. Therefore through this project we try to develop a mobile application to figure out the congestion situations and share relevant information among other users.



## GROUP3 HYBRID MOBILE POSITIONING

**SUPERVISOR: PROF. DILEEKA DIAS**

With the emerging technological advancements in the field of mobile telecommunication, location based services (LBS) have become more popular. Although GPS is available for location estimation, its limitations causes lower accuracy levels. In this project, a hybrid scheme for user location estimation is developed where the location of the mobile user is calculated using GSM network parameters and network planning tool predictions. A calibrated database is maintained using real field measurements. With a remote location estimation engine, the user location is calculated and sent to the mobile user.

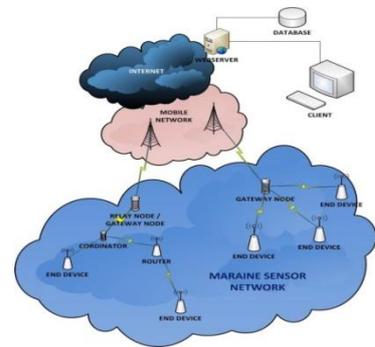


## GROUP4

### WIRELESS SENSOR NETWORK (WSN) FOR OCEANOGRAPHIC MONITORING

**SUPERVISOR: PROF. DILEEKA DIAS**

Sri Lanka being an island, it is very important to be vigilant about the surrounding marine eco system which is very sensitive to environment changes. Therefore, a Wireless Sensor Network will be deployed for oceanographic monitoring as a prototype for the first time in the country. Four buoys consisting of sensors to measure temperature of sea will be placed at one selected location (eg. Polhena). The data acquired from the selected locations will be sent to a web server via the GSM network. The data can be accessed by logging into the webserver via the Internet. Remote sea monitoring, protection of flora and fauna at sea, data collection for marine biologists and researchers will be made possible via this project.

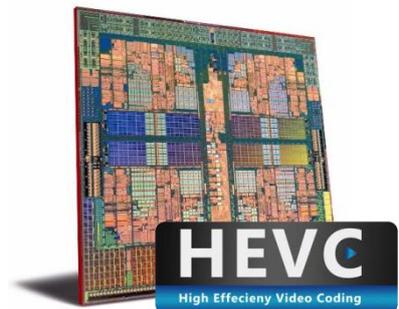


## GROUP5

### HARDWARE IMPLEMENTATION OF HEVC DECODER

**SUPERVISOR: DR. AJITH PASQUAL**

HEVC, the latest video compression standard was introduced during early 2013, as an effort to address the issue of ever-growing demand for transmission and storage of high resolution video. Despite the rewards, adoption of the new standard has been rather slow, largely because of extra computational complexity that HEVC carries. Particularly when it comes to videos of High-Definition (HD) or larger, computational burden of the decoding process is so overwhelming that software based decoder could barely achieve the real time decoding target. We present an area, power optimized hardware implementation for real time decoding of HEVC compliant encoded bit streams of videos of resolutions up to 1080p.



## GROUP6

### DESIGN AND IMPLEMENTATION OF NON-LINEAR EQUALIZER BASED RECEIVER FOR UPLINK OF LTE ADVANCED RELEASE 11

**SUPERVISOR: DR. CHANDIKA WAVEGEDARA**

With the introduction of LTE-Advanced technology by 3GPP, many service providers around the world were interested in implementing this technology in their mobile networks. To achieve those high data rates specified in LTE Advanced standards, we need to have advanced receiver schemes capable of operating near Shannon capacity. Since many research efforts are concentrated on improving the downlink performance our project



aims to design and implement an advanced non-linear receiver for LTE-Advanced uplink conforming to 3GPP-Release 11. The receiver will be extended for multi-user scenario and finally be implemented on FPGA.

## GROUP7 HEVC MULTI-VIEW CODEC

**SUPERVISOR: DR.AJITH PASQUAL,DR.VARUNA DE SILVA**

Multi-view video is simultaneous capturing and displaying of multiple views of the same scene. The video frames contain redundant information which will require massive bandwidth and storage when it comes to applications. The codec is based on state of the art video coding scheme HEVC (High Efficiency Video Coding). HEVC is said to double the data compression ratio compared to H.264/MPEG-4 AVC at the same level of video quality. The Multi-view codec will consist of an encoder which takes in Multi-view video and compresses the data into a single bit-stream and a compliant decoder which decodes the bit-stream and reconstructs view data as required by the application.



## GROUP8 INTELLIGENT VIDEO SURVEILLANCE SOFTWARE AND CROWD ANOMALY DETECTION ALGORITHM

**SUPERVISOR: DR.RANGA RODRIGO**

Security is a critical issue today. Consequently, video surveillance cameras are becoming ubiquitous as Governments, security forces and employers alike seek to minimize criminal behavior, ensure citizen safety and protect their own interests. The prevalence of surveillance cameras inevitably leads to the generation of large volumes of data that need to be analyzed. Manual analysis is prone to errors and time consuming while the existing software are expensive and have limited detection capabilities. Our project proposes a low cost intelligent video surveillance software package and a crowd anomaly detection algorithm as video surveillance is becoming wide spread in Sri Lanka.



## GROUP9 INTERNET BASED REMOTE CONTROL SYSTEM FOR A TELE-PRESENCE ROBOT

**SUPERVISOR: PROF. ROHAN MUNASINGHE**

The business world is getting more complex day by day. People need to attend to their work regardless of geographical boundaries. Sometimes they need to make themselves virtually present in different places within a short period of time. High traveling cost and wastage of time, affect their productivity adversely. The intention of

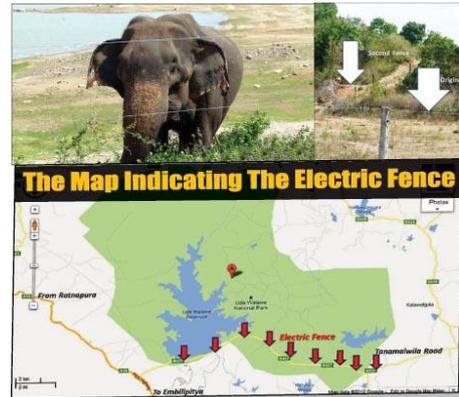


our primary project, "Immersive Tele-presence Robot Assistant and Companion" is to address these issues. Our part of this major project is to build the "Internet-based Remote Control System" for the robot. This remote control system is capable of controlling a robot avatar which has arm manipulation capabilities.

## GROUP10 REAL TIME ELECTRIC FENCE FAULT LOCATOR

**SUPERVISOR: PROF. ROHAN MUNASINGHE**

Elephant-human conflict has been consistently recorded over the past few decades due to fact that most areas that form elephant habitats are adjoining human settlements. This has become a grave threat for continued existences of both wild elephants and the forest adjacent people. Real Time Electric Fence Fault Locator is the ideal solution for this issue, which is capable of identifying the nature and the location of the fault in electric fences, where the fence is supplied a high voltage by the energizer and the on-going waveforms are observed, analyzed and compared with the healthy waveforms.



## GROUP11 MOBILE PLATFORM DEVELOPMENT FOR A TELE-PRESENCE ROBOT

**SUPERVISOR: PROF. ROHAN MUNASINGHE**

Over the past few decades many strides have been made to bring people together using technology. Mobile phones, video conferencing, internet telephony, are to name a few. The Immersive Tele-presence robot companion takes this concept a step further by giving its user the ability to move around and manipulate a remote environment as he or she wishes and thus giving them the experience of truly being there. Our project focuses on building a mobile platform for such a robot which has the ability to navigate inside a constrained indoor environment both autonomously and manually while avoiding obstacles on its' path.



## GROUP12 MANIPULATION OF A ROBOT ARM FOR TELE-PRESENCE ROBOT

**SUPERVISOR: PROF. ROHAN MUNASINGHE**

In relation to the telepresence robot project, a robot arm is designed as an addition to the robot. The arm will be manipulated by the end user through the same interface that controls the other robotic functions. According to the inputs from the user, the robot arm will make complex movements on 5 degrees of freedom. This will enable



the user to execute actions of the robot such as opening doors, picking up and placing books, cups and cans and also do basic hand gestures such as waving.

### GROUP13

## DEVELOPMENT OF A ROBUST SPEAKER RECOGNITION TOOL FOR FORENSIC PURPOSES

**SUPERVISOR: DR.CHANDIKA WAVEGEDARA,PROF. WALGAMA**

Currently Sri Lankan legal system does not have a proper or dedicated speaker recognition system. The commercially available tools which are used to analyze audio clips use out of date techniques and the level of accuracy is not sufficient for legal matters. Our aim is to create a tool for speaker recognition with a high accuracy to be used in the forensics field. There are features of speech that are unique to an individual. These features are extracted and speaker models are built by the system for both manual and automatic analyzing.



### GROUP14

## INDOOR LOCALIZATION SYSTEM WITHOUT USE OF EXTERNAL SENSORS FOR A TELE-PRESENCE ROBOT

**SUPERVISOR: PROF. ROHAN MUNASINGHE**

The main objective of this project is to provide the position of the Tele-Presence robot that enables it to localize itself in a known internal environment. Since it is not viable to install sensors everywhere, localization is done using image processing techniques. Database of image properties is maintained and by matching with that database, current position and probability of the estimated position are calculated



### GROUP15

## HYPERTENSION MONITOR

**SUPERVISOR: DR.AJITH PASQUAL**

'Hypertension' which is one of the major causes for non-communicable diseases, can be controlled via medication if detected early. But in most of the cases the detection is not done in early stages. To overcome this continuous blood pressure monitoring has to be done in a non invasive manner. Our aim is to determine the relationship between the hypertension and some important biological parameters to develop a wearable,



continuous, noninvasive blood pressure monitor which is capable of displaying blood pressure continuously, alerting the user in Hypertensive conditions and also recording and sending data to a central system for further analysis.

## GROUP16

### AUTOPILOT SYSTEM DEVELOPMENT FOR A QUADROTOR UAV

**SUPERVISOR: PROF. ROHAN MUNASINGHE**

This is a research platform and the development of a quadcopter which is capable of hovering (altitude holding), GPS locking, auto takeoff and landing and auto piloting through the given GPS point. As this is a continuation of a previous project, currently a MAV (Manned Aerial Vehicle) has been developed. The objective of this project is to develop the research platform to unmanned level. Our final objective is to have a fully autonomous flight which could be used in disaster management, object tracking and any other task related with aerial photography.



## GROUP17

### INDOOR TRACKING SYSTEM USING WI-FI NETWORK INFORMATION

**SUPERVISOR: PROF. DILEEKA DIAS**

The Global Positioning System (GPS) shows poor accuracy in indoor environments because of the limited availability of satellite signal coverage. Other positioning and tracking technologies that use sensor networks often require expensive infrastructure. This project aims to provide a low cost and accurate Wi-Fi based solution to position and track a mobile user within an indoor environment. The expected project outcomes include the development of an indoor positioning system that uses Wi-Fi network RSSI measured from an android application, development of a tracking system using estimated positions and analysis of system performance for different prediction algorithms and varying environmental conditions.

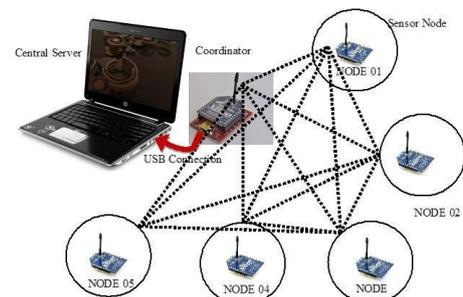


## GROUP18

### WSN BASED INTRUSION DETECTION (OF ELEPHANTS)

**SUPERVISOR: PROF. DILEEKA DIAS**

This project aims at developing a system to detect intrusions of elephants in jungle - village borders using Wireless Sensor Networks (WSN). The functional requirement of the system is that it should detect any and all intrusions of elephants (without missing any) in the effective geographic location where the system will be



installed. It is also expected not to produce any false alarms. The system has to be robust under adverse weather conditions, should operate on very low power (renewable energy like solar) and propagate the alarm in a timely and effective way so as to serve its purpose.

## GROUP19

### INTERCONNECTED HOSPITAL SYSTEM FOR SRI LANKA

**SUPERVISOR: DR.NUWAN DAYANANDA**

Hospital management systems are being widely adopted in many countries including Sri Lanka. Many advantages could be created by moving into health management systems and interconnecting the hospital systems and networking. The ultimate goal of this project is to design a unique hospital networking system for the public health sector of Sri Lanka using the OpenMRS platform for hospital level. It also includes a Radiology unit and a Bed head ticket data storage method for hospitals based on electronic data transfer. The proposed system will also introduce on adopting technology into Sri Lankan hospitals analyzing the unique requirements in Sri Lanka.

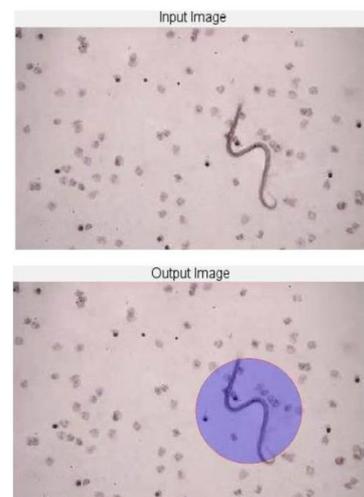


## GROUP20

### AUTOMATED SLIDE SCANNING MICROSCOPE WITH ASSISTIVE DIAGNOSTIC PLUGINS

**SUPERVISOR: DR.NUWAN DAYANANDA, DR.SAGARIKA SAMARASINGHE**

The conventional optical microscope used in the medical labs of Sri Lanka has many drawbacks. By incorporating suitable hardware to the existing microscope, it is possible to create a system which can be used to acquire a digital image of the slide using Whole Slide Scanning (WSI) techniques. Once a digital image is acquired many analytical tools could be used on the image. The detection of the presence of microfilaria in the peripheral blood smears is attempted by creating a plug-in. This project is carried out as a joint research with the Medical Research Institute (MRI) of Sri Lanka.

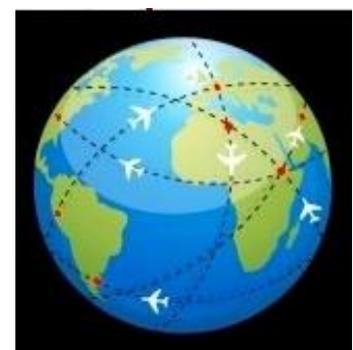


## GROUP21

### AIR TRAVEL PLANNING ALGORITHM USING GPU

**SUPERVISOR: DR.RANGA RODRIGO, DR.JAYATHU SAMARAWICKRAMA**

Travelling by air is a hassle that many of us are familiar with. An integral part of ensuring that the agony is minimized when taking to the air is to find an itinerary that minimizes travel time and cost while



maximizing comfort. Given that over 1.2 million flights happen between nearly 4000 airports worldwide in a single week alone identifying the optimal flight plan is a huge computational problem. The project plans to implement a solution in a GPU so that its parallelism capabilities can be utilized to optimize the search. The goal is to reduce the waiting time for a solution down to a few seconds.

## GROUP22

### REMOTE MEDICAL CONSULTATION SYSTEM FOR RURAL AREAS

**SUPERVISOR: DR.NUWAN DAYANANDA, PROF.SISIL P. KUMARAWADU**

The main objective of this project is to develop a reliable, robust, portable and easily utilizable remote medical consultation system that would fulfill the requirement of providing basic health services to the rural areas of Sri Lanka. Since the people who live in rural areas have to travel long distances with lack of proper transportation facilities in order to obtain their basic medical checkup for the diagnosis/monitoring of their diseases, this device would help them by delivering the platform to measure the required medical parameters, communicate with doctors to get their diagnosis/ treatment plans regardless of time or place constraints.



## GROUP23

### FIXED WING UNMANNED AERIAL VEHICLE

**SUPERVISOR:PROF.ROHAN MUNASINGHE**

The goal of this project is to develop a fixed wing Unmanned Aerial Vehicle along with a Ground Control Station. It is expected to have flight duration of 1 hour and carry a payload of 5 kg. The control of the vehicle can be switched between autopilot mode and manual mode. It will also stream a live video feed using a VPN. This UAV will be very useful in weather monitoring, traffic monitoring, military applications and also as a research platform for further developments.

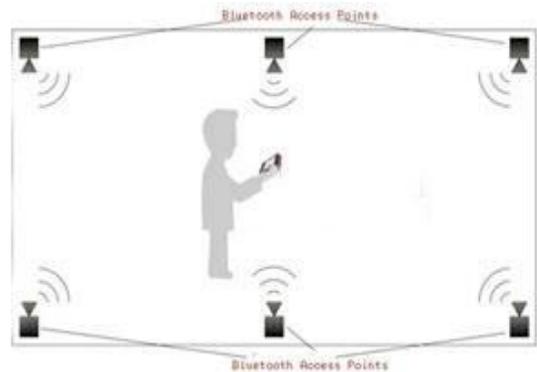


## GROUP24

### LOCATION BASED SMART REMINDER

**SUPERVISOR:PROF.DILEEKA DIAS**

We all normally use alarms to remember events which operate based on the time of the system. There exist situations where you would like to prefer alarms based on your locations. In contrast to the conventional alarms, "Location Based Smart Reminder" provides location triggering alarms and services. Our main intention is to develop mobile application to utilize wireless technologies to locate people, up to the accuracy we expect, and provide useful information. Also the application and infrastructure intend to work robustly with low battery power consumption.



## GROUP25

### BRANDIX AUTOMATED TAGGING MACHINE

**SUPERVISOR:DR.JAYATHU SAMARAWIKRAMA**

When a garment is manufactured by stitching together multiple pieces of cloth, all the pieces must come from closely located areas of the cloth roll. Therefore, workers manually tag (label) the cut pieces to ensure that the pieces from the same layer in the spreading (laying) process end up in given apparel. We propose to automate the tagging system by manufacturing an attachment to the spreading machine, so that each piece in each layer can be impinged with the appropriate label.

