

1. Introduction

Due to the increase of home users that are connected to the internet, the author had focused this project on home security vulnerabilities. This led to investigate security issues to provide protection to secure a user data on home networks. In order to secure a network, it requires two methods to complete it. Research on previous studies to understand and carry out experiment to test network to provide solutions to address vulnerabilities, threats and risks targeting a home network technology. In completion of the project, the author hoping to achieve target and this has had achieved because all the experimentations completed with success.

2. Aim & Objectives

The aim is to conduct an experiment to address security vulnerabilities, threats and risks targeting a home network technology.

- Literature review of books, journals and articles
- Identify vulnerabilities, attacks and threats
- Critical review of previous studies on network security problems
- Design and implement a network
- Experiment with a combination of software and hardware equipment to test
- Test and evaluate findings & make recommendations for future improvements.

3. Sources

Books, journals, articles and any other sources that related to home network security. This helps to understand the type of vulnerabilities, threats, attacks and risks that home user faces on daily basis when connected to the internet to provide solutions [1-4].

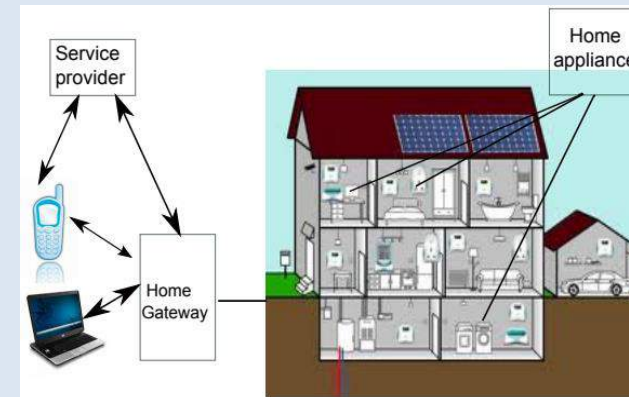


Figure 1: Smart Home Design [5]

4. Design & Implement

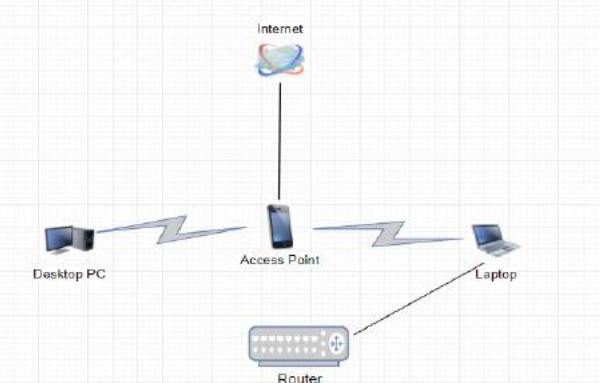


Figure 2: Smart Home Design

5. Experiments

The author conducted 3 methods of experimentations. The results shows on 6, 7 & 8 section. The methods which are WPA2 password crack, man in the middle attack and port scanning. All carried via Kali Linux operating system.

6. WPA2 Crack

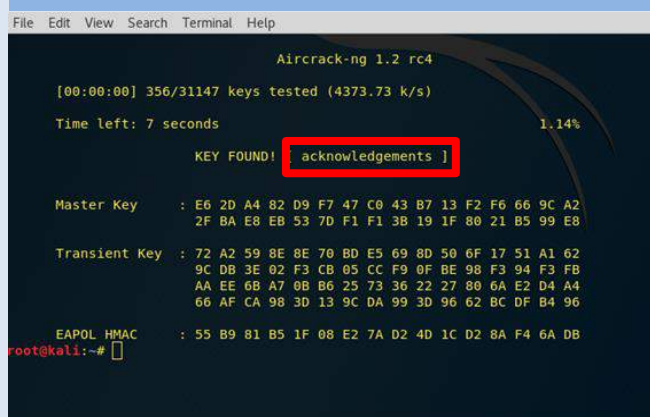


Figure 3: Smart Home Design

Figure 3 shows result of Key found which is as “acknowledgements”.

7. MITM Attack



Figure 4: Smart Home Design

Figure 4 shows result of sniffing and capturing images from targeted device via driftnet.

8. Port Scanning

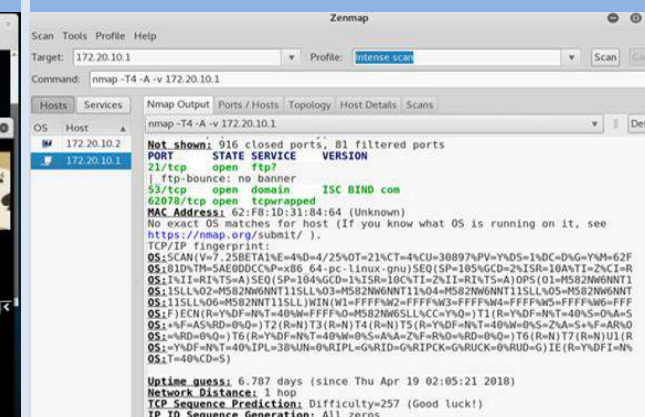


Figure 5: Smart Home Design

Figure 5 shows port scanning results which conducted via ZenMAP method.

9. Conclusion

Overall, this project has completed successfully. As the author being able conduct three different types of experimentations. Which shows in the results on figures 3-5, all of them were successful. In the future, the author is aiming to learn more about home network in order to provide better network to project home user data. As home networks have greater risk the business according to research findings during this project.

10. References

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An Investigation into Distance Measuring Technologies to Augment Driving Experience

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1. Introduction

Globally over 1.3 million fatalities occur from traffic collisions with 90% due to human error [1]. Advanced Driver Assistance Systems (ADAS) are a group of safety technologies relating to motor vehicles, with their main purpose to minimise human error. This project outlines an investigation into ADAS which adopt distance measuring technologies.

2. Aim & Objectives

Aim:

To investigate distance measuring technologies within ADAS and develop an electronic system to test a selected technology.

Objectives:

- Research and investigate Advanced Driver-Assistance Systems which adopt distance measuring technologies.
- Write a design specification for a system to test a selected technology.
- To design and build a system based on the design specification.
- Perform tests on the overall system and the technology, recording all results achieved.
- Analyse and evaluate the test results, comparing collected results with relevant studies.

3. Research Overview

ADAS which adopt distance measuring sensors include parking sensors, lane departure warnings, blind spot monitors, collision avoidance systems, adaptive cruise control and autonomous vehicles. Technologies used:

- RADAR:** excellent range and reliability, however suffer line of sight issues.
- Camera:** excellent object detection and accuracy despite being unreliable in adverse weather conditions.
- LiDAR:** high response times and reliability however the technology is costly and requires higher computational power.
- Ultrasonic:** low cost and accurate however have a limited range and surface and angle reflectivity issues [2].

Due to budget constraints ultrasound was the adopted technology. There are many related studies which use ultrasound. Jiménez et al provide a study of the suitability of ultrasound in vehicle tracking and detection. They believe ultrasound is strongest for short range ADAS due to low cost and accuracy [3].

4. Design and Implementation

The final system uses eight HC SR04 ultrasonic sensors which are fitted around a buggy to simulate the workings of a short range collision avoidance system. A PIC16F887 is used to control the buggy and perform two software algorithms, being free roam and self park modes. These algorithms use 'if' statement thresholds where a change in distance changes the speed or direction of the motors. The speed is controlled using PWM and the distance is calculated using the time of flight principle:

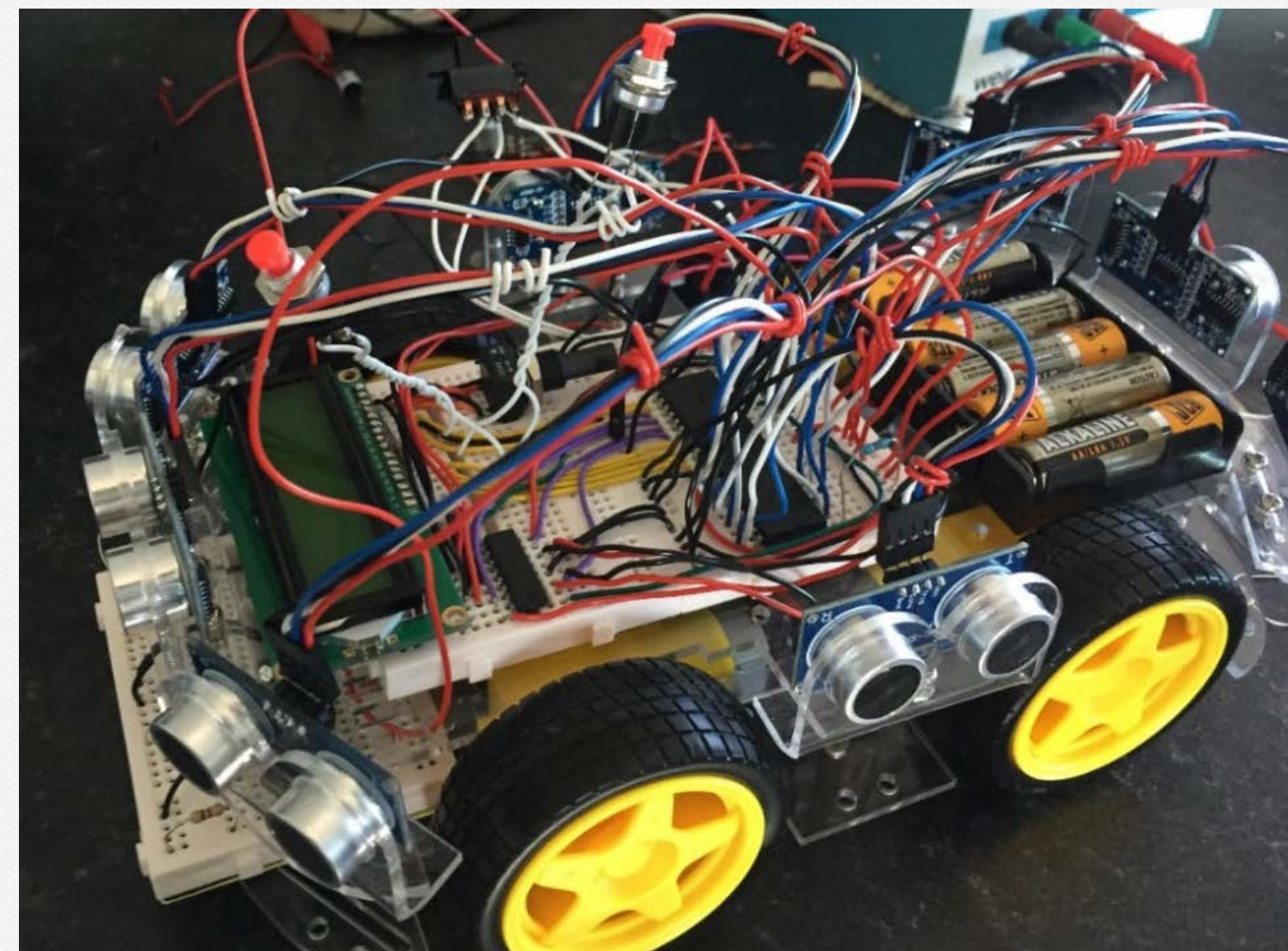
$$Distance = \frac{time\ of\ pulse \times speed\ of\ sound}{2}$$


Figure 1: Final Hardware Implementation

5. Testing & Results

Many tests were performed on the final system:

- Surface Reflection:** The accuracy of the system was tested against a variety of materials. Results showed paper to produce the most errors with errors occurring throughout the measurement range (fig 2). These results are as expected from research with a study by Adarsh et al showing similar errors. This is due to papers transmission property [4].
- Angle Effect:** The accuracy of the system was checked against a varying angle. Results showed that the sensor performs poorly with large errors occurring at just 20° (fig 3). This compares with research as a similar experimental study by Gamarra-Diezma et al show errors occurring at 20° also [5].
- Algorithm Response:** The algorithm responded as intended and reacted well to a variety of materials. However, paper provided false starts due to reflection issues.
- Interference Effect:** A transducer was used to direct a varying frequency at the sensors. No inference was found, future tests considered using larger transducer.

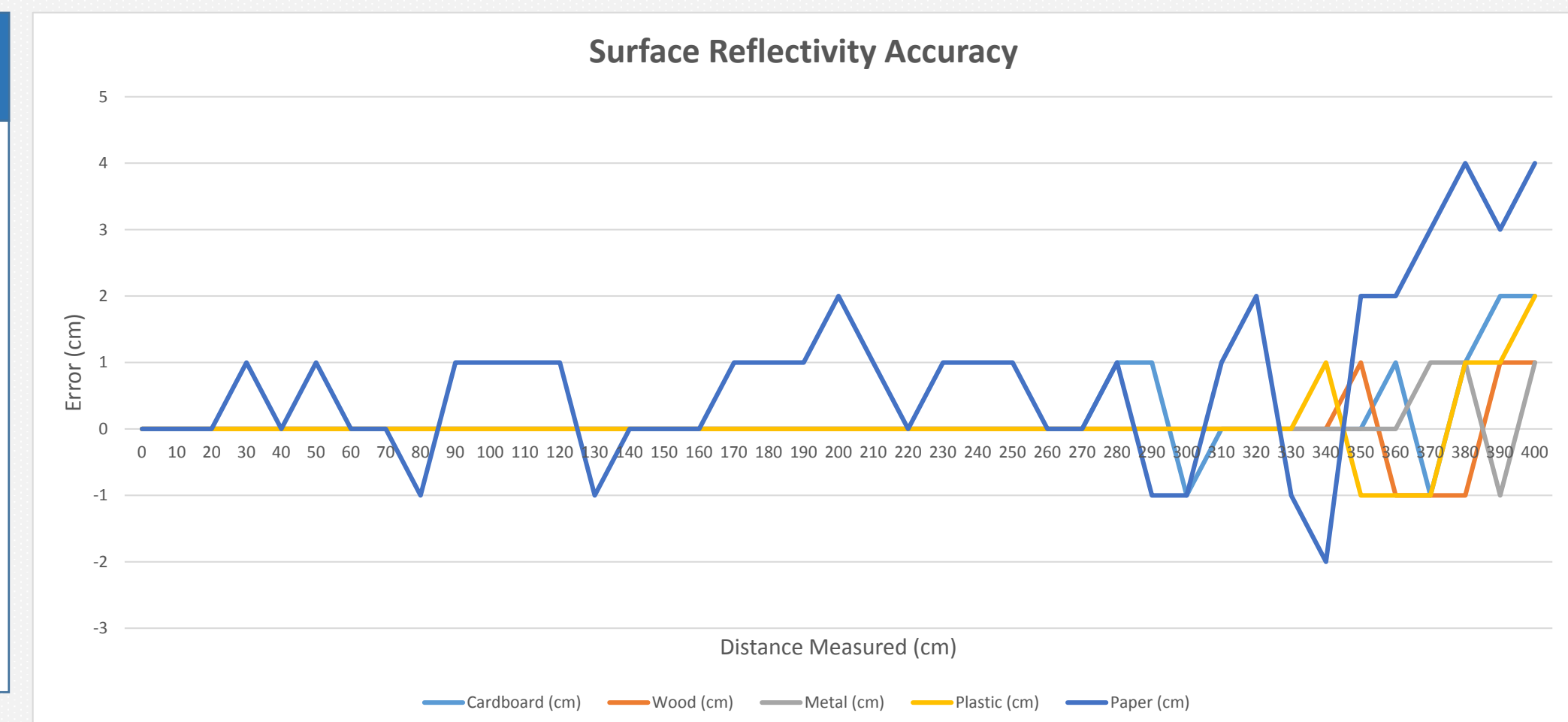


Figure 2: Surface Accuracy Results

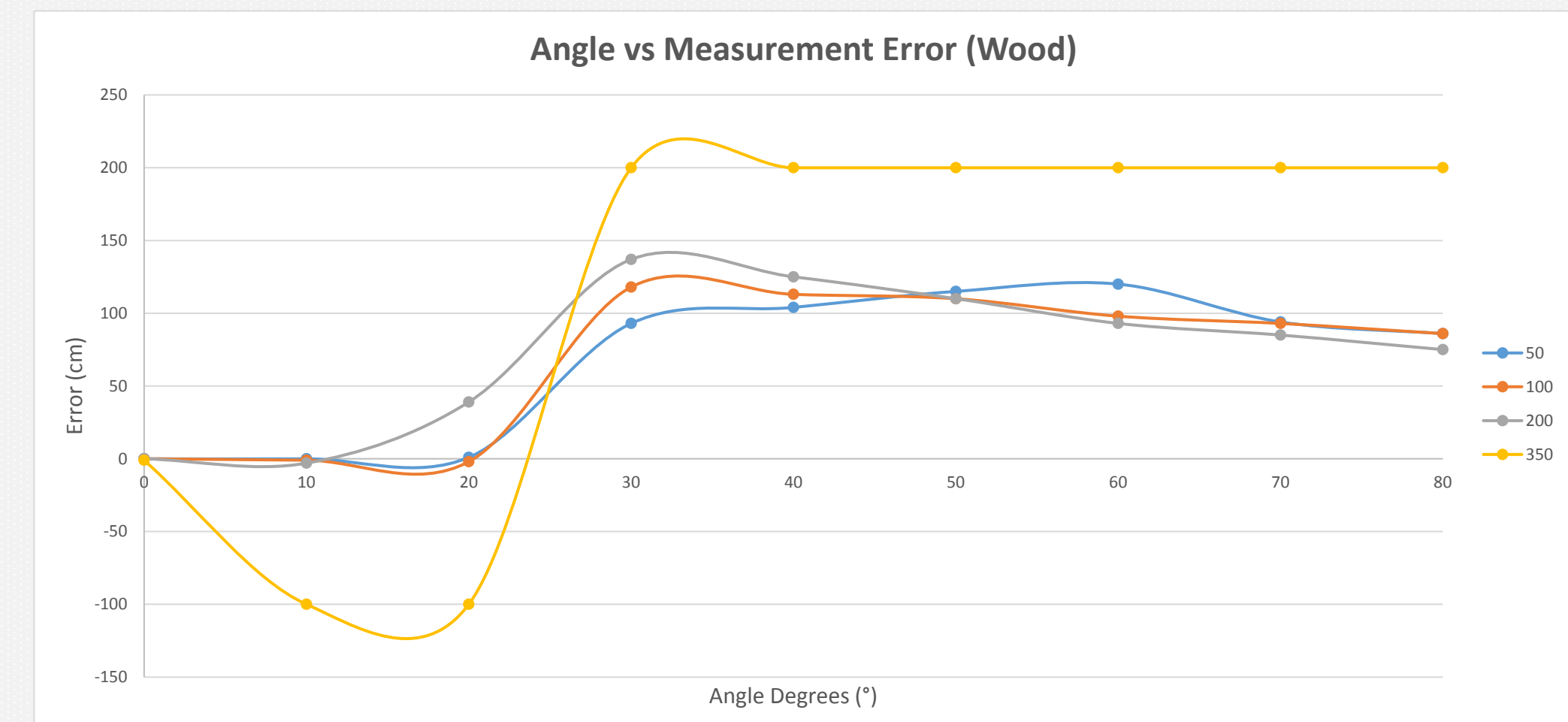


Figure 3: Angle Effect Results

6. Conclusion

Ultrasonic sensors are regarded as a low cost and accurate option for short range ADAS. However, limitations include surface and angle reflectivity issues. Due to these limitations for ultrasonic systems to be applied to a self drive car, a large number of transducers are required to overcome these issues. In terms of system design the system functions according to the specification, with minor improvements including temperature compensation and algorithm improvements. The project has led to potential future work including investigations into other technologies (e.g. RADAR) and further testing on the current system. Overall the project is regarded a success with all objectives met.

References

- [1] National Highway Traffic Safety Administration, "Critical Reasons for Crashes Investigated in the National Motor Vehicle Crash Causation Survey," NHTSA's National Center for Statistics and Analysis, Washington DC, 2015.
- [2] J. David and N. Cheeke, Fundamentals and Applications of Ultrasonic Waves, 2nd ed., CRC Press, 2017.
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- [5] L.-D. Juan, M.-F. Antonio, L. Jordi, C. Andrés, L. B.-R. Gregorio and R.-L. Antonio, "Testing Accuracy of Long-Range Ultrasonic Sensors for Olive," *Sensors*, vol. 15, pp. 2902-2919, 2015.



An Investigation into Sea Depth Measurement

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Abstract

The sea covers 71% of the Earth's surface 95% of which is unexplored [1]. Monitoring the properties of the ocean has both environmental and commercial applications. Four depth measurement technologies were researched, after this research one method was chosen for further investigation. Echo sounders were chosen and a device was developed using the spiral method, with the aim of making depth measurements using this technology. By the final prototype the device could make surface level measurements and in air distance measurements but was not capable of submerged measurements.

Aim of Project

The aim of this project is to investigate sea depth measurement techniques and analyze the concepts and issues involved with these measurements then develop a system capable of making depth measurements to further explore the subject area.

Current Methods

Satellite

This method uses satellites currently in orbit to monitor several aspects of the ocean such as depth and temperature. This is good for mapping large areas but due to the nature of the technology it is inaccurate [2]

Automated underwater vehicles (AUV)

These are small vehicles are typically deployed from larger vessels that follow a set path along the sea floor mapping depth using sonar. These devices are much more accurate as they are a lot closer to the object being measured however are slow to map large areas. [3]

Restricted floating sensors

These sensors are typically used to map a small area such as a harbour. They operate by using a floating object that is tethered to the sea floor, this then uses the length of the tether and the drift of the float to determine currents and depth[4].

Echo sounders and waves

Sonar

This technology uses the emission and reflection of high frequency sound waves to detect the proximity of an object as shown in figure 1 [5]. It was selected to develop this device due to the other technologies researched being too complex to implement and test within the timeframe.

Ultrasonic wave properties

An ultrasonic wave is a longitudinal wave (figure 3 [6]) outside the range of human hearing (20kHz-10MHz). The speed of sound is greatly increased in water compared to air (340m/s in air to around 1450m/s in water). Waves of lower frequency can penetrate further into a medium but have a lower measurement resolution compared to higher frequencies [6].

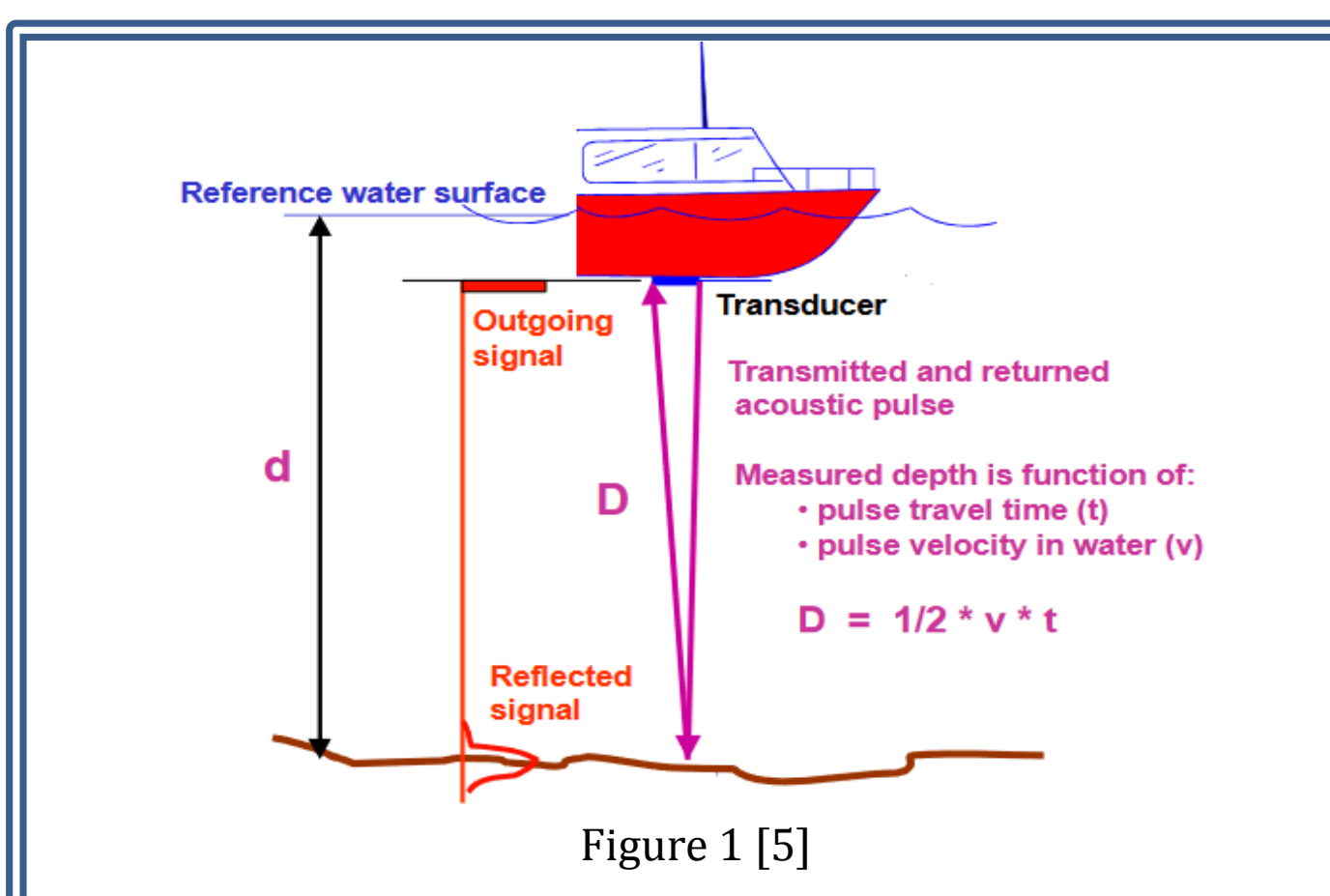


Figure 1 [5]

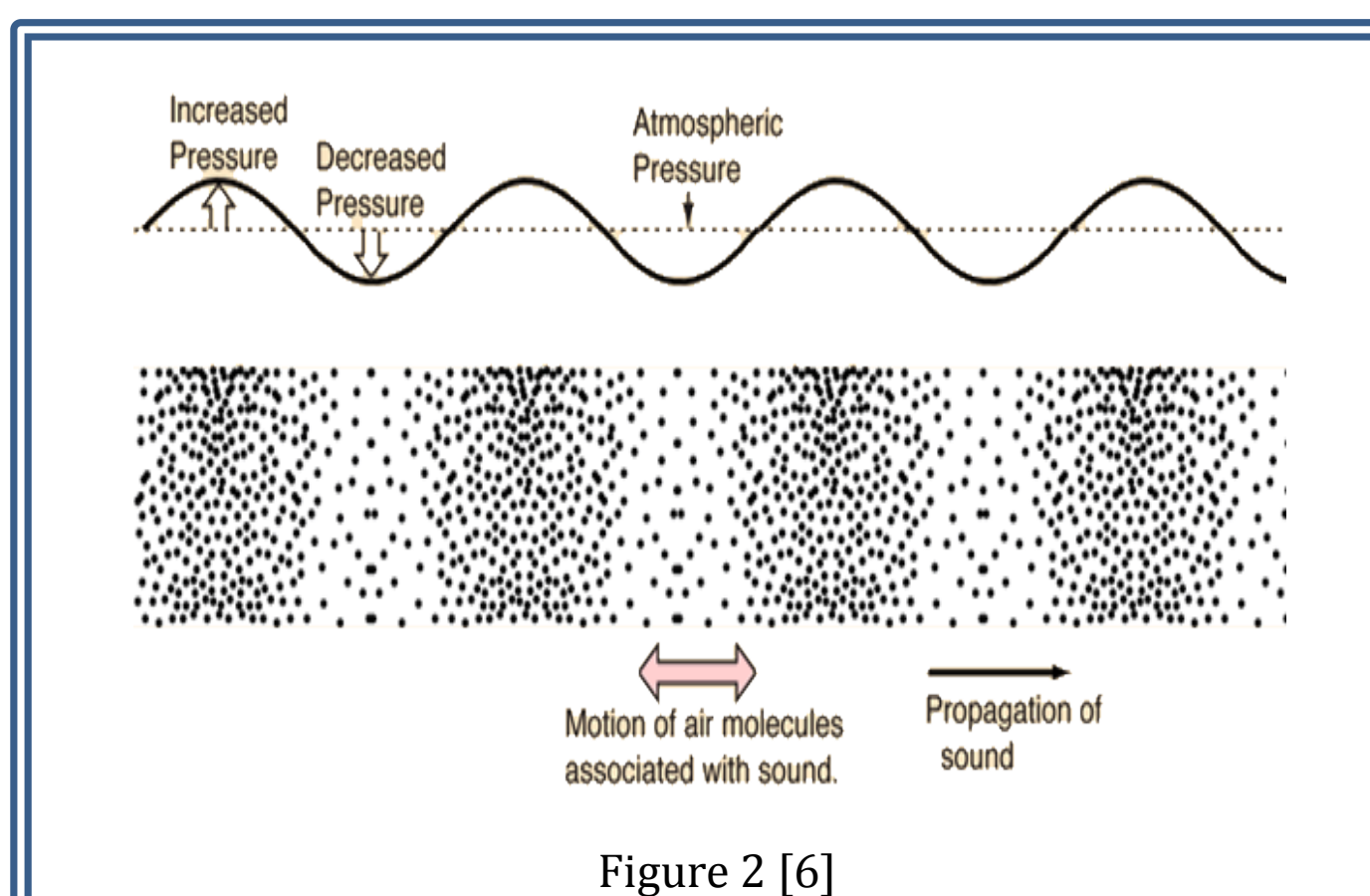


Figure 2 [6]

Prototypes

First prototype

Used HC-SR04 (Figure 3) sensor to successfully obtain accurate distance measurements in air.

Second prototype

Swapped transducers of HC-SR04 (figure 4) with waterproof transducers. With poor results.

Third prototype

Used JSN-SR04 2.0 (figure 5) chip obtained inconsistent measurements in air but could not obtain measurements submerged in water.

Fourth prototype

Used JSN-SR04 chip obtained consistent measurements in air but could not obtain measurements submerged in water.

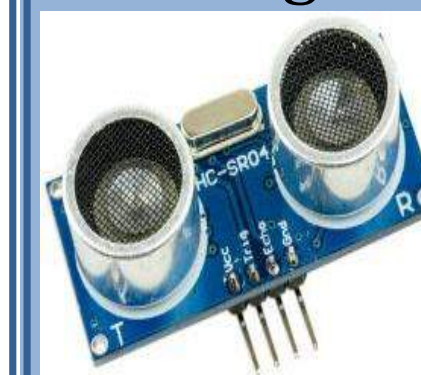


Figure 3

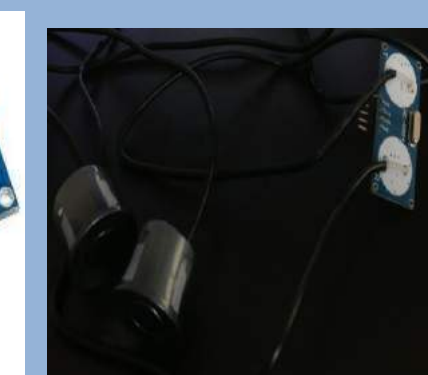


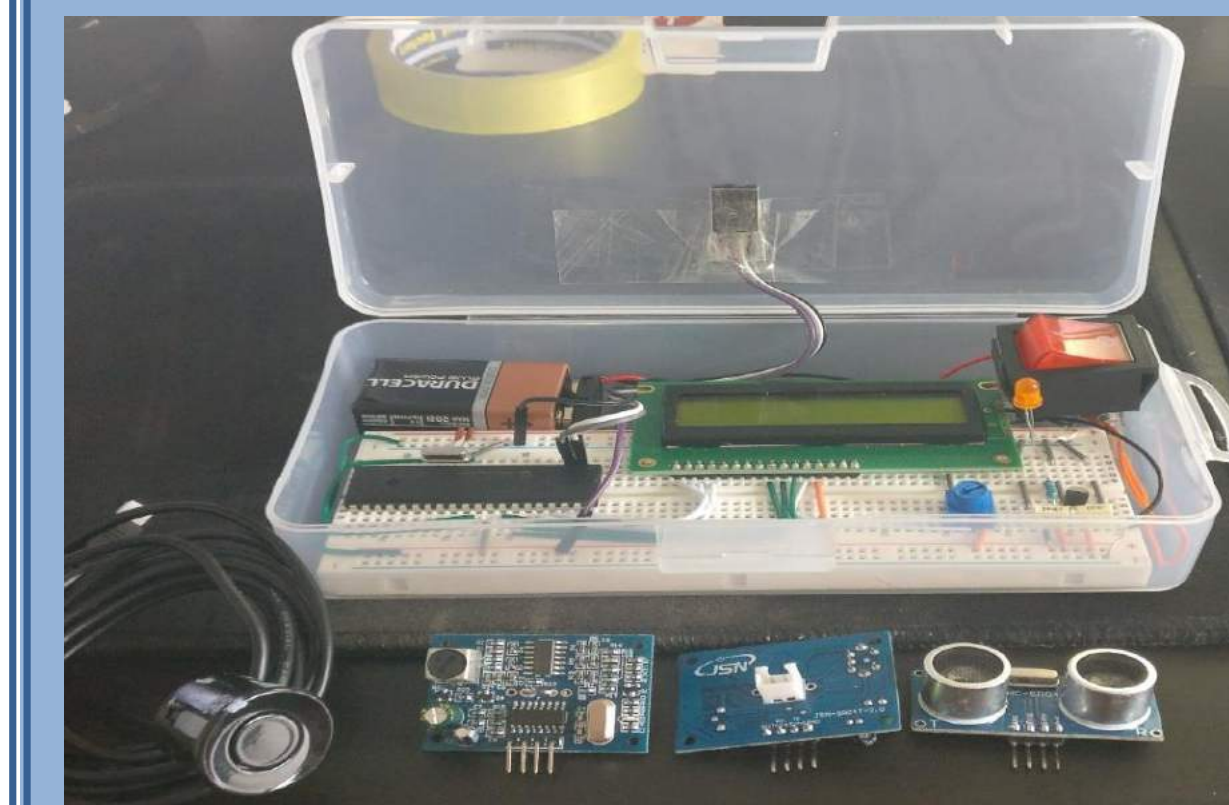
Figure 4



Figure 5

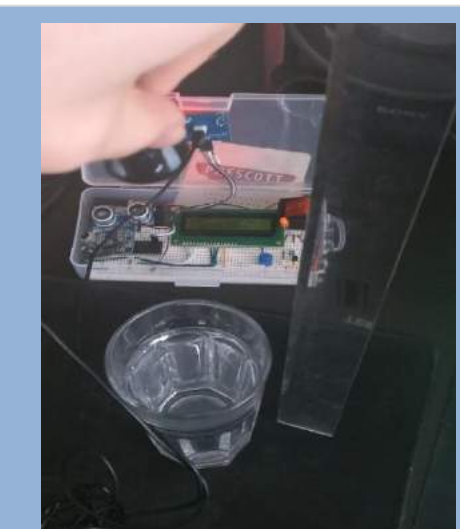
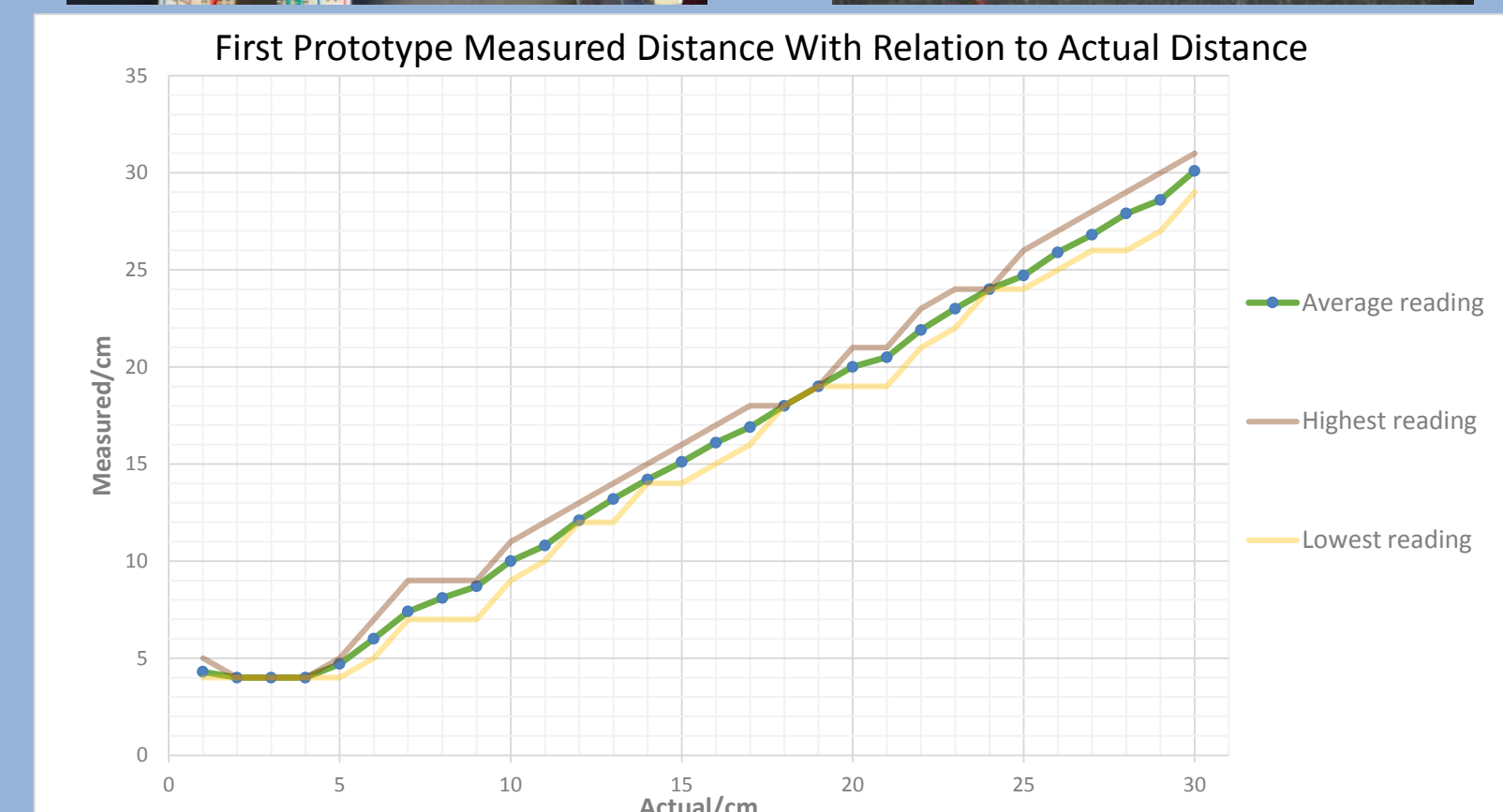
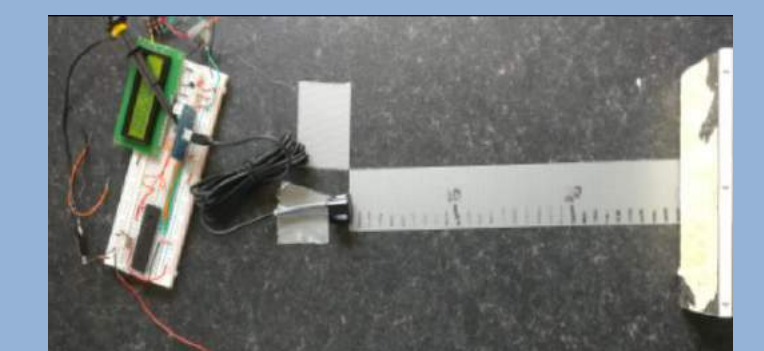
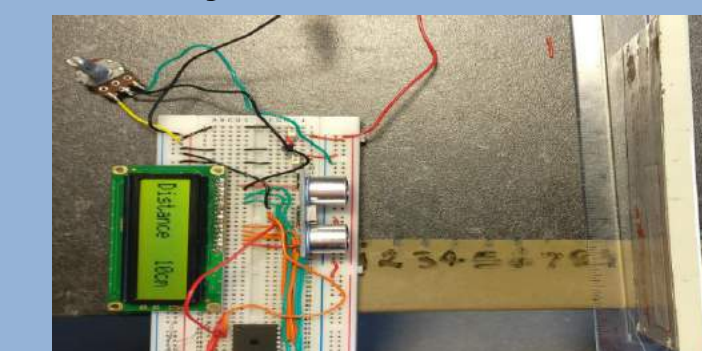
Final prototype

Final prototype was capable of making surface level measurements, within 1cm of accuracy up to around 80cm and had a maximum range of around 500cm. Displays pulse width from sensor and distance measured.



Testing and Results

Testing of each prototype was done by placing an object at varying distances to test the systems accuracy.



Conclusions

The transducers used although waterproof were not powerful enough to transmit and receive ultrasonic signals when submerged.

In theory if a powerful enough transducer was used a simple calculation change would give distance in water.

Time of flight measurement and the angle of the reflector are both very important to the accuracy of the distance measurement.

References

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- [2] S. Castro, W. Emery and G. Wick, "Accuracy improvement in an infrared satellite skin sea surface temperature product," in Geoscience and Remote Sensing Symposium, Seoul, 29-29 July 2005.
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Vehicle Display System

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1 – Introduction

This project involved creating a system that could measure the characteristics of a vehicle, and display the measured values to a driver in real time.

The project was created with the aim of improving driver awareness, safety and overall driving experience.

This project was achieved by designing individual sensor circuits which were then connected to a single electronic microcontroller.



Project Vehicle – Ford Capri 3.0

2 - Aims & Objectives

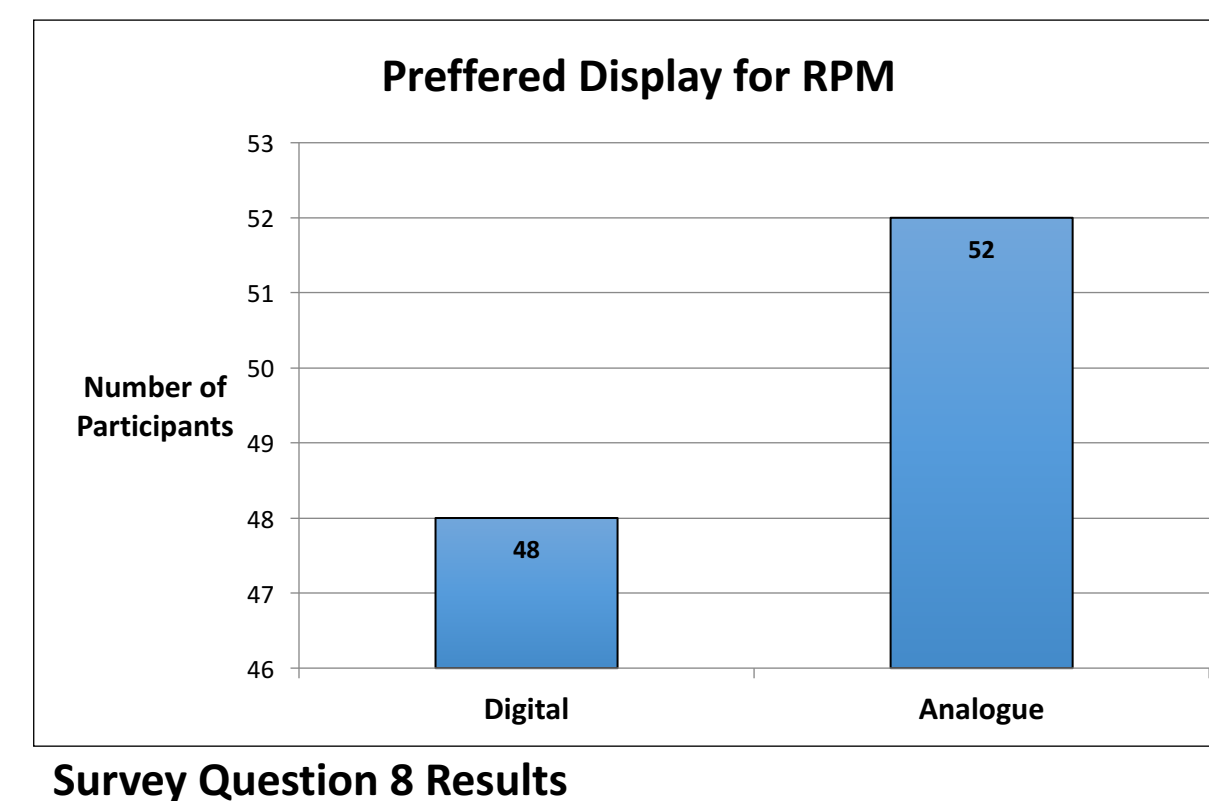
The set aims and objectives for this project are listed below:

- Visual indication the system is running.
- Ambient air temperature circuit
- Engine temperature circuit & warning light
- Tachometer circuit with LED display system
- Speedometer circuit
- Real time clock (RTC)
- LCD display screen
- System set parameter values designed to the vehicle specifications
- Microcontroller providing communication between programming and hardware.

3 – Research

Research was completed on multiple aspects of the project with the aim of gaining a high level of knowledge, and understanding before moving forward to design stages.

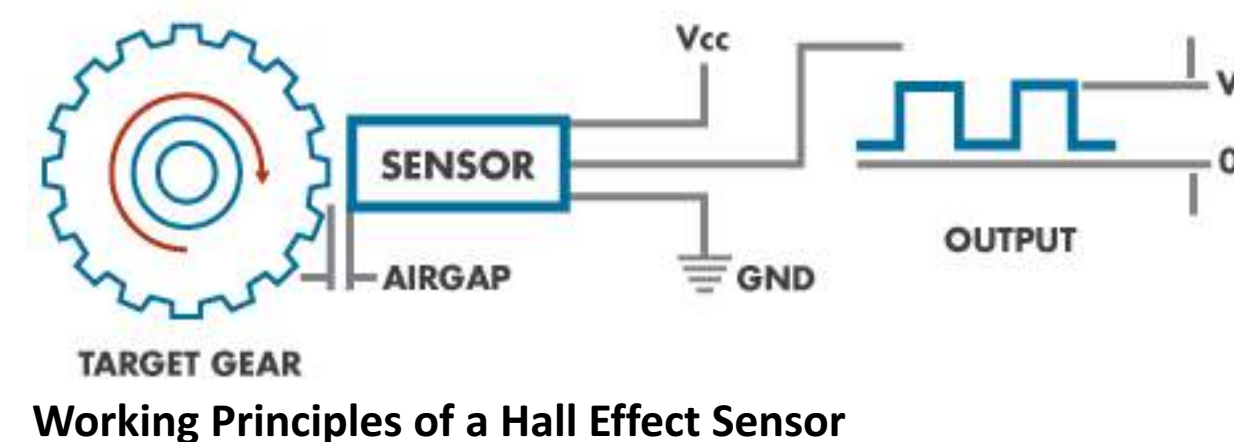
A public survey was created and distributed to 100 random participants, with the aim of collecting user feedback.



Hall Effect Sensor

Multiple sensors were researched, and their attributes compared. This information was analysed in order to select the most suitable sensors for the project.

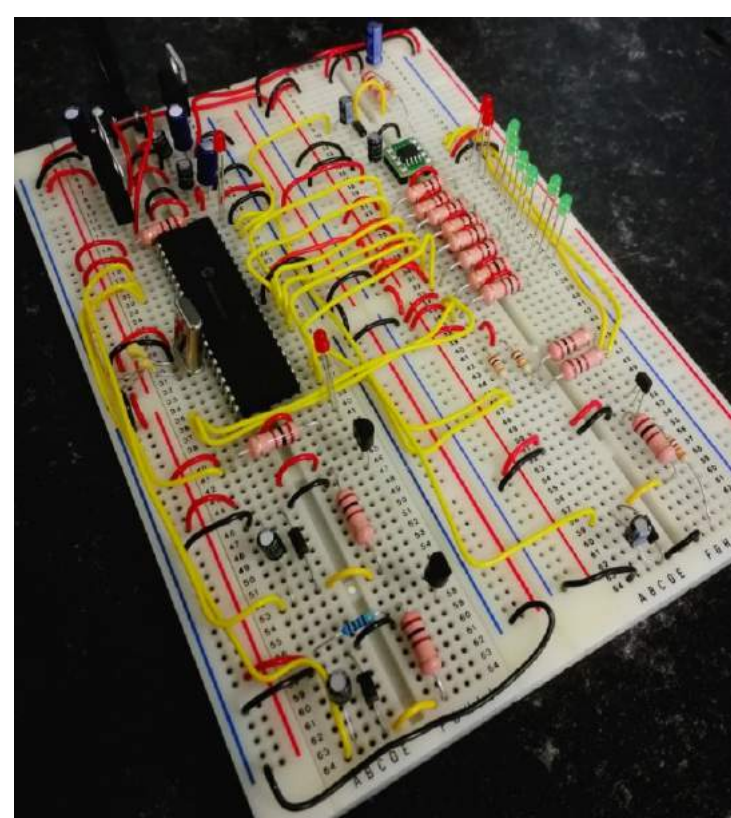
Research was completed on the working principles of different sensors, this provided knowledge and understanding of how the components function.



4 – Design

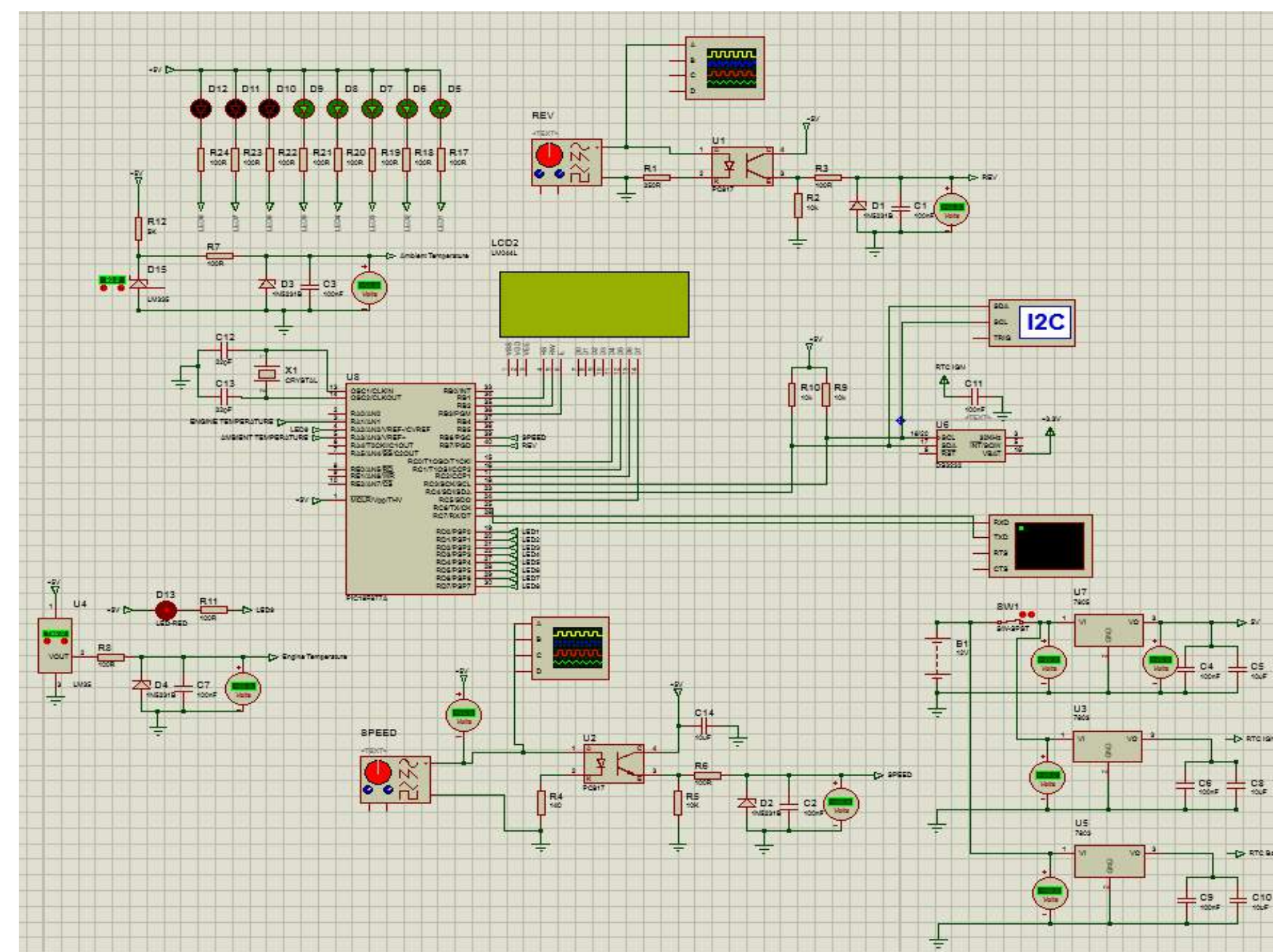
A successful design required a combination of all the information gathered from the completed research, component data sheets, and the use of mathematical formulas.

Thorough design work was completed to ensure the system functioned correctly and accurately.



Hardware assembly via breadboard

Two circuit designs were completed, one software design via Proteus simulation, and a hardware assembly via breadboard.

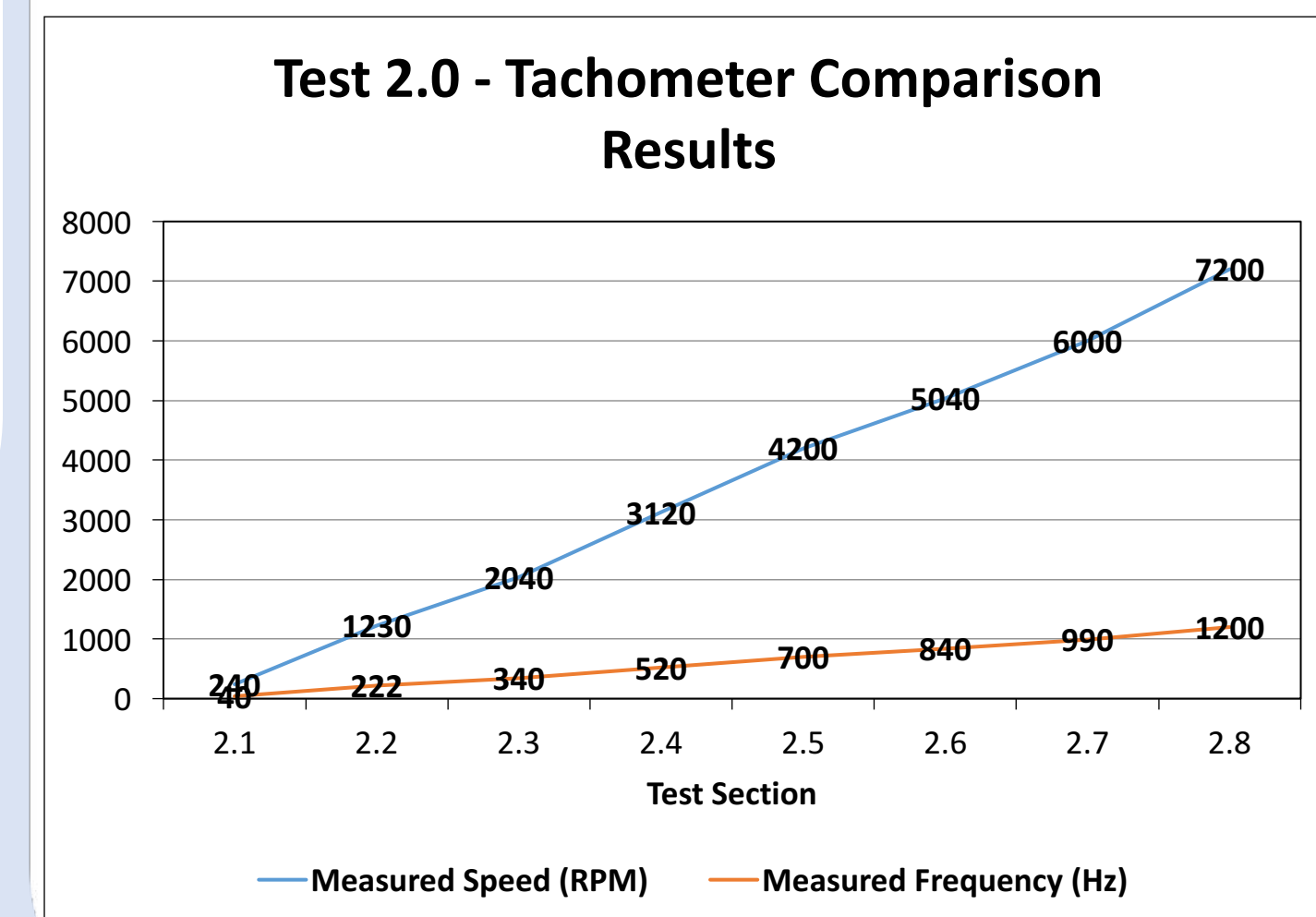


Proteus Simulation Design

5 – Testing

Extensive testing was completed, this included hardware and software testing. The aim of the testing was to ensure the system functioned as designed. The Proteus software package and various available lab equipment was used to complete the testing.

Below is one example of a test result.



6 – Conclusion

The overall project was a success. This conclusion is supported by results from extensive testing and the working prototype.

All aims and objective set for the project were achieved. The system works as designed, the displayed values are accurate, and all desired circuits types were created.

Opportunities for improvements to this system can include, but are not limited to, a GPS circuit, automatic headlights, reverse sensors, heated windscreen and mirrors.

An Investigation into App Usage on Mobile Devices

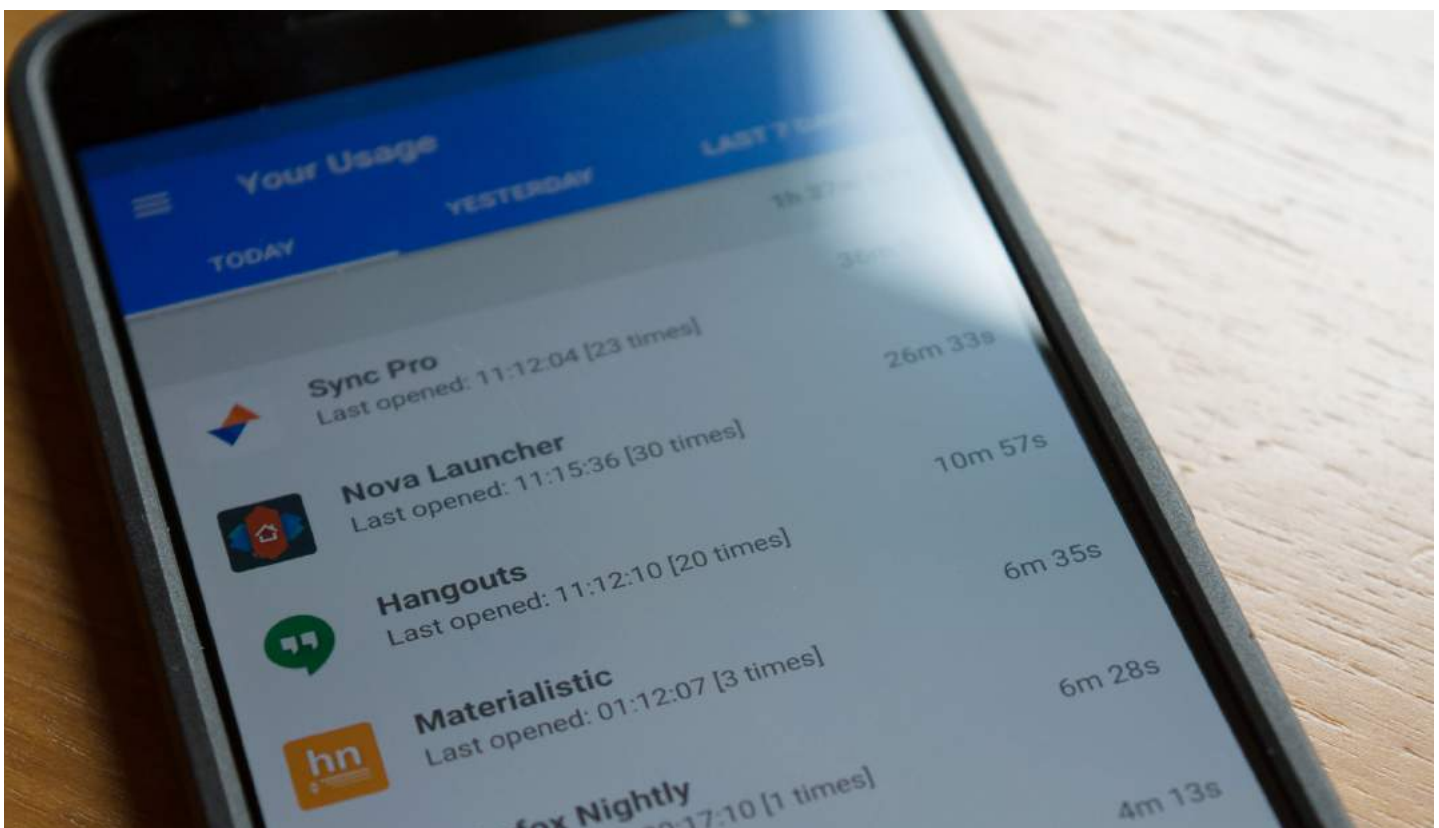
ABSTRACT

Mobile addiction has become a growing phenomenon that affects individuals and society. In this study, data will be collected from users to understand how they use their smartphones and tablets.

First, a survey on 86 participants was collected then analysed for further research, and data collection opportunities. Survey results found that 55% of respondents used social media the most when comparing to other categories, with 69% using their device the most during evenings. 58% of respondents said they were somewhat dependent, rating their usage as medium (normal).

To measure how people use their device, an Android app called Consume was developed. Data was collected from consenting participants over 29 days. During that time, 75 days' worth of data was collected from participants ($n=3$). Participants collectively spent 501.24 hours using 117 different apps.

Results found that participant usage progressively increased towards the weekend, with the highest usage spent during weekends. On average, participants spend 7.66 hours on their device on weekends, with one participant averaging 11.52 hours on Saturdays. When averaging out participant daily usage, and extending it to the rest of the year, it is expected that the participant with the highest usage will use their device for 33.57% of the year.



Consume: Proposed Android App

INTRODUCTION

Technology is deeply involved in modern day society. So much so, that we are becoming increasingly dependent on it in both our personal and working lives.

We are spending more time using technology, however it is important that to understand why we are using it for longer, its effect on our health (both physically and mentally), and the impact this may have on our lives.

Mobile addiction can be considered a form of psychological dependency to not only smartphones, but other kinds of technologies. Some of the behaviours shown in mobile addicts were similar to those affected by other addictions such as gambling and drug/substance abuse, however due to this addiction being of a non-chemical nature, it is categorised as a behavioural addiction.

In certain countries, mobile addiction has become a growing concern, that governments have started making changes in the efforts to reduce its effects on citizens, with countries like South Korea opening web addiction treatment clinics, France banning mobile phones in classrooms, now that children as young as three are affected.

AIM

The aim of this study is to understand how people use their smartphones and tablets, why are certain apps more addictive than others, and how technology has changed over the years to become what it is now.

This goal is not to solve the root causes of mobile addiction, or to diagnose dependent to having an issue, but to help them make sense of their usage, and how much time is being spent on this technology.

After providing the user with their data, it is down to them to act upon the results, should they choose to do so.

OBJECTIVES

To satisfy the aim, the following actions will be conducted:

1. Conduct an initial survey
2. Research mobile application, the cause, and effects to mobile addiction
3. Evaluate a popular mobile app for addictive practices
4. Develop an Android app that will collect usage data from consenting users
5. Analyse & compare collected data to survey results



FINDINGS (INITIAL SURVEY)

- **58%** of respondents said that they were somewhat dependent on their device, rating their usage as normal.
- **55%** said that Social Media was their most used app category, using app between **6-10** times per day.
- **69%** used their device the most during evenings.
- **55%** said their device *sometimes* runs out of battery
- **88%** said they have not used an app to monitor usage, **41%** were interested to try proposed app.

FINDINGS (APP DATA COLLECTION)

Data was collected for 29 days between dates, 19th March – 17th April. There were six active app users, three whom chose to remain participants, and others opting-out. From three active participants, 75 days of data had been collected. During this time, participants had collectively spent 501.24 hours using 117 applications.

The following outlines *some* of the findings:

- Apps were opened a total **22,698** times
- Data showed that participants used their device the most between **4:00 PM – 10:00PM**, followed by **midday**, then the early hours of morning **~5:00 AM**.
- Participants used their device the most during **weekends**, with usage on **Monday** and **Tuesday** still high.
- Participants check their device an average of **156** times per day (**6.64** hours usage), and **206** on weekends (**7.66** hours).
- On a given day, participants opened apps on average **308** times, reaching **337** on weekends.
- Participants averaged **23** opens on Social Media apps.
- Participants are expected to spend on average **27%** of the year on their device, with more dependent spending over **33%**.

CONCLUSIONS & RECOMMENDATIONS

- On reflection, the need to self-regulate ones' usage to these technologies would be beneficial.
- The tech industry will continue to find new ways to be more persuasive in getting your attention.
- Being in the proximity of your device can affect how well you perform.
- Further research should be carried out into behavioural addiction, to understand the compulsive need for reward.
- To include a larger number of participants to attain a more realistic sample.



An evaluation of social media marketing and production of best practice guide

Abstract

The purpose of this project is to evaluate the use of social media marketing and develop a best practice guide based on organisations operating in the Swansea area.

Introduction

The use of social media has risen rapidly in recent years, 21% in the last 6 years in fact. Therefore the purpose of this project is to explore social media marketing and its usage in Swansea.

The project begins with a literature review, follows with the research methodology then presents the findings chapter, which is split into two sections these are: Primary research findings and implementing both primary and secondary research findings in the case study. Finally the project ends with a conclusion and recommendations for future research.

Aims & Objectives

The overall aim of the project is:

Evaluation of social media marketing and production of best guide.

The objective are to:

1. Conduct secondary research to evaluate social media marketing.
2. Conduct primary research - survey and interview businesses in Swansea.
3. Evaluate primary and secondary research to produce a best practice guide

Methodology

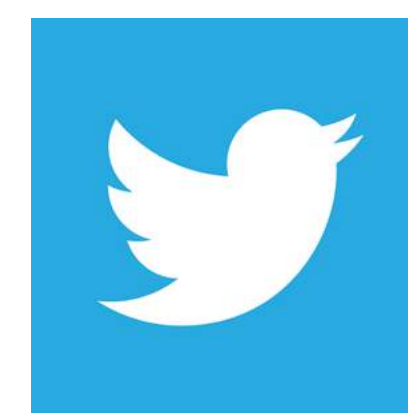
The purpose of this chapter is to review the methods that were employed to answer the research objectives.

Research Design - Phenomenology

Research Approach - Inductive

Research Design - Case study approach

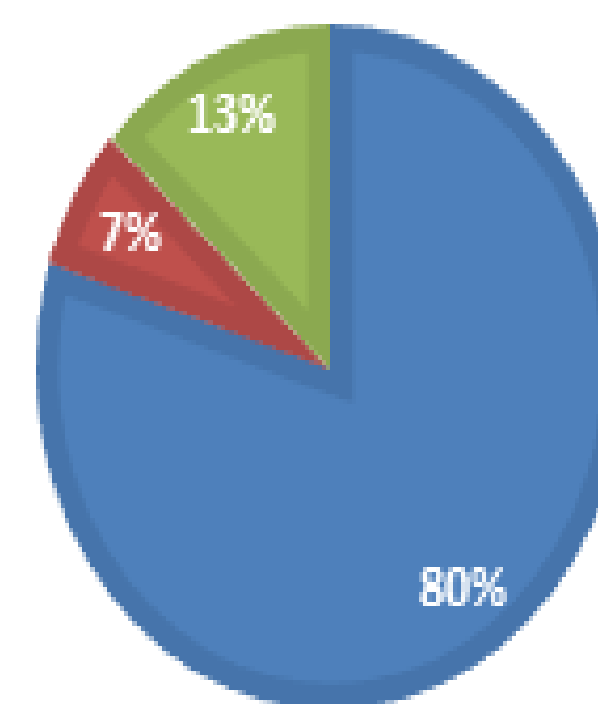
Surveys were handed out and interviews conducted to ascertain social media usage for marketing for small organisations in Swansea. The results were then implemented in the case study's social media accounts chosen for the project



Results of Primary Research

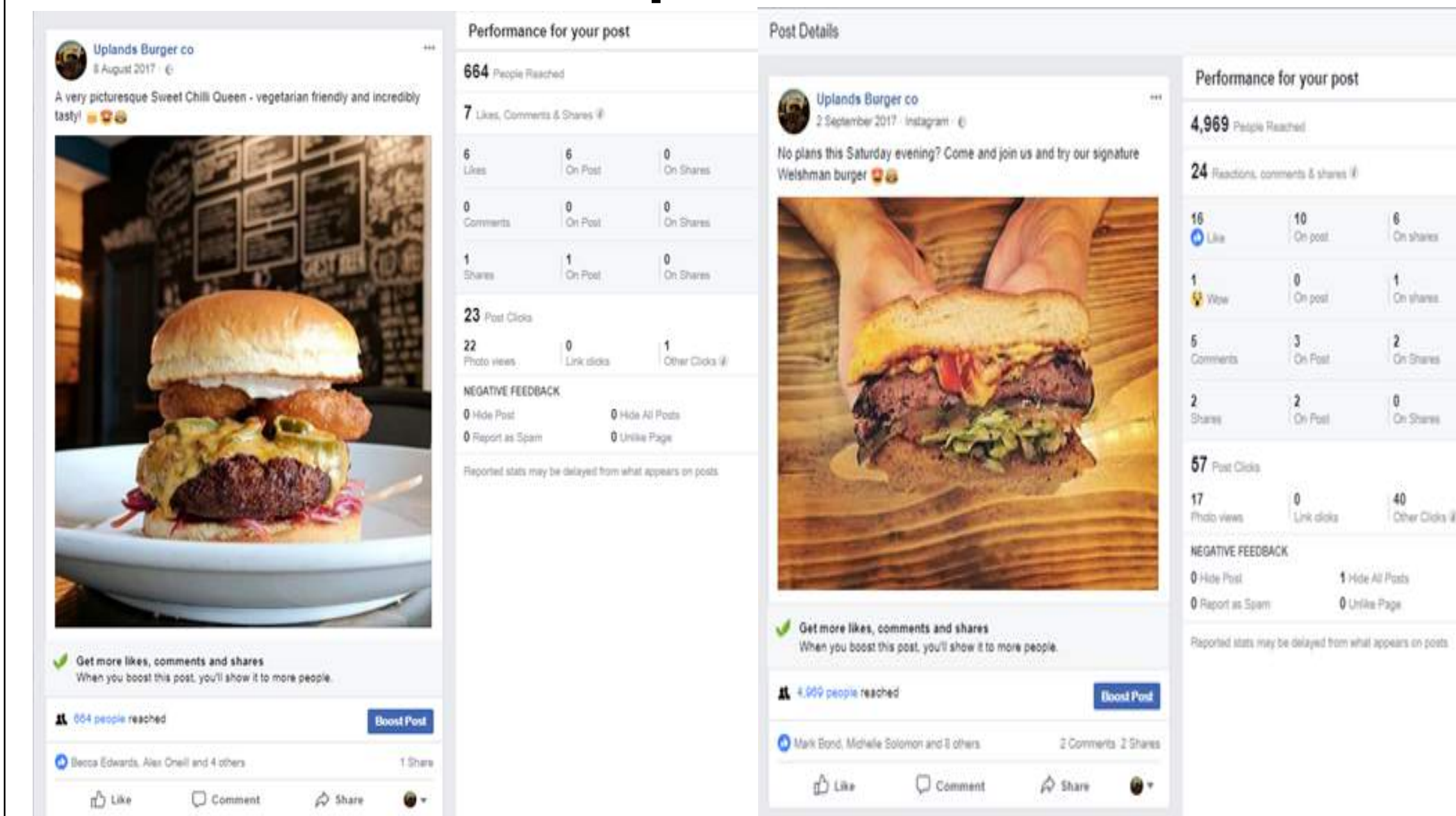
DOES YOUR ORGANISATION UTILISE SOCIAL MEDIA?

■ Yes ■ No ■ Maybe



The above pie chart shows results from question one of the survey handed out. Clearly shows the majority businesses in Swansea use social media for marketing.

Results of Implementation



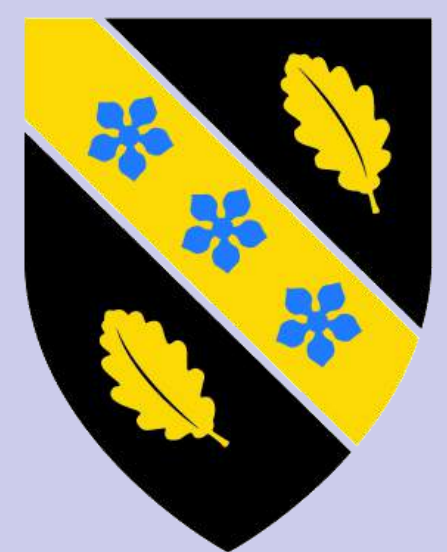
Above is results from the practical implementation.

The picture on the left was posted according to the primary and secondary research findings, whilst the picture on the right was posted on the same day at the same time to compare the reach and engagement. The picture posted in line with the research findings performed much better than the other post.

Recommendations

Recommendations for future research could be:

1. Further the scope of the project, expanding the reach out of Swansea or changing the sampling method.
2. Surveying case study customers to ascertain whether it was a social media post which resulted in them using the case study or something else, to test the effectiveness of their social media marketing.



Prifysgol Cymru
Y Drindod Dewi Sant
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By **Cerys Nickels (P145484) - Software Engineering**

Web Based Application for Remote Controlled Lunar Exploration Robotics Incorporating AI



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1. Project Summary

The project was to develop a web-based application to simulate the control of lunar exploration robots, using the Lego Mindstorms EV3 robotic kits. The development incorporated AI to simulate the communications delay, and for pathfinding and anti-collision measures. This could be used to train operators that control robots remotely. This project was not a success, and is explained during the development and analysis sections.



Figure 1: Lego Mindstorms EV3 logo [1]



Figure 2: Lunar exploration robot [2]

2. Project Aims & Objectives

The aim of this project was to create a web-based simulator to train operators to control a Lego Mindstorms robot using a wireless communication network, whilst applying a realistic delay to the communications. To achieve this, the project had the following objectives:

- A literature review to determine any existing Lego or rover simulators, and compatible programming languages and IDE's to program the Lego Mindstorms EV3 robot.
- To design and create at least one Lego robot for testing purposes.
- To create an application based upon the research conducted, incorporating AI aspects to simulate communications delay and hazard

awareness, based upon data received from sensors and human input.

- To test the simulator on the Lego robot, and analyse and evaluate the simulator.

3. Methodology

This project followed an agile approach, known as feature driven development (FDD) methodology, due to the ease of design, development and testing. It is a timeboxed approach, which allowed for the addition of features within each timebox, prioritising the completion of the aims, objectives and the success criteria. It was developed using the Lego Mindstorms kit, LeJOS and Java.

4. Design & Development - The Build Process

Over the six timeboxes, both the rover and application was developed into the final result. Web services was used between the control and operator devices, with the connection between the operator and rover using sockets over a Bluetooth connection. Both were tested when new changes, such as the addition of AI, or when classes were added to allow for the creation of the system architecture:



Figure 3: System Architecture Diagram

There are two main issues with the application:

1. The application does not connect to the rover, despite several attempts to rectify this. It is narrowed down to a network configuration.
2. The Java Plugin is not supported by modern browsers.



Figure 4: Final Web Application Design

5. Analysis

A questionnaire was used to gather information about the application, with the aim to prove or disprove the hypothesis. It is split into 3 sections, and was carried out by ten people after piloting:

1. System usability scale (SUS) - Score of 32.4/50 (64.8%).
2. Hardware & software issues - Connectivity and the web application.
3. Operational Data - This data could not be collected due to the issues with connectivity, but would be analysed using a two sampled T-test.

6. Recommendations & Expansion Plans

- Dual connectivity - Wi-Fi and Bluetooth connections
- Smartphone and tablet applications
- Solve the connection issues
- Additional structural support for the rover frame
- Web browser compatibility
- Additional colour and visual representation of sensor feedback - CSS

7. References

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1. Introduction

The project focuses on how to build a secure home network. Essentially, this is a network that can protect its users and data from specific attacks. New threats are introduced every day meaning it is very difficult to secure a network against every threat.

2. Aims and Objectives

The main aim of this project is to build a home network that can be used to conduct experiments to find the vulnerabilities and provide solutions to secure the network.

Objectives:

- Research different devices that are in home networks
- Research threats/vulnerabilities
- Research solutions for the identified threats
- Design and implement a home network
- Conduct the experiment by completing the attacks

3. Related Work

Three main papers were used when conducting this project, the key topics from each of these can be seen below.

1. This paper looks into how WPA2 attacks can be performed within Kali Linux [1]
2. This paper looks at an approach to a P-SCAN. This paper looks into every devices security within the network [2]
3. This paper looks into how secure IoT devices are [3]

4. Design and Implementation

A physical network was designed and built to produce the results for analysis. The implementation included the following.

- Wireless Router
- Network Devices
- IoT devices
- Smart devices
- Kali Linux operating system

5. Results

The results from the project experiments can be seen in figure 1-3. Figure 1 identifies open ports within the device that was tested. Figure 2 shows the results from the man-in-the-middle attack. Figure three is used to show that the WPA2 password was cracked “X-Win32_v6”.

6. Conclusion

This project was completed to investigate the security within home networks. This enabled the author to provide solutions so that a secure network could be built. The aim and objectives of the project have been met and future work was identified.

- Knowledge of Kali Linux operating system
- Security implementations and software on the market today
- Security threats that are affecting networks today

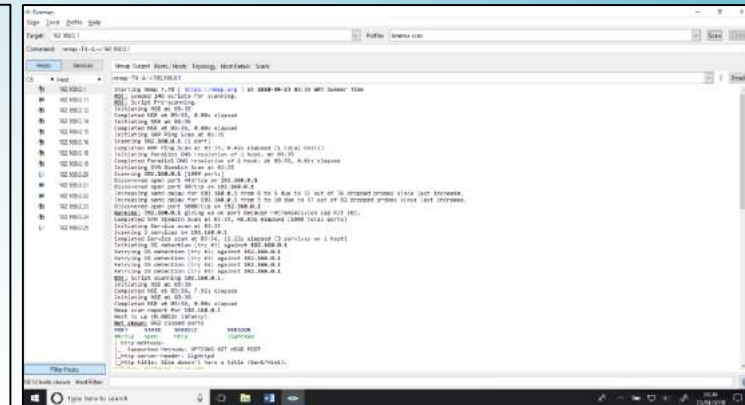


Figure 1



Figure 2

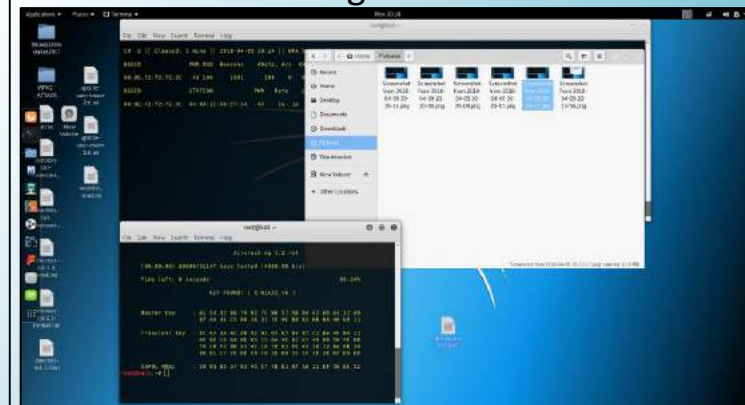


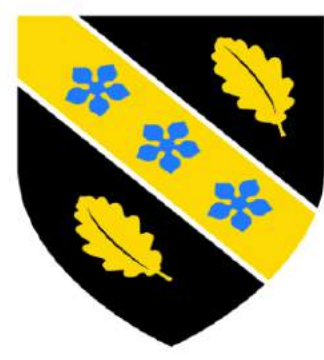
Figure 3

References

1. Profiling and mitigating brute force attack in home wireless LAN (2014)
2. IoT security assessment through the interfaces P-SCAN test bench platform (2018)
3. Vulnerability scanning of IoT devices in Jordan using Shodan (2017)

Table of Figures

1. Port Scanning
2. Man-in-the-middle
3. WPA2 Password Cracking



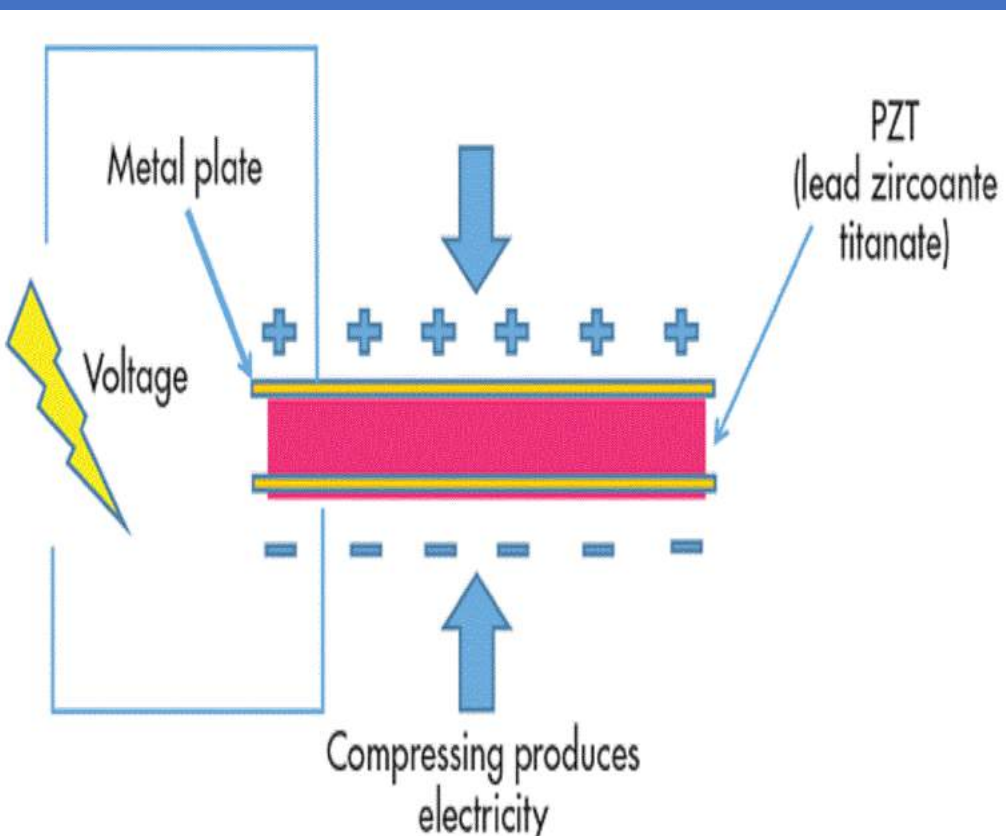
Prifysgol Cymru
Y Drindod Dewi Sant
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An investigation in to Piezoelectric Energy Harvesting and Potential Implementations

Daniel Lennon
BEng. Computer systems
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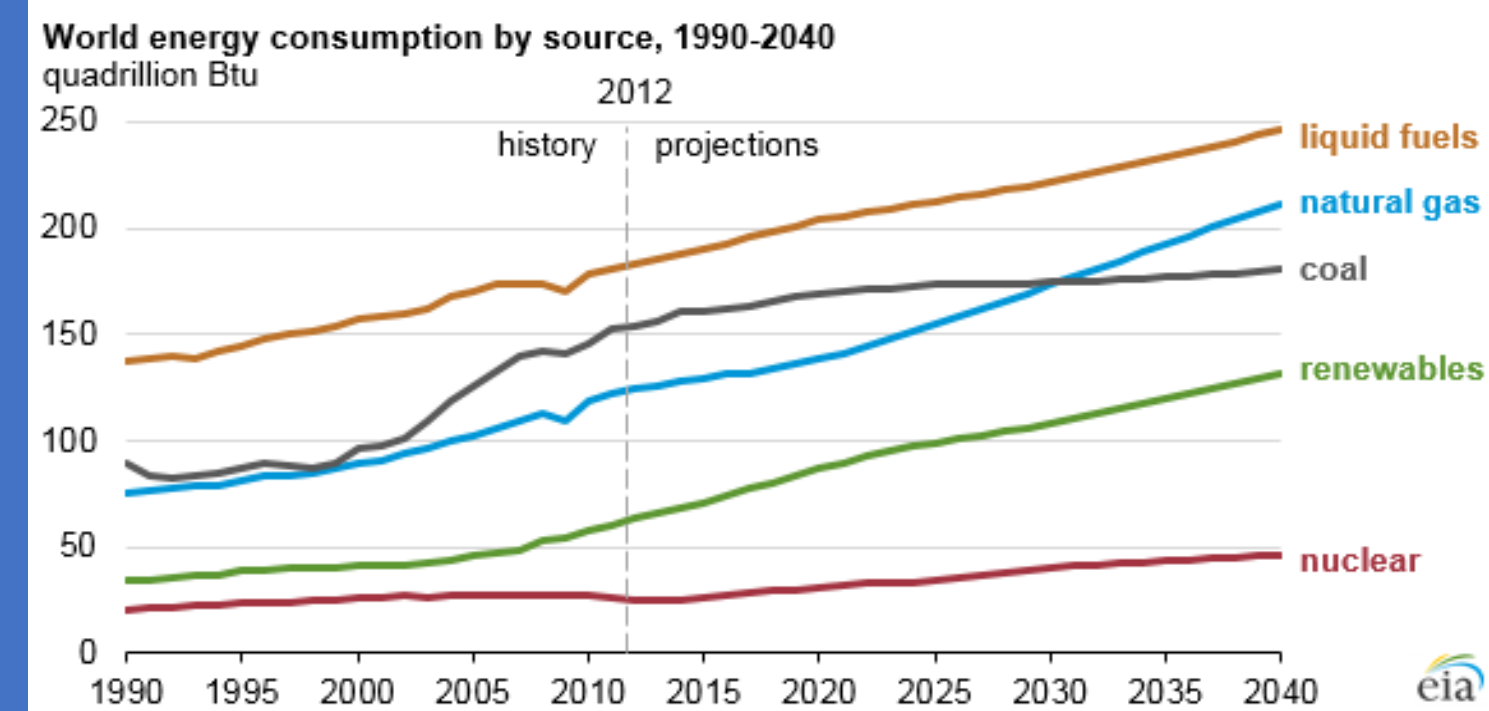
Abstract

The purpose of this project was to investigate, through the use of experimentation and research, the potential uses of a piezoelectric material as an energy harvesting device. Piezoelectric, lead zirconate titanate (PZT) transducers were used for testing. The proposed use of this type of transducer was to be incorporated in to a step set up, utilizing the energy released from a person's footsteps to potentially power LED's which would illuminate the step when being used and then fade out when stepped off of. It was discovered early in to the investigation that the test setup developed would not provide enough power to complete the desired task. It was, however decided that testing should continue so that calculations could be made to determine how much energy could potentially be generated in a larger, more task oriented environment such as a busy train station. A microcontroller based circuit was also developed to simulate the step lighting and fading using Pulse Width Modulation (PWM).



Reason for project

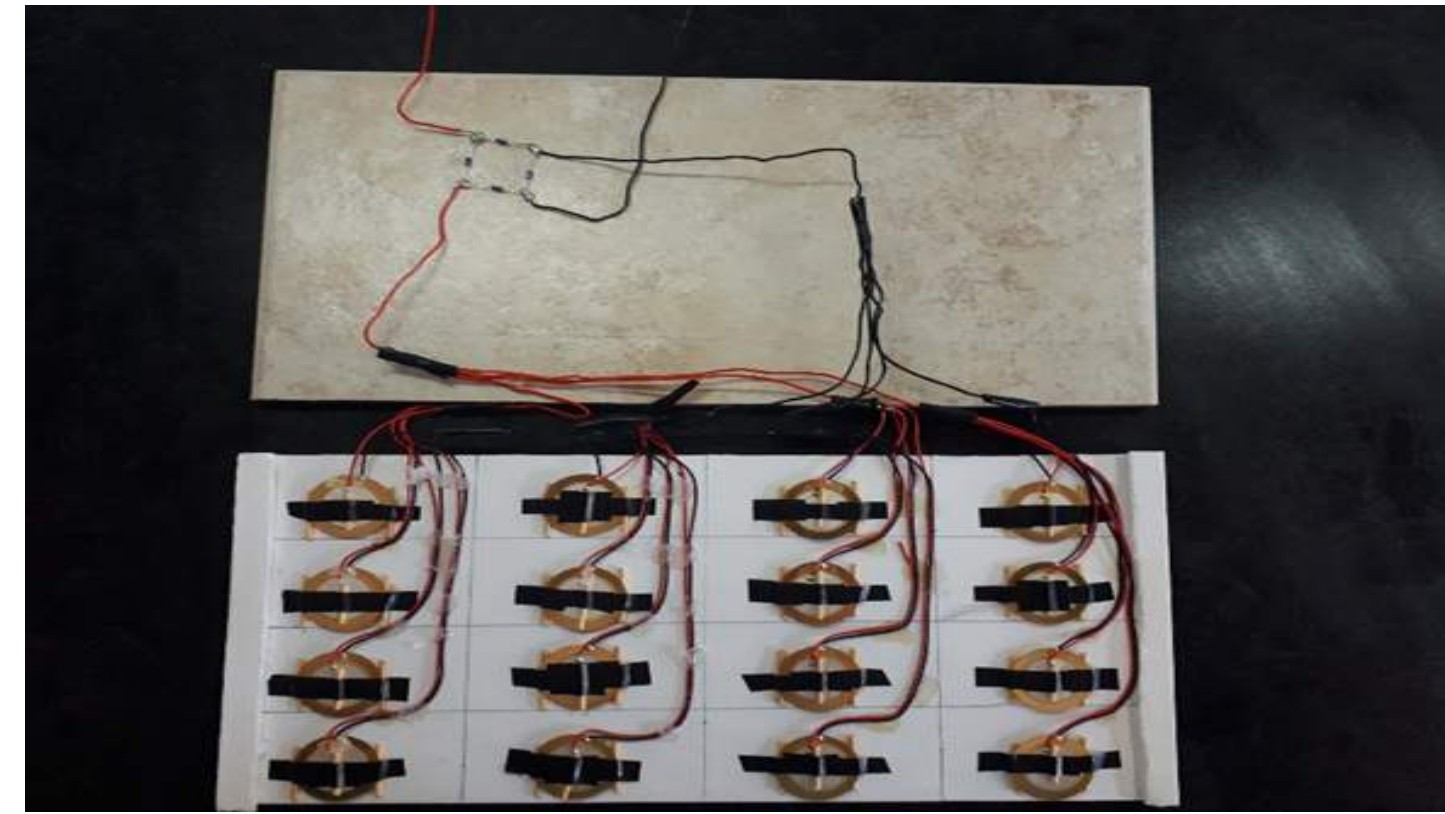
The motivation behind this project was the exponential growth of power consumption world wide. The Energy Information Administration (EIA) predict that by 2040, world wide energy consumption will rise by 48% (1). With the development of low power electronics such as smart phones, smart watches and low power lighting, the potential to harvest smaller amounts of energy from previously un-usable sources is becoming a more viable option. It is believed that the use of piezoelectric materials to harvest enough energy to power these types of devices could help to alleviate the pressure placed upon our power grids and help lead to a more self sustaining way of producing energy.



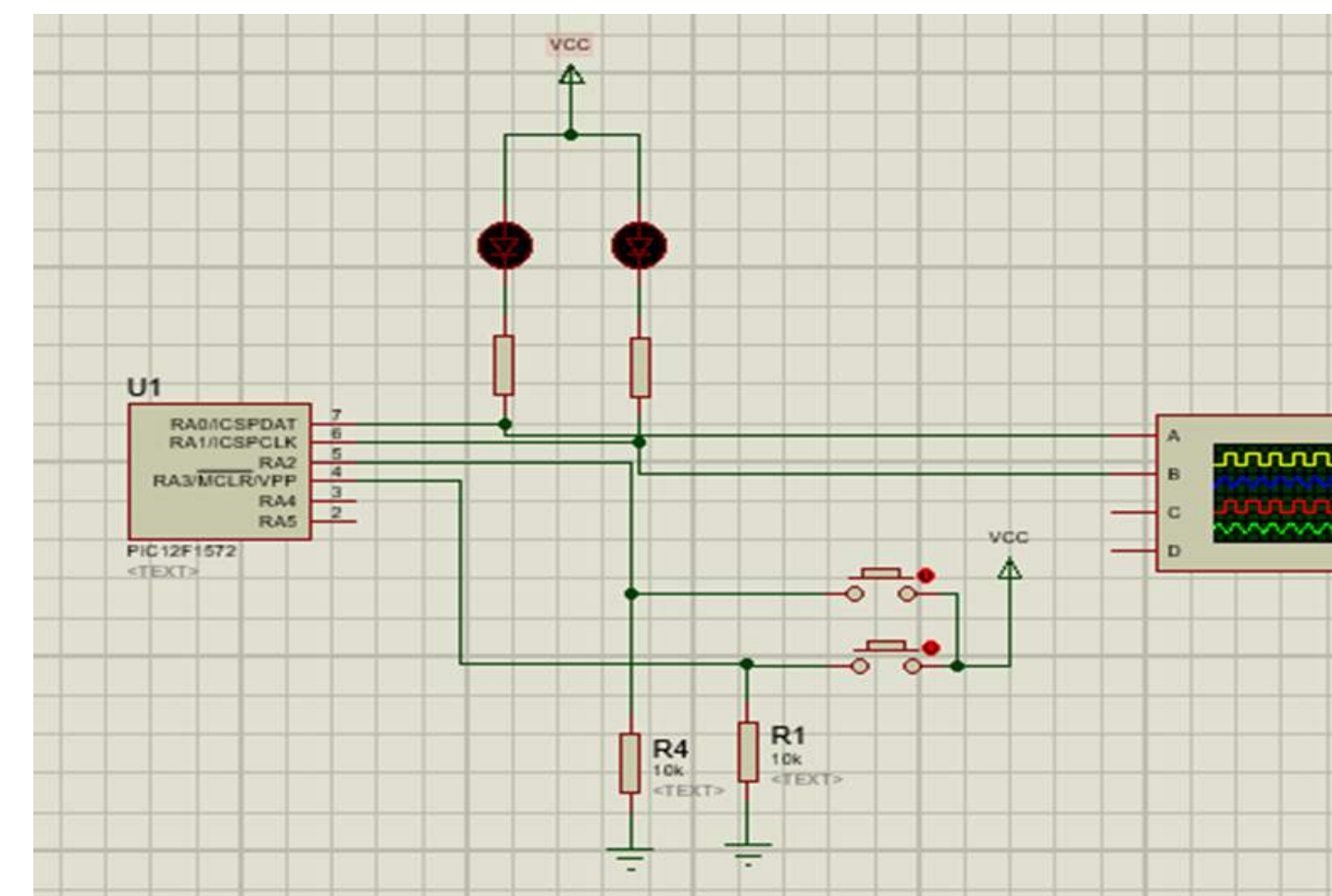
Materials used for test setup

The materials used for this project were 27mm PZT piezo elements and Schottky diodes with a very low forward voltage drop of approx.0.5V. The final setup had 16 piezo elements wired in a parallel configuration leading in to a full wave bridge rectifier used to convert the AC signal produced to a more usable DC voltage. Different value capacitors were then used to measure the voltages accumulated across them and those voltages were then used to calculate the potential power that could be obtained

The final test setup



Microcontroller PWM circuit simulation



This was a basic circuit design built using Proteus circuit design software. It was built to simulate, using Pulse Width Modulation (PWM), the ability to light a step when stepped upon and for the light to gently fade out over a period of 3 seconds when stepped off of. The code was produced using a combination of the CCS compiler and the built in compiler on the Proteus software

Final testing and potential implementation calculations

The results obtained from the test setup did not provide enough power to operate a system of stair lights as had been hoped. However, when the results obtained were used to calculate what could potentially be produced in a more task oriented environment such as a busy train station the results were more encouraging. the Office for Rail and Road (ORR) published the estimates of station usage for all stations in Britain in 2016-2017 with Waterloo station being the busiest having 99,403,096 visitors over the year. This equates to more than 250,000 visitors per day (2). If a system like the one built for the test setup was implemented into a set of 20 steps each measuring 200 cm by 30 cm and placed in a station like waterloo, it was calculated that a potential 11.3Wh could be produce per day. This is still not a huge amount of power but given the materials used in this experiment it is believed that a much higher level of power could potentially be produced if better materials were used.

Conclusions

Although the results obtained from this investigation were not as good as had been hoped for, it is believed that with the use of better materials, more controlled testing, more research and a more in-depth understanding of piezoelectric materials, this kind of implementation could work. The potential to harness forms of energy that are other wise unused could greatly help in bringing this world to a level of self sustainability and greatly reduce the strain that is put on the natural resources of our planet

References

- [1] "EIA projects 48% increase in world energy consumption by 2040 - Today in Energy - U.S. Energy Information Administration (EIA)." [Online]. Available: <https://www.eia.gov/todayinenergy/detail.php?id=26212>. [Accessed: 04-May-2018].
- [2] "ORR publishes top 10 busiest stations for 2016-17 - Network Rail." [Online]. Available: <https://www.networkrail.co.uk/orr-publishes-top-10-busiest-stations-2016-17/>. [Accessed: 22-Apr-2018].

Electric Motor Data Acquisition System

BEng Electrical & Electronics Engineering

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1. Introduction

An Electric Motor Data Acquisition System, was identified as a relevant target area to produce a data logging system that could measure key areas of the main drive motor within the authors place of work. Not just compare the major differences with AC and DC main drive motors performance, but to be used as a maintenance tool for both the operation and maintenance departments. For the purpose of the Major Project, a prototype data acquisition system was produced. The main findings and learnings of the prototype could be adapted for a full scale Electric motor data acquisition system for further use.

2. Aim

- Design and produce a Microcontroller based Electric Motor Data Acquisition System

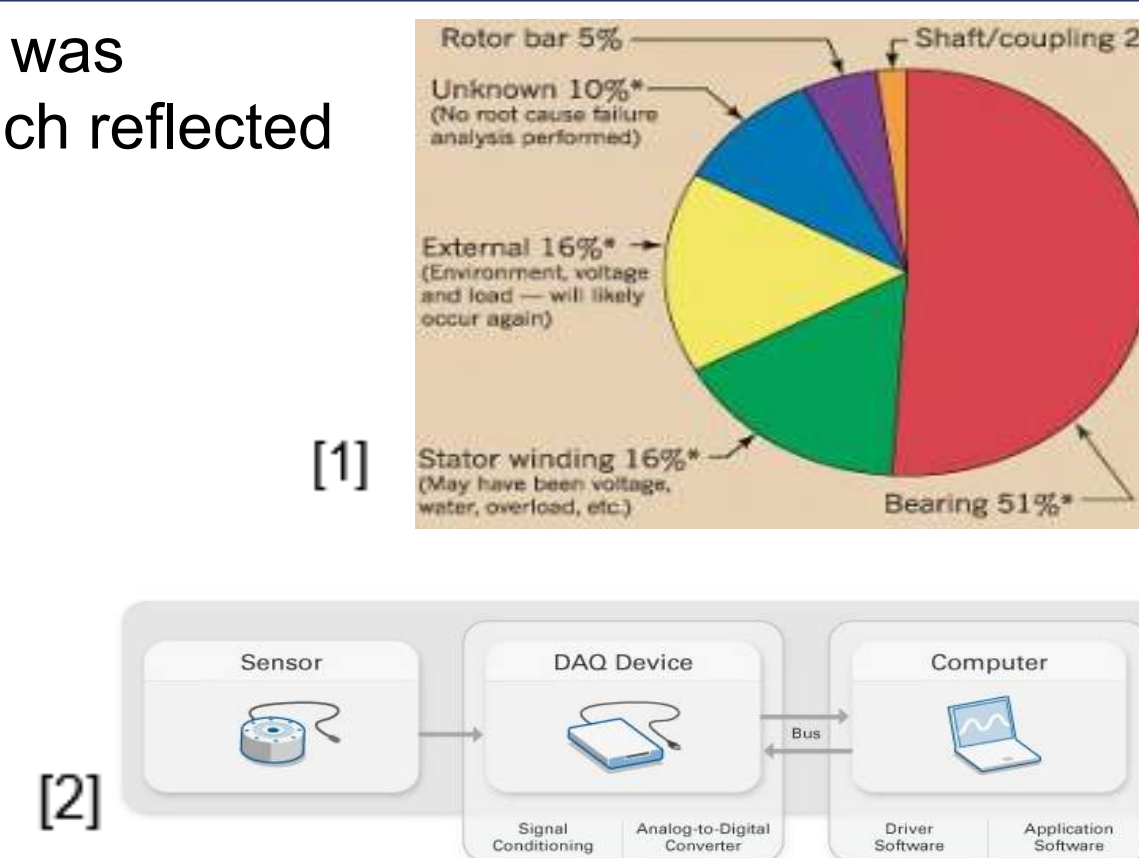
3. Objectives

- Research into AC and DC motors and identify their main characteristics
- Research into the major failings for AC and DC motors
- Identify a way in which the failings could be monitored via sensors
- Design and build a prototype data acquisition system
- Test the data acquisition system
- Gather data from the bench motor
- Evaluate and conclude the project
- Look at further opportunities for the system to be improved and produced as a usable system on site.

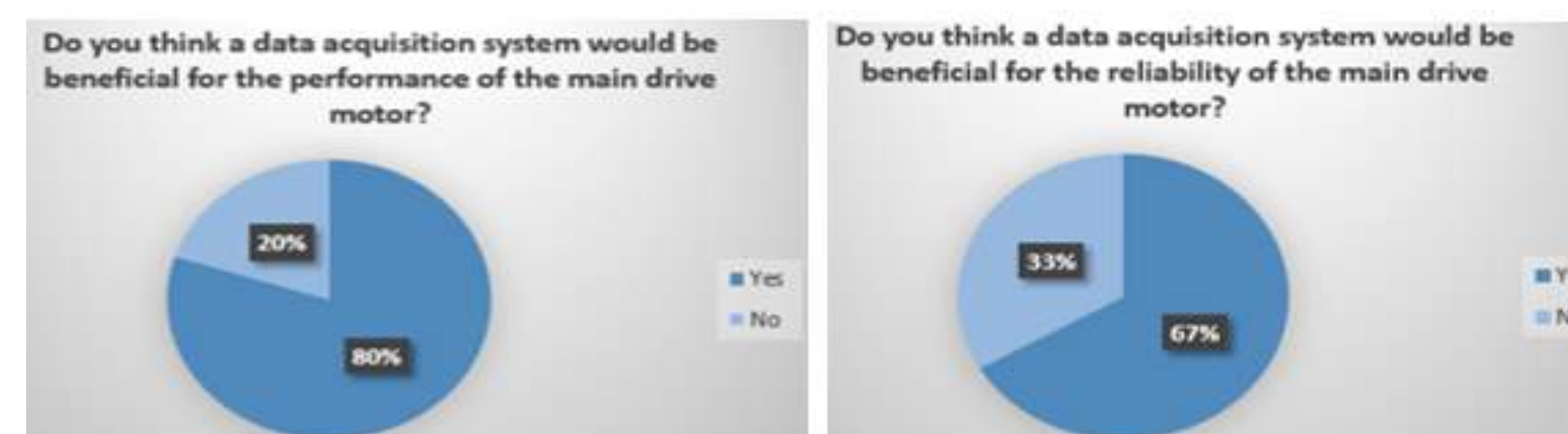
4. Research

- Motor Failure pie chart to the right was extracted from the 'EC&M paper' which reflected a root cause motor failure analysis.

- A Data Acquisition System, also known as 'DAQ' is a system that collects information from a specific device to obtain the measured variable, producing adequate and accurate data.



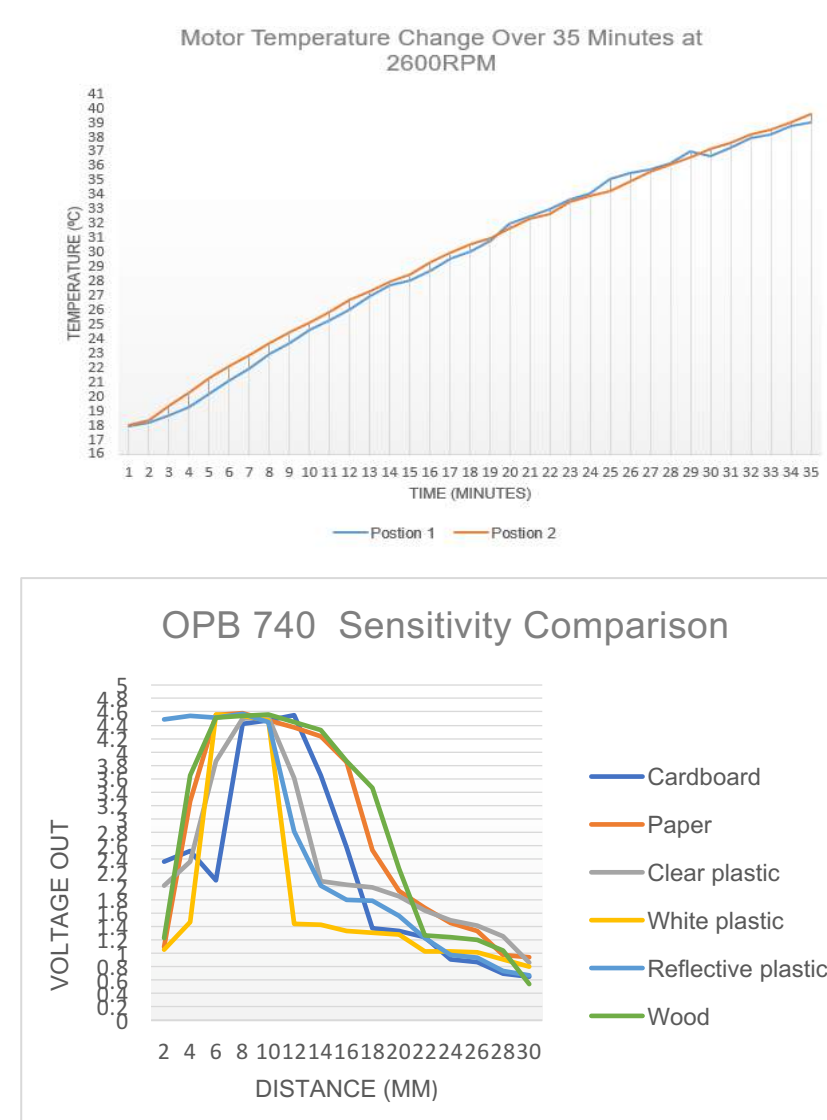
- Work based survey reflecting requirement for a DAQ.



5. Testing

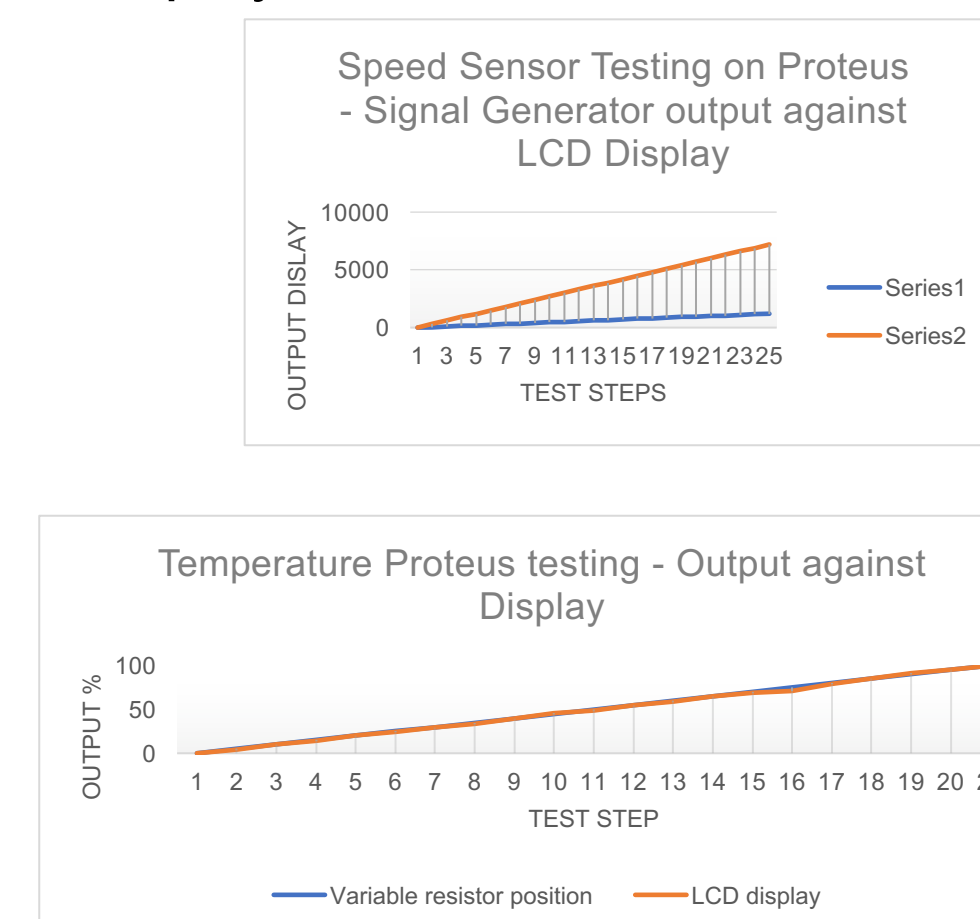
Component Testing

- Motor and Speed sensor tested for operation and functionality.



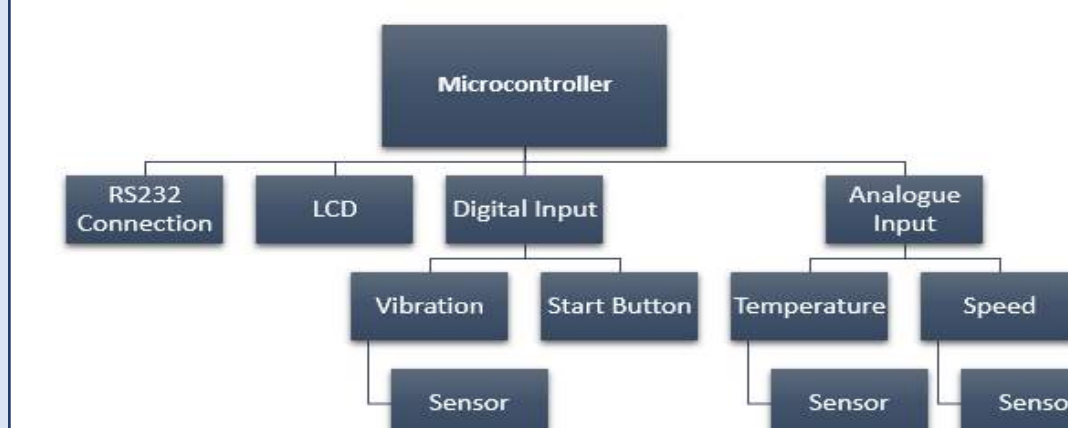
Proteus Testing

- Speed sensor and temperature operation was tested within proteus – Actual values against displayed values.

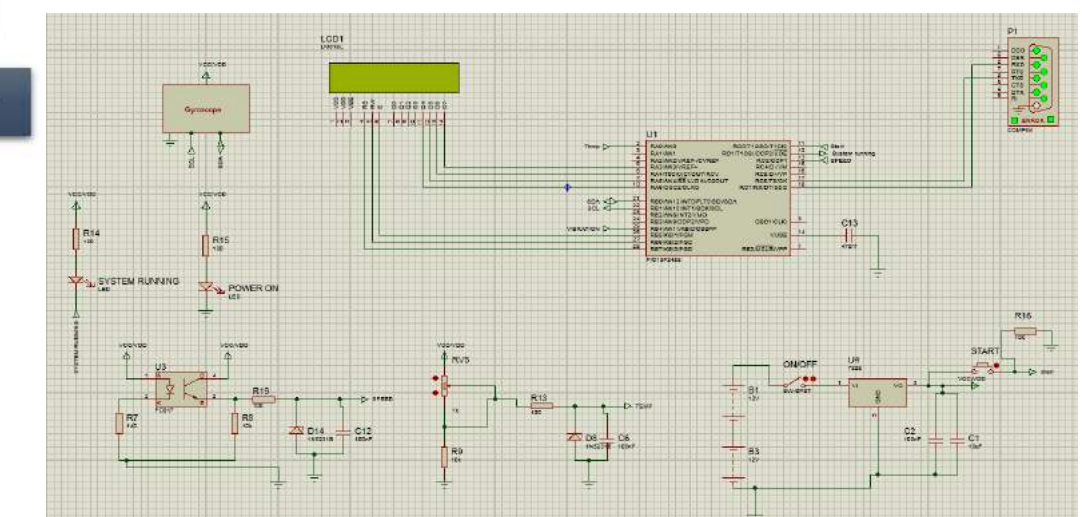


6. Design & Implementation

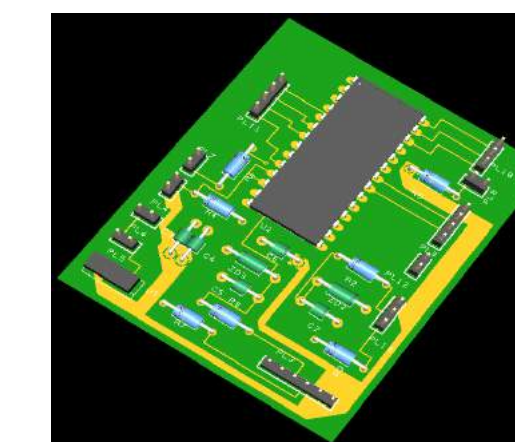
- System function blocks outlined



- Proteus schematic built and tested with CCS coding to reflect DAQ's operation



- Easy-PC used to build PCB design



- Structural Implementation



7. Conclusion & Recommendations

Conclusion

There were many successful and unsuccessful aspects of this Major Project. Successful aspects included a fully working CCS/Proteus design and implementation. Unsuccessful aspects included unable to display values of on structural LCD display.

Recommendations

- Rectify fault with LCD Display via soldered breadboard/PCB
- Develop prototype into a handheld device
- Universal measurement device ports
- SD Card storage
- Operator control panel display

8. References

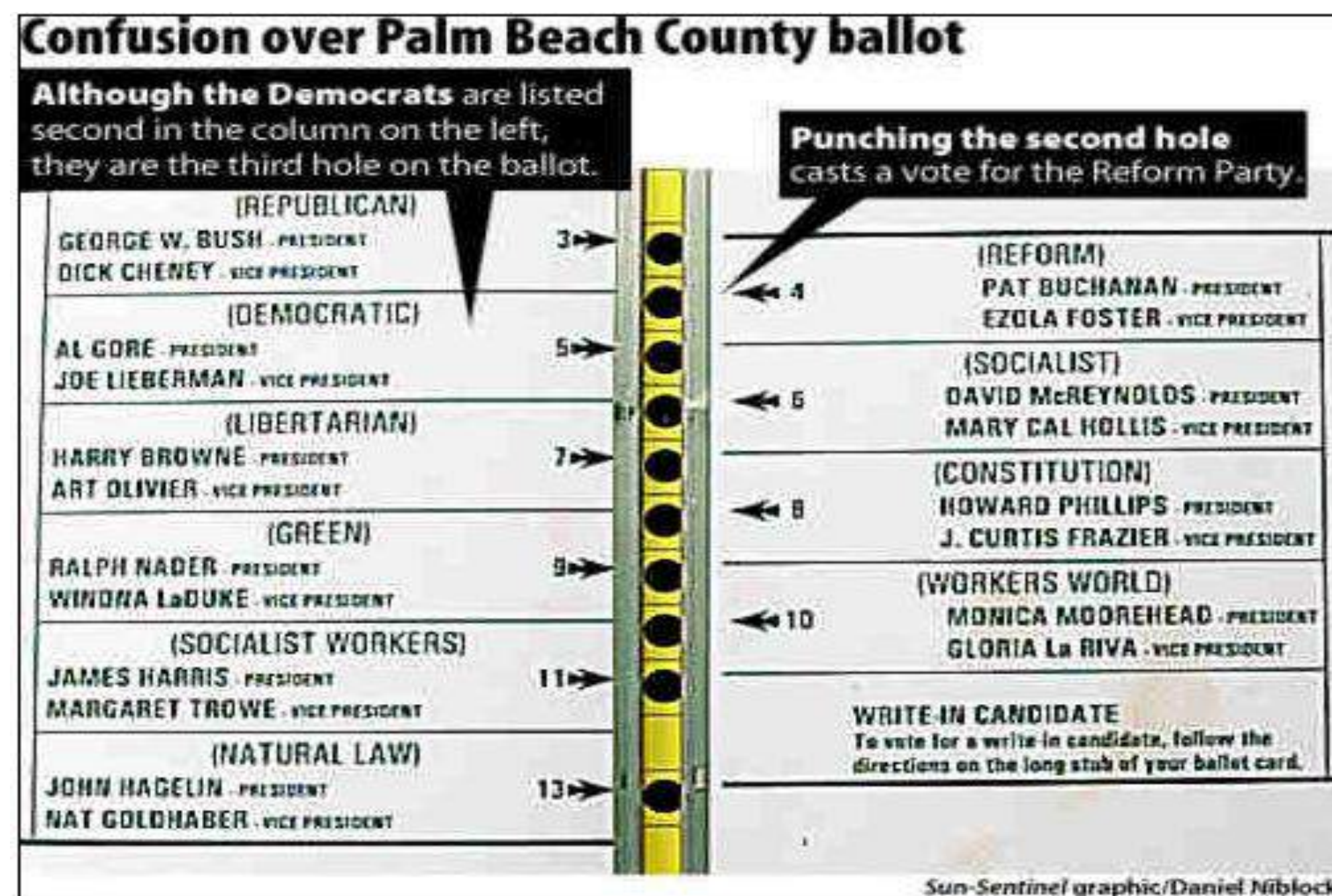
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- [2] "National Instruments," [Online]. Available:<http://www.ni.com/data-acquisition/what-is/>. [Accessed 27 04 18].



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1. Introduction

After the 2000 U.S Presidential election usability issues were considered more because of the many issues that appear on the ballot paper. As a result, many countries began considering using technology for online voting as an alternative method to traditional paper voting.



2. Aim

To analyse, discover, and evaluate the usability & security issues of E-voting systems.

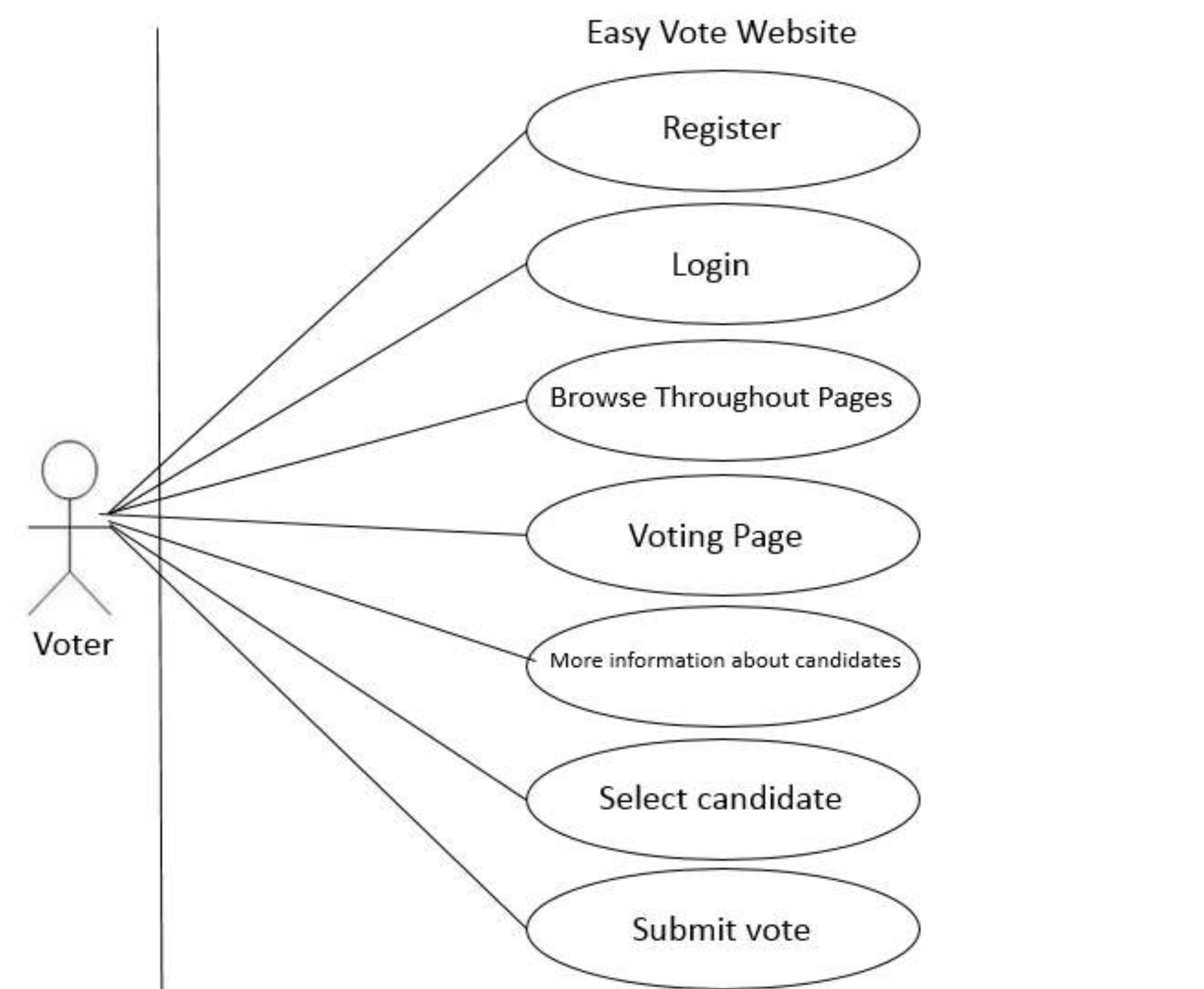
3. Objectives

- Research usability and security issues in E-voting systems.
- Produce a prototype highly similar to an e-voting website.
- Present the prototype to various number of users and collect feedback on the prototype's usability from them.
- Analyse the feedback collected and come to an evaluation concerning usability issues of electronic voting.

4. Design & Implementation

4.1 Design

A use case diagram was developed to identify the users and their interactions with the application.



4.2 Implementation

The tools that used to build the prototype are PHP, HTML, and CSS, wamp server, notepad++.

```
if(!empty($firstname) && !empty($lastname) && !empty($ninanddrive) && !empty($Candidate))
{
    $query="INSERT INTO comments(first_name,last_name,NIN,Candidate) VALUES
    ('$firstname','$lastname','$ninanddrive','$Candidate')";
    $result=mysqli_query($link,$query);

    echo "Thank you,Your vote has been submitted."<?php>";
    <a href="index.php">Back to home page</a>
<?php
}
else
```

5. Evaluation

There are several types of testing methods with each method pointing to different research goals such as:

- System Usability Scale Survey(SUS).
- Heatmaps – Eye tracker (Eye Tribe).
- Retrospective Think Aloud (RTA).

Heat Map Example



6. Conclusion

When it comes to real-world e-voting systems issues, opinions will be different for voters themselves.

Usability issues in an E-voting system could be reduced in the near future following the steps below:

- a) Using different usability testing methods to test E-voting websites could help to reduce E-voting issues.
- b) The increased development in the field of security, may provide an opportunity for E-voting system to have a big chance to be used in the future.
- c) Using different users' background would lead to more varied results with different comments and opinions. Such as old, busy, young people and more.

1. Introduction

Augmented Reality (AR) is a technology that has continually evolved since 1968 with the Sutherland's[1] "Sword of Damocles" project and is defined by Azuma[2] as a "variation of environments (VE)". The popularity of Pokémon GO has put AR in the spotlight and it has continued to grow in popularity. Image Processing is a sub section of Computer Vision, designed to process digital images using Kernels. The project examines the iteration of Image Processing, a method that can be used to scan image and process all the pixel data within the image.

2. Aims and Objectives

The aim of this project is to develop two edge detection algorithms, Sobel and Robinson and compare in terms of Speed, Quality and Memory used. To achieve this, 5 objectives are described.

1. Establish an Understanding of Image Processing and the Principles.
2. Establish an Understanding of Augmented Reality.
3. Provide a literature Review of Augmented Reality, its History, The development and current and future trends in the fields of the public sector.
4. Provide a Case Study detailing algorithms in Edge and Corner Detection, Approaches by professionals in the field and propose own solution.
5. Develop an edge detection algorithm.
6. Analyse results of performance and quality of the new images calculated.

3. Methods

The research methods consist of using the positivism philosophy due to the project dealing with hard data. The strategies used was the Literature Review, Case Study and Implementation of two edge detection algorithms. The development methodology used was the Rational Unified Process, an agile method based on Iterative Development. The phases include Inception, Elaboration, Construction and Transition.

4. Analysis

The tests conducted were in OpenCV and three images were used. Each image was tested and recorded.

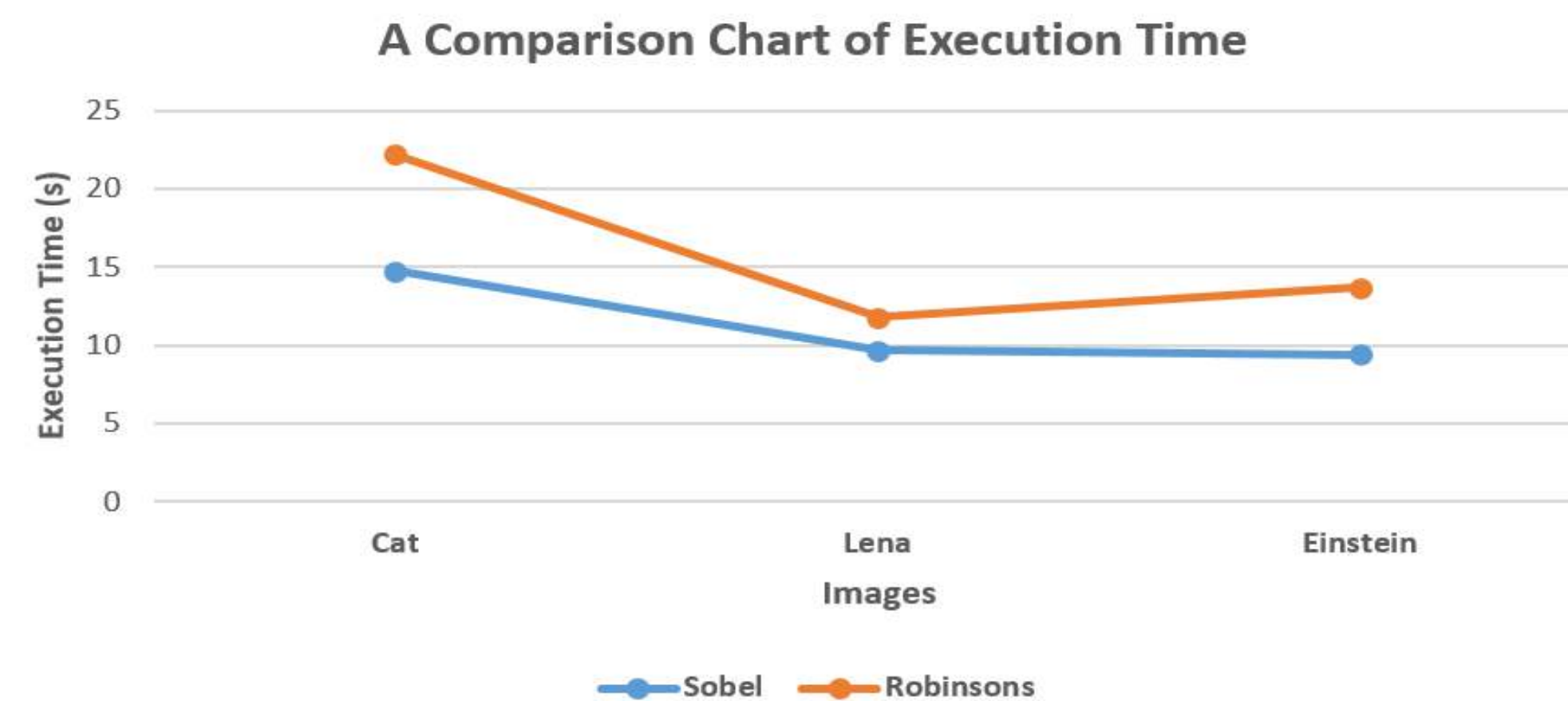


Figure 1 Comparison Chart of Algorithm Speed

The Results above show the Sobel is faster to use due to the usage of two kernels while Robinsons uses eight kernels.

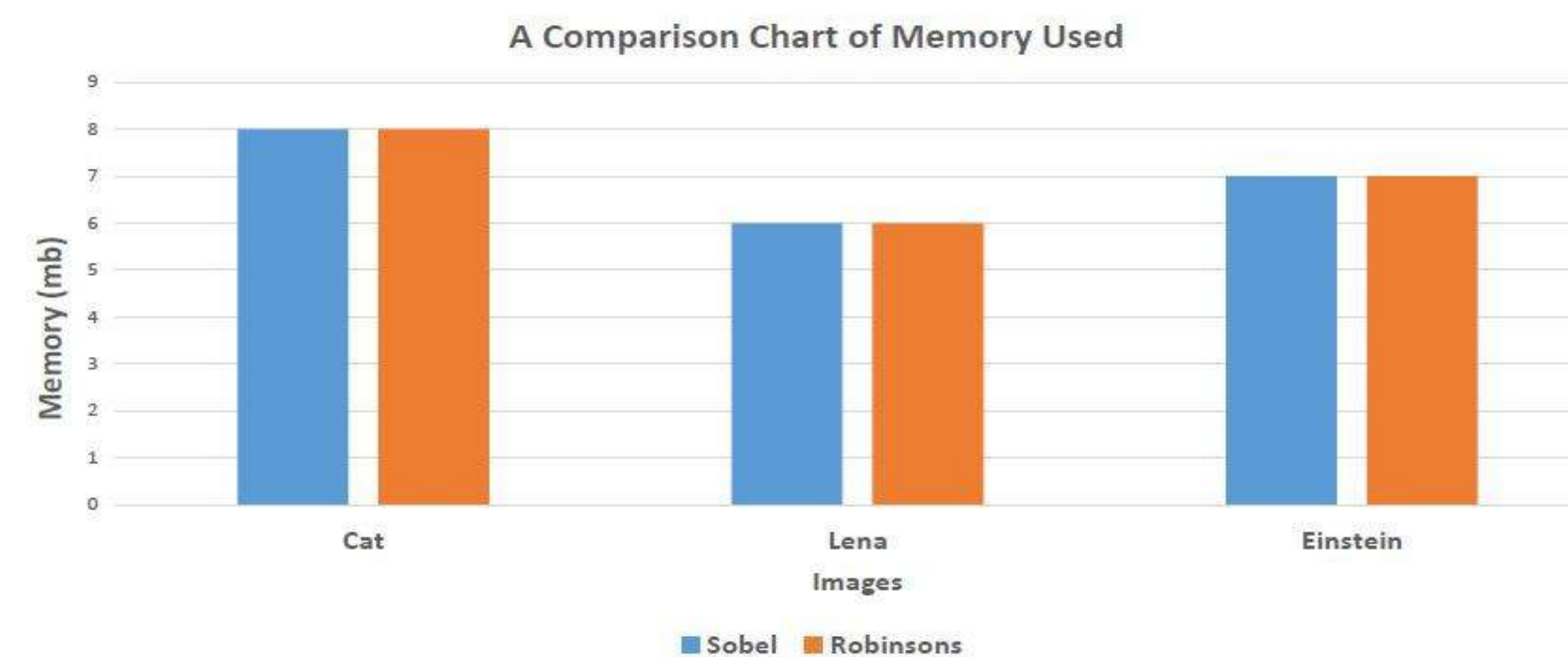


Figure 2 Comparison Chart of Memory usage

The majority of images used equal memory to execute for both Sobel and Robinson.

5. Conclusion

While the implementation of the algorithms in OpenCV was successful, OpenGL was not successful due to time constraints and test results were not recorded. Sobel is the fastest to use while Robinsons detects more edges and uses less memory. In Summary, Sobel can be used for quick process with a reasonable amount of edges however, Robinsons can be used for detecting more edges with the expense of speed.

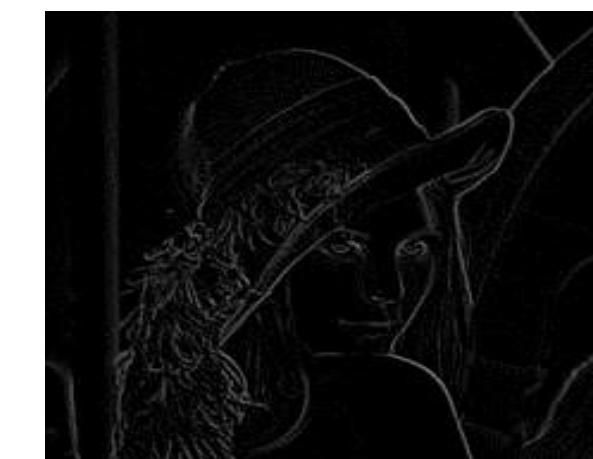


Figure 3 Lena After Sobel



Figure 4 Lena After Robinsons

6. Future Work

With the progress of Augmented Reality gaining public attention creating demand, many aspects such as Human Senses can be discovered. Future research will focus on the possibility that Augmented Reality can enhance human senses as well as improve human lives. The second area of future research is to examine tracking and how marker based applications perform tracking algorithms. The third and final area is to develop a proposed edge detection algorithm designed for AR applications. The end goal is to develop a marker based AR application, with the intent of enhancing everyday lives to improve society as a whole.

7. References

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Introduction

Home security is important to allow the public to feel at ease and secure within their homes. Compared to last year there has been an increase in burglary by 9% and an increase in robbery by 33% according to the England & Wales National statistics[1]. With burglaries on the rise I believe home security is important and with the design of and intruder device could potentially lower this figure.

Aims & Objectives

Aims

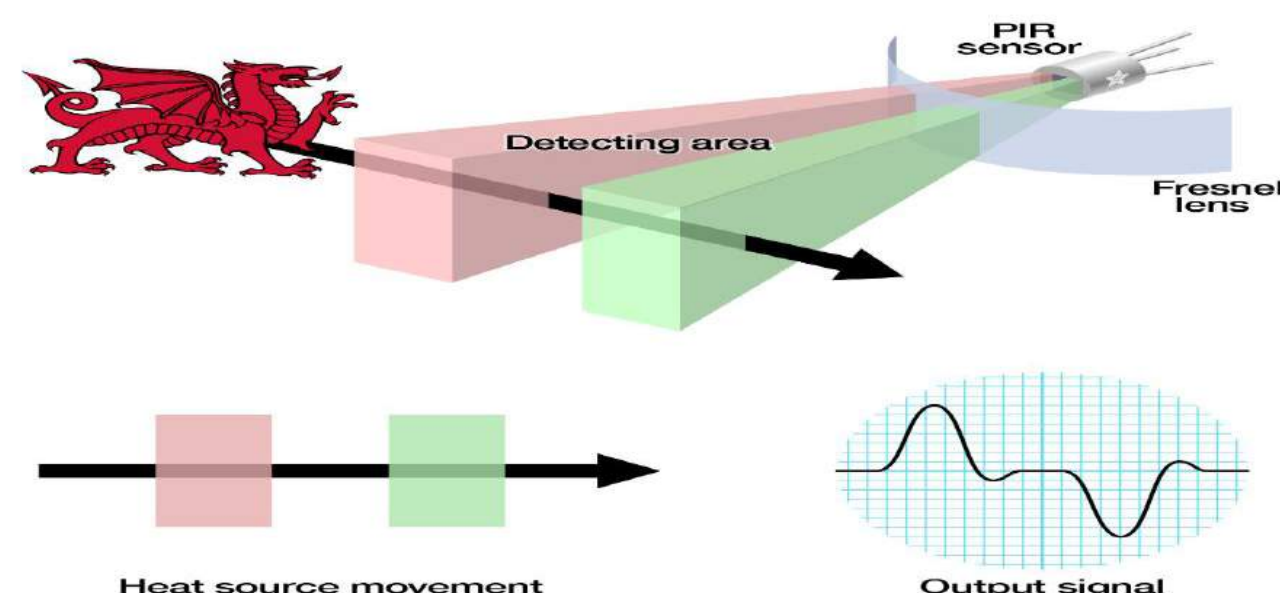
- Create a device that notifies the user of any movement within a given area.
- Installed in indoor/outdoor environments.
- Affordable for all members of the public.
- Minimize the number of false alarms.

Objectives

- Research & Investigate existing technologies/products.
- Adopt specifications and form ideas based on research.
- Theorise, design and build a prototype.

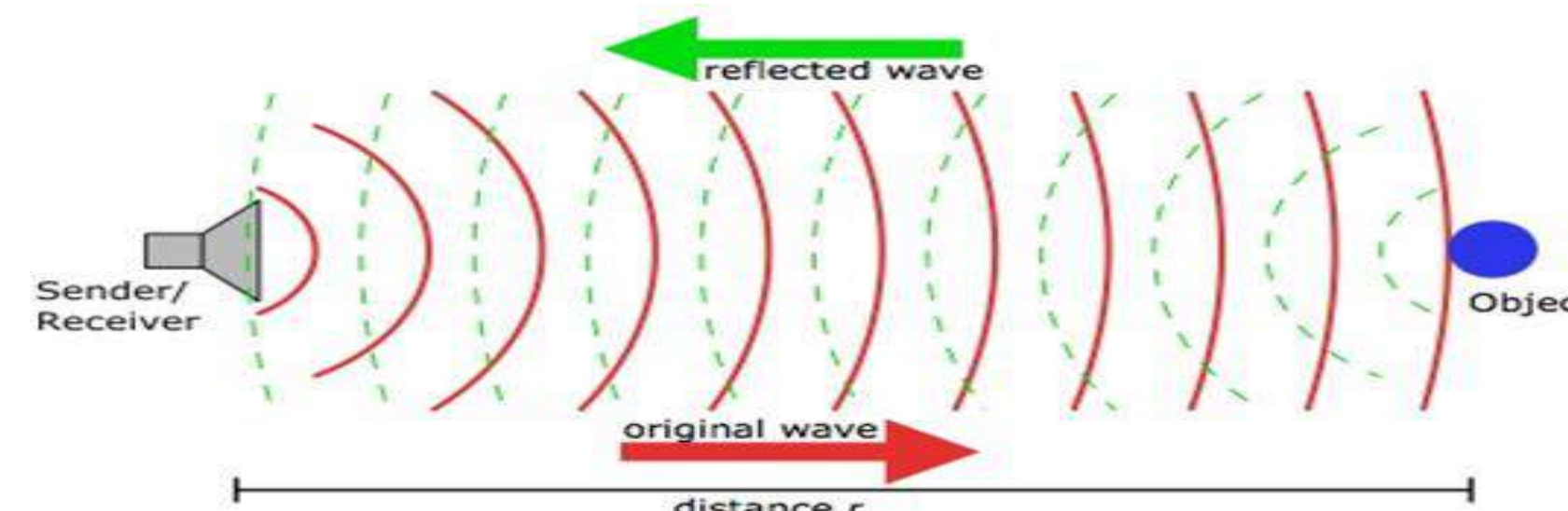
Passive Infrared

- Low cost.
- Simplicity.
- Can detect heat signatures up to 10 meters.
- Can be used in harsh weather environments.
- Does not interfere with devices within proximity.[2]



Microwave

- Can be used in harsh temperature environments.
- Can detect movement of a max range of 20 meters.
- Large frequency range, avoiding interference. [3][4][5]

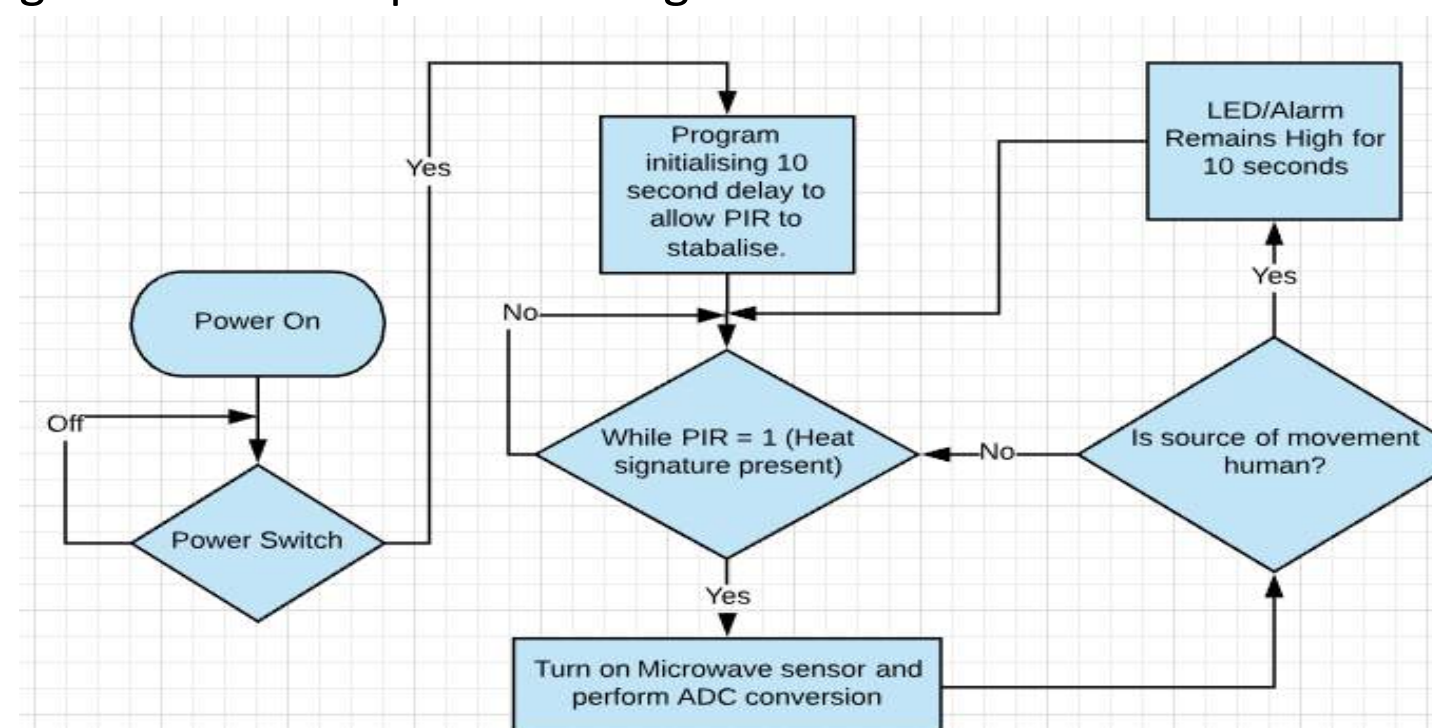


Research Overview

The two technologies chosen is very popular within intruder detectors. The two technologies chosen inversely complement each other as ones weakness is the other ones strength, using these technologies together will minimize the number of false alarms and increase the overall accuracy of the device.

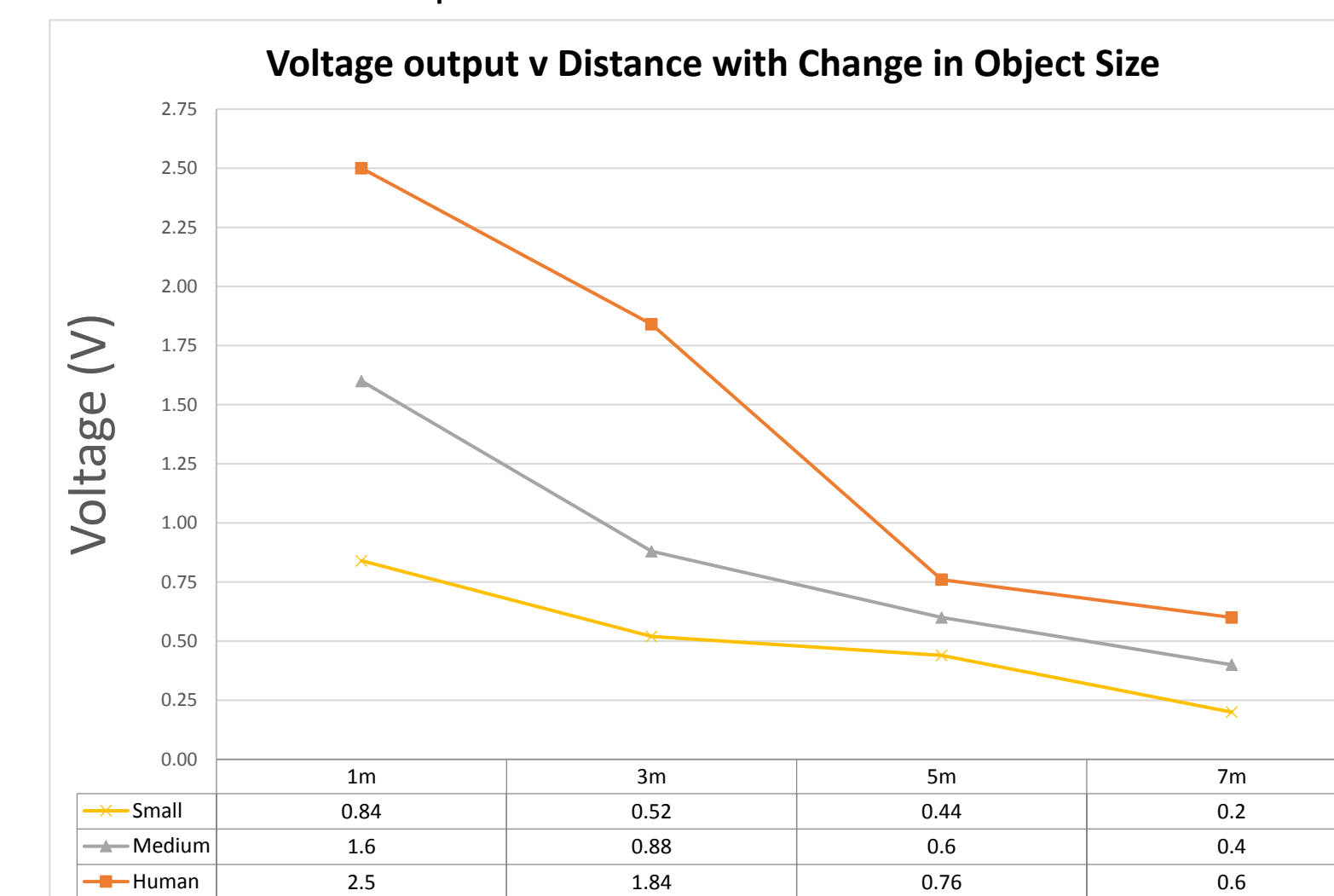
Design & Implementation

- Passive Infrared Sensor (AMN14111) is used as an automatic switch when a moving heat signature is detected.
- When a moving heat signature is present current is supplied to the microwave sensor (HB100) and gives a voltage output proportional to the amount of radio frequency reflected.
- Using a pic16f887, logic was designed so that when both sensors detected movement it would generate an output in form of an LED/Buzzer.
- To minimize false alarms, pet immunity was implemented using an ADC and creating a window comparator using 'C' software.



Testing & Results

An experiment was conducted to determine the voltage thresholds needed for the window comparator in order to distinguish between a human and different sized pets.



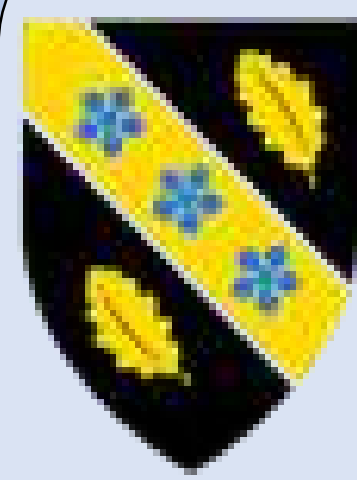
- Larger the object passing the motion sensor, the higher the voltage output.
- Further away the object is from the sensor the lower voltage output.

Conclusion

- Implementation of dual technology was successful.
- Implementation of a microprocessor was included.
- Overall approximate cost of the project was £35.
- Implementation of pet immunity resulted in less false alarms.
- With the use of a IP65 casing allowed it to be used indoors/outdoors.

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Investigation and Development of an Electronic Tuner for Santoor

By Iman Sayadi Choobari

Introduction

Musical instruments from different type of family made in various models and shapes produce different frequencies and harmonics which identify as tone. They need to be accurately *TUNED* in order to produce optimal sound. *TUNING* is a process of adjusting the pitches of tones to establish the intervals between them by considering a reference pitch such as (A=440Hz). An instrument with pitches that is either too high (sharp) or too low (flat) in relation to a given reference pitch, called “Out of Tune”. These instrument, therefore, need a *TUNERS* to adjust them to correct pitch or intonation[1].

An *Electronic Tuners* benefit of wide range of frequency detection which make them able to tune different types of musical instruments including Santoor[2].

What is a Persian Santoor?

Santoor (also known as santur, santūr, santour) is a stringed instrument of Persian/Iranic origins which was recorded for the first time by “Mohammad Sadeqh Khan” from before the Qājār period in 669 B.S[3].

The santoor has 72 strings. Strings are made of two different materials and two different colours. The yellow strings are made of brass and the white strings are made of steel.

The strings, grouped in units of 4 and seat on top of small, movable, wooden bridge.

Wooden bridges arranged in two rows that divides the santoor into three positions.

Stretched metal strings horizontally across over bridges and snapped to the left side by metal hooks and right side by tuning pegs (adjustable part for tuning) of instrument. The santoor is played by two hammer shape plectrums called “Mezrab” which are held between the thumb, index and middle fingers[4].



Aims and Objectives

The aim of this project is to investigate electronic musical tuning technologies and in turn implement and develop a prototype which can electronically tune a Santoor.

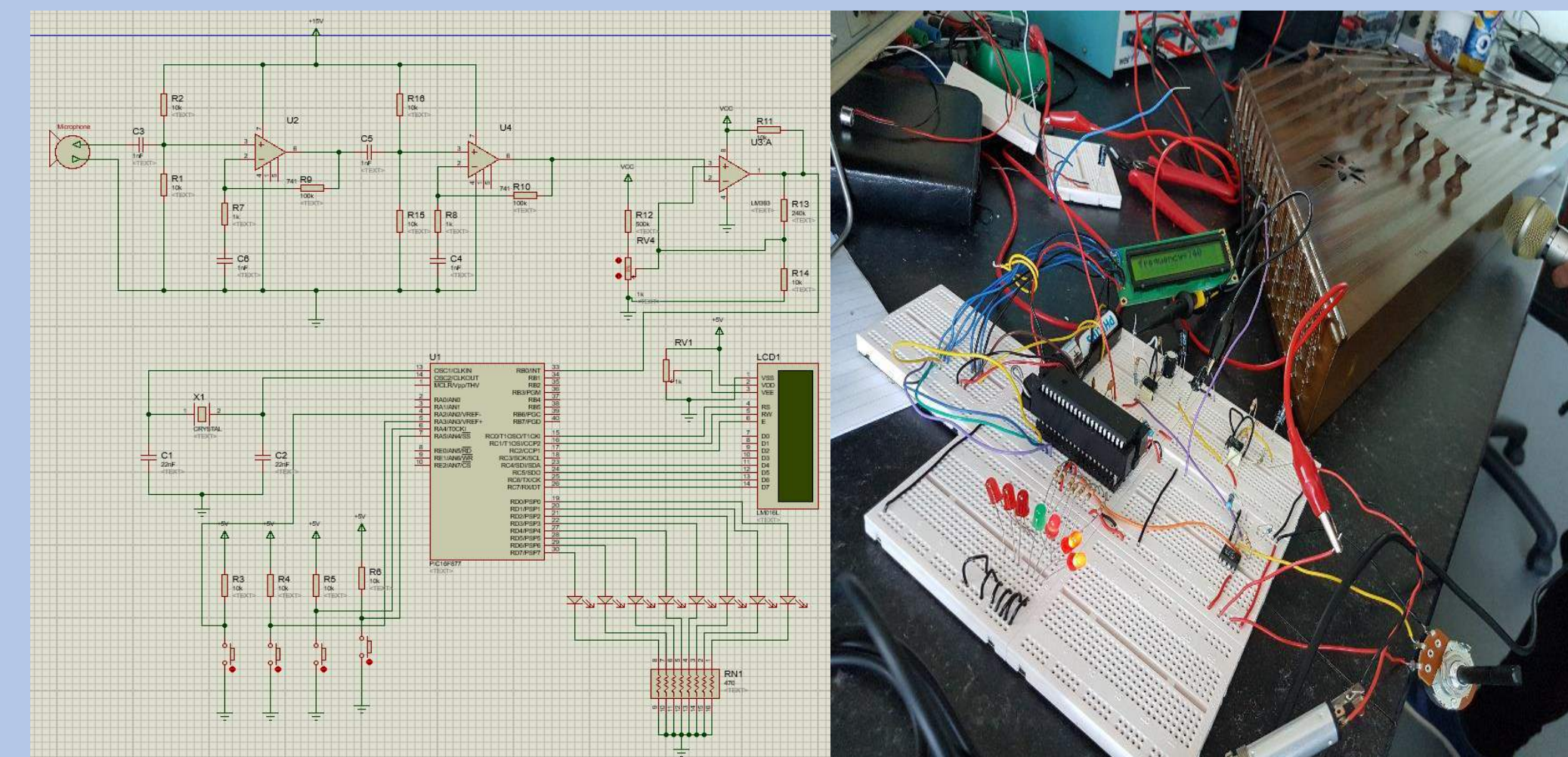
1. Research technologies on musical tuning devices.
2. Test various components which have been identified through research.
3. Analysis of various methods for tuning musical instruments.
4. Opting one method based on the analysis performed and other design considerations.
5. Design and implementation of a tuner with selected components.
6. Prototype various design methods and build final device based on preferred prototype.
7. Testing of the solution.
8. Evaluate finished device against the initial design.

Electronic Tuners

- Wide range of frequency detection.
- Using internal microphone (or input jack) to pick up frequencies.
- Utilizing Microcontrollers for frequency calculation and tuning process.
- An LCD displays the information for tuning.
- A needle-shaped marker plus green and red LEDs indicate “in tune” or “out of tune” (sharpness or flatness of notes) instrument.
- The “Sound Out” ability distributes a reference sound for selected note and it improves ear training.
- “Back Up Memory” records the tuning history, even when the device is turned off.
- Some can clip directly to the instruments and sense the vibration
- High accuracy in term of circuitry by ignoring background noises[5].



Design and Implementation



- Receiving frequency by microphone
- Amplifying signal using power amplifier
- Feeding amplified signal to voltage comparator using LM393
- Compared voltage connected to input pin of PIC16f877 Microcontroller
- A timer module is used to measure frequency
- An LCD is utilized to display measured frequency
- LEDs indicate whether notes are in tune or out of tune

Conclusion

The frequency numbers which were produced by biting Santoor string were inconsistent on the LCD display. This is due to frequency generated from Santoor is instantaneous and diminishes quickly. Although this means the frequency is not displayed effectively to the user the project overall is still regarded a success. The frequency is displayed consistently on the LCD with a continuous frequency and is stable. For future work improvements are to be made to rectify this problem.

References

- [1] T. E. Miller and A. C. Shahriari, World music : a global journey.
- [2] “BOSS - TU-12EX | Chromatic Tuner.” [Online]. Available: <https://www.boss.info/us/products/tu-12ex/>
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- [4] “Instrument Details.” [Online]. Available: <http://www.farabisoft.com/Pages/FarabiSchool/InstrumentsDetails.aspx?lang=en&PID=4&SID=30>.
- [5] “CA-50 - CHROMATIC TUNER | KORG (U.K.).” [Online]. Available: http://www.korg.com/uk/products/tuners/ca_50/.

Implementation of a secure & smart university Campus for SA1

1. Introduction

This project was produced to develop smart environments within an academic field to help improve academic performance. The project is based on Internet of Things (IoT) and Wireless Sensor Networks (WSN).

The university obtains multiple advantages of this project as this project enables the university to monitor and control Building Management System (BMS) and Energy Monitoring System (EMS). The provided benefits will then help the university save money by cutting the amount of electric usage that has been acquired by the university. Also smart environments will help implement security with the use of CCTV cameras and motion detection sensors that would be installed around the university campus.



Figure - 1



Figure - 4

2. Aims & Objectives

Aim of the project is to implement a secure and smart campus prototype for the University of Wales Trinity Saint David. Located within the new Waterfront Innovation Quarter constructed at SA1 Swansea.

Objectives:

- Improved learning area's
- Understanding and use of Internet of Things devices
- Research and literature review
- Design a prototype smart campus sensor and actuator network
- Implement in simulation the smart set up, and evaluate important parameters
- Build a small prototype demonstrator for smart campus IoT features
- Identifying the overall project advantages and disadvantages
- Testing and analysing results



Figure - 2



Figure - 6



Figure - 5

3. Related work

There were several different papers researched to help assist to achieve the best ability of an successful smart university campus prototype, these papers are:

- Michigan University[1-2]
- Study of Smart Campus Development Using Internet of Things Technology[3]
- Smart university, a new concept in the Internet of Things[4]
- Building automation and energy control using IoT – Smart Campus[5]
- IoT Smart campus review and implementation of IoT applications into education process of university[6]
- How Internet of Things making the university campuses smarter? QA higher education perspective[7]
- Design and field test of an autonomous IoT WSN platform for environmental monitoring[8]

4. Research Design

A physical and simulation experiment was developed and produced. The project was not able to be utilised within the whole university campus due to limitation of time and cost. The physical experiment was utilised with the use of multiple IoT monitoring devices and a wireless gateway. The simulation was produced using Netsim Simulation Tool based on IoT environments setting.

Physical Devices used to monitor the classroom environment were Temperature sensor, Humidity Sensor, LUX Sensor, Motion Detection, Light Presence sensor and a wireless gateway. Some of the physical devices are demonstrated on figure 1, 2 and 6.

The simulation experiment also conducted had serval IoT devices that all had serval features within them for the successful outcome of a smart car park implementation. The devices used within the simulation were a Closed Circuit Television (CCTV) that also operated as an Automated Number Plate Reader (ANPR), Motion detection sensors and smoke detectors.

5. Results

The experiments that were deployed were both analysed to understand if the aims and objectives of the project were met. Some of the results gathered is demonstrated from figure 6-9.

Understandings of the results gathered from the experiments:

- Simulation Packet Loss average of 30%
- Simulation Network Throughput speed average of 0.0003 Mega bits per second
- Simulation Packet analysis show average of 100% Payload Transmitted, 70% Payload Received and 30% Payload loss
- Delay output average 500000 microseconds
- Classroom Humidity readings average of 40%
- Average Light intensity level 80 LUX
- Room temperature average of 25°C

6. Conclusion

The project and the experiment were completed to the authors best ability, shown by the results gathered it shows that the simulation experiment was not met to an very beneficial success due to the amount of network set back that were produced which can be improved with the use of different network devices. The physical experiment and the project report was a success within the authors findings and recommendation, this is due to the successful outcome results provided by the Imonnit IoT sensors.

Future redocumentations that require to be focused on:

- IEEE protocol Standards
- Security
- Simulation tool's
- Further in-depth secondary research
- Use of alternative devices for physical experiment

7. Reference's

- [1]"14 Rules for Becoming a Smart College Shopper - Robert Ronstadt - Google Books." [Online]. Available: https://books.google.co.uk/books?id=Ysdma18Qin4C&pg=PA24&dq=michigan+university+smart&hl=en&sa=X&ved=0ahUKEwin_o6ZztfaAhWhKCAKHVMWBesQ6AEILDAB#v=onepage&q=michigan+university+smart&f=false. [Accessed: 26-Apr-2018].
- [2] B. F. (Billie F. Spencer, *World forum on smart materials and smart structures technology: proceedings of the World Forum on Smart Materials and Smart Structures Technology (SMSST '07)*, Chongqing & Nanjing, China, 22-27 May, 2007. Taylor & Francis/Balkema, 2008.
- [3] M. Widyasari, "Study of Smart Campus Development Using Internet of Things Technology," in *International Conference on Recent Trends in Physics 2016 (ICRTP2016) IAES International Conference on Electrical Engineering, Computer Science and Informatics IOP Publishing IOP Publishing*, 2016, vol. 755, p. 011001.
- [4] M. Cata, "Smart university, a new concept in the Internet of Things," in *2015 14th RoEduNet International Conference - Networking in Education and Research (RoEduNet NER)*, 2015, pp. 195-197.
- [5] M. Jain, N. Kaushik, and K. Jayavel, "Building automation and energy control using IoT - Smart campus," in *2017 2nd International Conference on Computing and Communications Technologies (ICCCCT)*, 2017, pp. 353-359.
- [6] A. Zhamanov, Z. Sakhiyeva, R. Suliyev, and Z. Kaldyulova, "IoT smart campus review and implementation of IoT applications into education process of university," in *2017 13th International Conference on Electronics, Computer and Computation (ICECCO)*, 2017, pp. 1-4.
- [7] A. Majeed and M. Ali, "How Internet-of-Things (IoT) making the university campuses smart? QA higher education (QAHE) perspective," in *2018 IEEE 8th Annual Computing and Communication Workshop and Conference (CCWC)*, 2018, pp. 646-648.
- [8] F. Wu, C. Rudiger, and M. R. Yu, "Design and field test of an autonomous IoT WSN platform for environmental monitoring," in *2017 27th International Telecommunication Networks and Applications Conference (ITNAC)*, 2017, pp. 1-6.

8. Table of Figures

1. Imonnit Wireless gateway
2. Room MH505
3. Imonnit logo
4. Humidity sensor
5. Temperature sensor
6. Temperature readings
7. Motion detector readings
8. LUX sensor readings
9. Simulation Packet Loss results

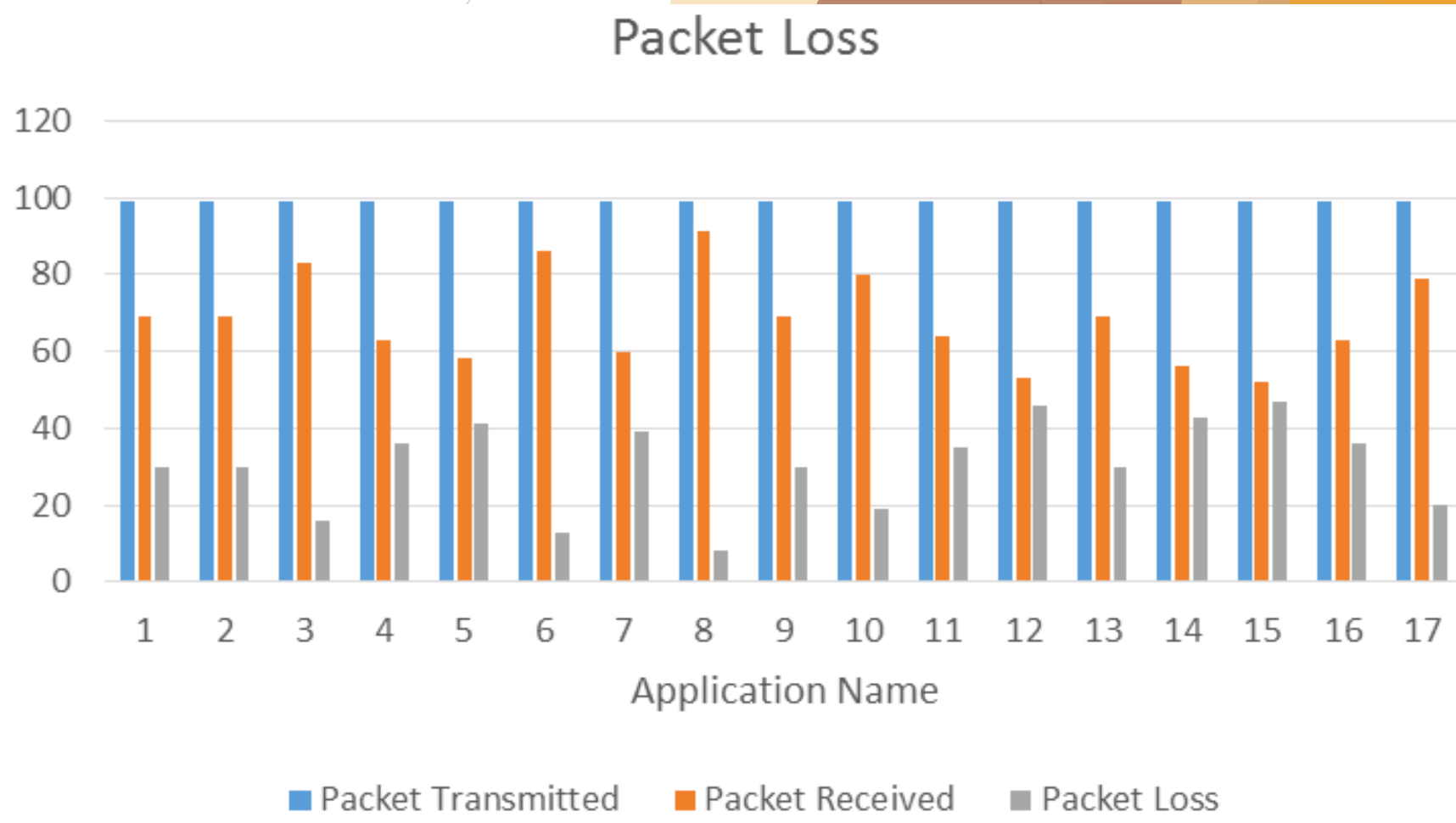


Figure - 9

Attacking an Industrial IoT Wireless sensor network.

Ivan Thomas: Computer Networks & Security: School Of Applied Computing: UWTSD

Introduction

The Aim of my project was to review and test the cybersecurity of an industrial wireless sensor network. An Industrial wireless sensor network consist of stand alone devices that share data through a configured gateway. Advancements in IoT integration has been credited to WSN's and their enablement to monitor and store real time data from the physical world.

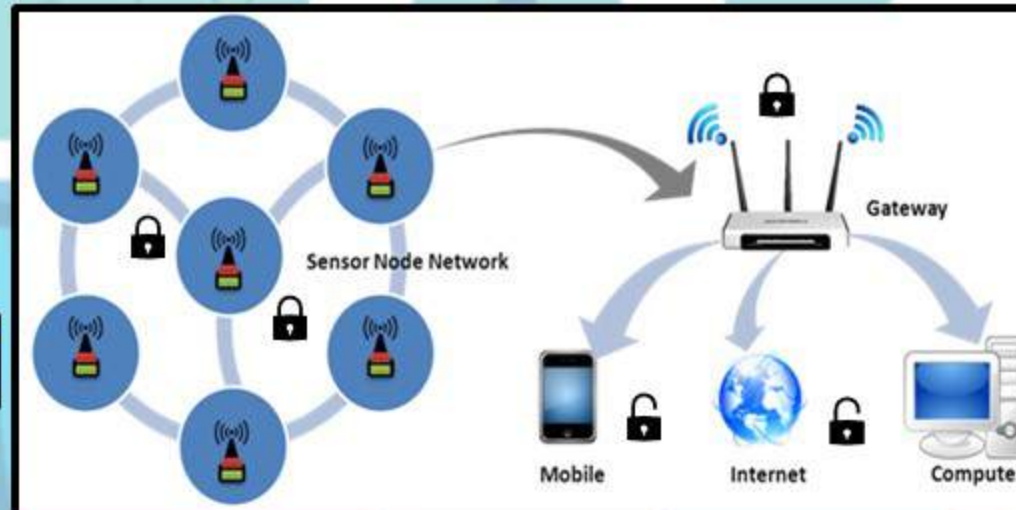
Isolate Victim

- Reconnaissance concluded that the sensor network security was too strong to break directly.
- Therefore all cyberattacks were against connected clients to gain administrative control over the sensors. The attack required a rogue wireless network acting as both as a available and safe connection. Once connected to the rogue wireless network, the victim has unknowingly removed themselves from their network security.

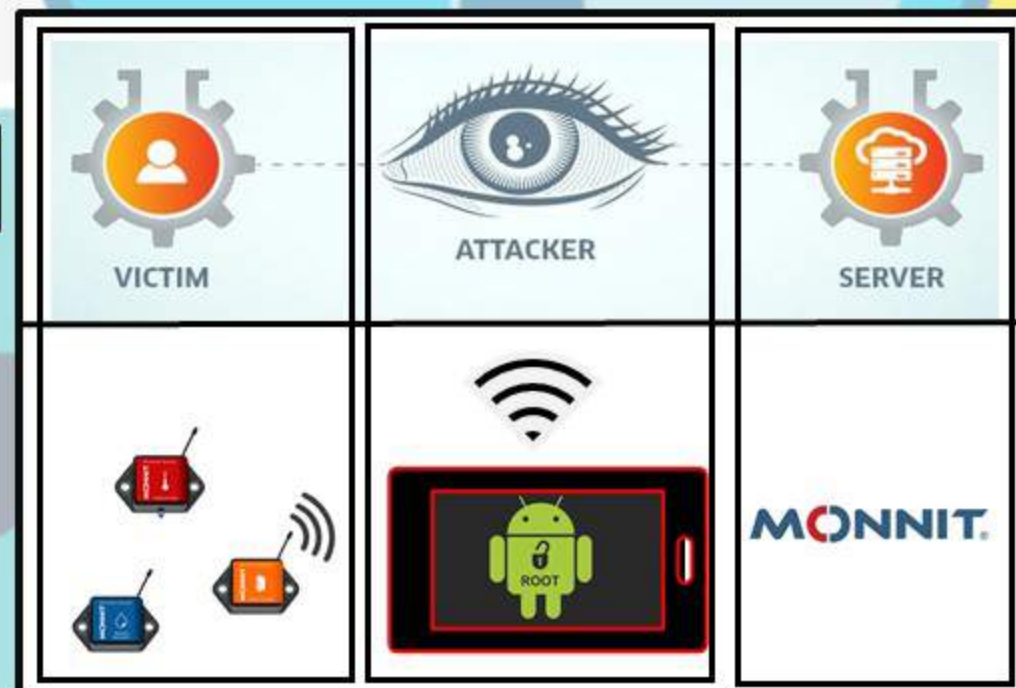
Execute Attacks

- Spyware is then installed on the PC either local or remotely. The spyware executes collecting personal information including the logon credentials of the administrator. As the client is in a rogue network there are no restrictions on information being remotely delivered to the attacker.
- With the sensors login credentials, web security, network security and physical security all become obsolete as there is no double authentication other than a username and password.

Victims Topology



Man in the middle attacks facilitated by a rooted phone and hotspot connection



Conclusion

The worst case scenario is the Cascade effect," By launching an attack on a small, poorly secured system that doesn't seem very critical, It interrupts others systems setting off a chain reaction. In a Industrial scenario this reaction could be water purification plants, gas or electrical grids. This attack is flexible and can be modified to a selection of targets. Success rates are high with extraction of data throughout the testing In this project. Conversely the attack relies heavily on the victim connecting to the rouge access point and removing themselves from any protection. As this attack utilises the cellular network this attack is mobile and difficult to stop.

Works Cited

- [1] WSN Network Image: <https://ns2projects.org/ns2-simulation-code-for-wireless-sensor-network/>
- [2] Victim Image: <https://blog.appknox.com/category/enterprise-mobility>
- [3] Background Image <http://www.selligent.com/blog/email/an-intro-to-spf-dkim-and-the-need-for-email-authentication>
- [4] Research: 'IEC WSN internet of things'
- [5] Monnit Image: www.Monnit.com
- [6] Sensors: <http://www.smartm2m.co.za>

Realtime downbeat recognition using neural networks

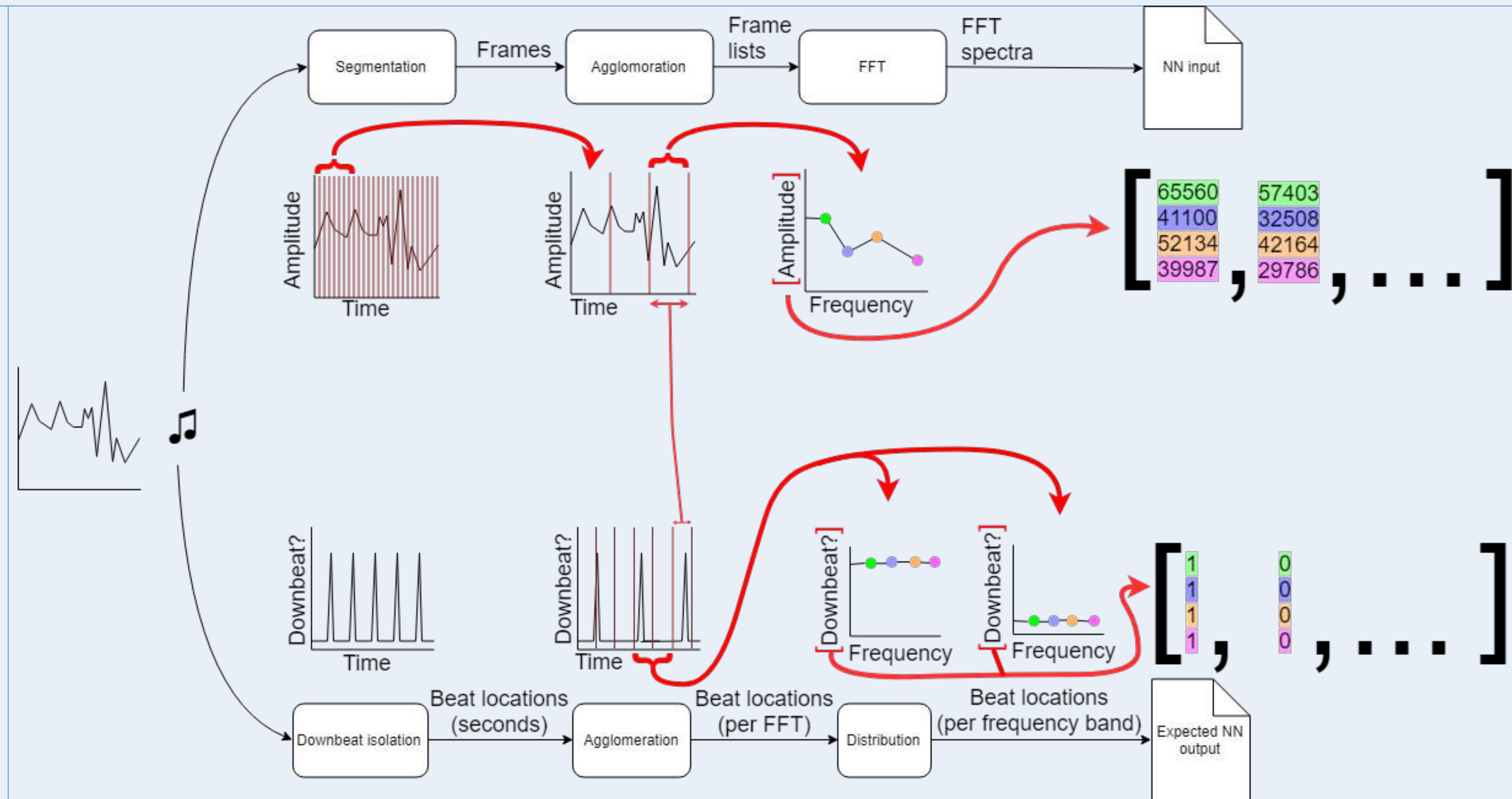
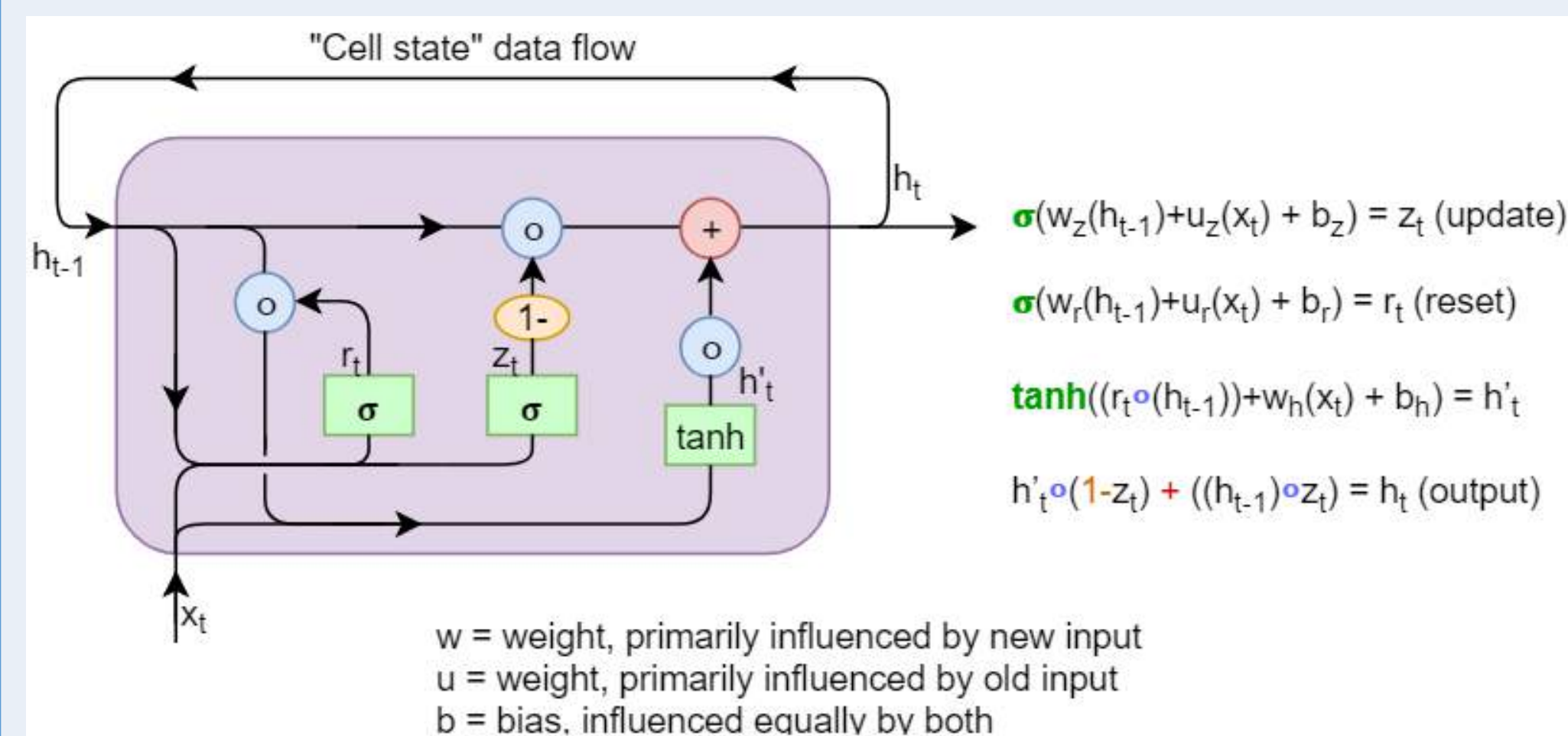
Jack Hinton - p147676 jhinton.147676@student.uwtsd.ac.uk

The aim of this project was to determine the feasibility of a system that could keep time when music is played to it. This could then be combined with a drum machine to allow musicians to use a drum track that keeps time with them, rather than the other way around.

This presented unique challenges, as it was necessary for the feedback to be both accurate and instantaneous. It was thus decided that a neural network and feature extraction architecture could provide the necessary rapidity and accuracy. A neural network can be thought of as a 'net' or 'chain' of simple processes that feed their output into other processes and thus allow the system to 'learn'. [1]

Single neurons typically have an imprecise binary or floating point output but when many are networked together, the potential for subtlety and precision is greatly increased. They can also have the ability to 'learn' from stimulus, thus allowing one to 'train' a neural network to give the correct output when the function is not easily expressed in objective terms.

To accomplish this, a system of weighting is used whereby neurons that produce correct results are given higher influence over the end result. Thus, a neural network that is given many examples and correct outcomes will eventually learn to reliably give the correct output. The architecture[2] of the neural network used in this project is shown below:



In order to process a data stream it is sometimes necessary to split it up into discrete units that may be individually addressed, rather than trying to continuously process the data in real time [3]. The neural network used is trained using music that is segmented into chunks 0.128s long with accompanying downbeat data. This is performed using the system above.

After segmentation has been achieved, the resulting segments must then be processed in order to extract the data pertaining to the presence of a musical downbeat. There are many methods for doing this, the four most reliable of which were trialled. These methods were as follows: Analysis of Chroma change, analysis of low frequencies, spectrum analysis, and melodic constant-Q transformation. [4]

The output from the aforementioned data extraction method is then fed into a neural network, which will have been previously trained using the samples obtained. The neural network will then detect the downbeats from this data.

References

1. M. W. Pedersen, "Training recurrent networks," in *Neural Networks for Signal Processing VII. Proceedings of the 1997 IEEE Signal Processing Society Workshop*, Amelia Island, FL, USA, pp. 355–364.
2. J. Chung, C. Gulcehre, K. Cho, and Y. Bengio, "Empirical Evaluation of Gated Recurrent Neural Networks on Sequence Modeling," *arXiv [cs.NE]*, 11-Dec-2014.
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4. S. Durand, J. Bello, B. David and G. Richard, "Robust Downbeat Tracking Using an Ensemble of Convolutional Networks", *IEEE/ACM Transactions on Audio, Speech, and Language Processing*, vol. 25, no. 1, pp. 76-89, 2017.

Building a training data generator for poker hand classification.

Jennifer Ada

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Risky Data Sources

- After evaluating other poker hand classifiers it was concluded that some existing datasets such as the popular UCI's dataset[1] presented risks for mis-training neural networks which classify poker hands by the rank or value of the hand[2][3].
- The probability of a hand appearing in the UCI dataset is proportionate to how likely it is to be drawn from a deck of cards (Figure 1). Therefore, to mitigate the small sample of high value hand labels in the dataset (I.e. Straight Flush), it would be necessary to produce equal samples of each set of values.
- This is necessary to ensure that the data did not cause a classifier to only learn to classify some poker hands and mostly fail to classify others. One classifier had an accuracy of 92% which is also the total of 2 out of 8 of the classes of hands that exist in the dataset.

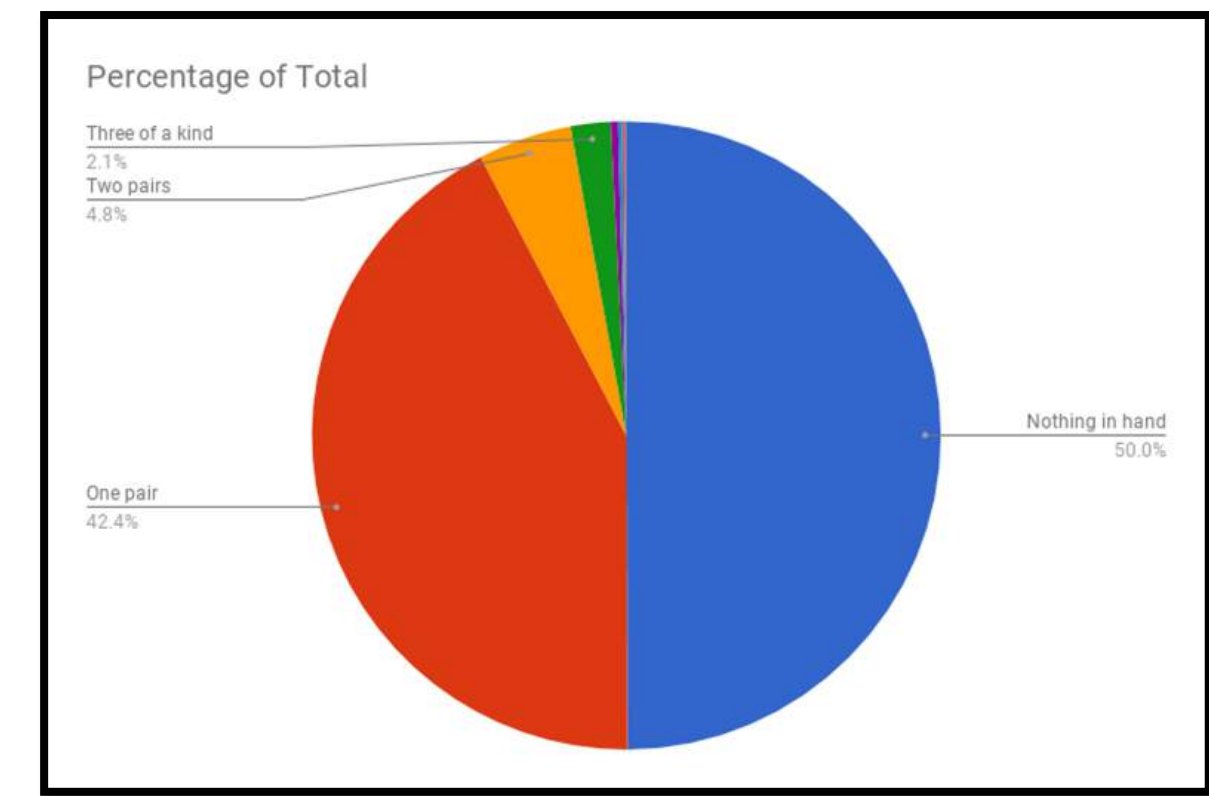


Figure 1 – Percentage of hand combination instances in UCI training data.

Objectives

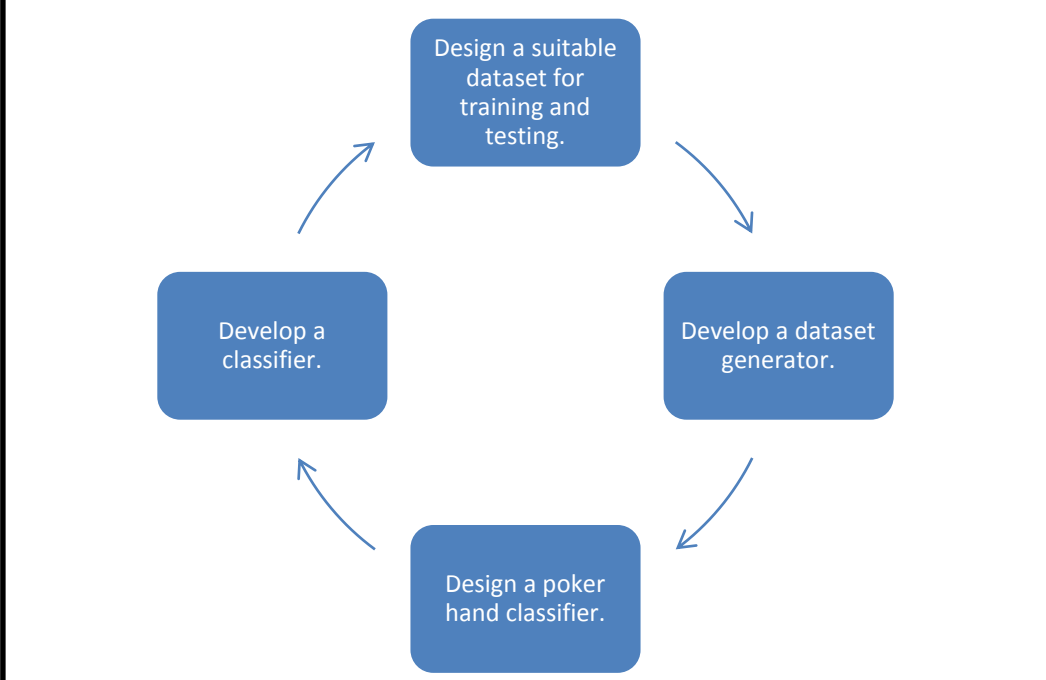


Figure 2 – Aims achieved through iteration.

Methods

- Objectives were composed of features.
- Each feature was prototyped separately as components which are then integrated into the core (Fig. 2).
- The TensorFlow[4] machine learning framework was used to design the target convolutional neural network allowing a layer of abstraction (Fig. 5,6).
- Python was used to develop a rules-based classifier (Fig. 4).
- The classifier was used to develop a data generator (Fig. 4), which adhered to the Unified Representation for Poker Games[5] (Fig. 3).

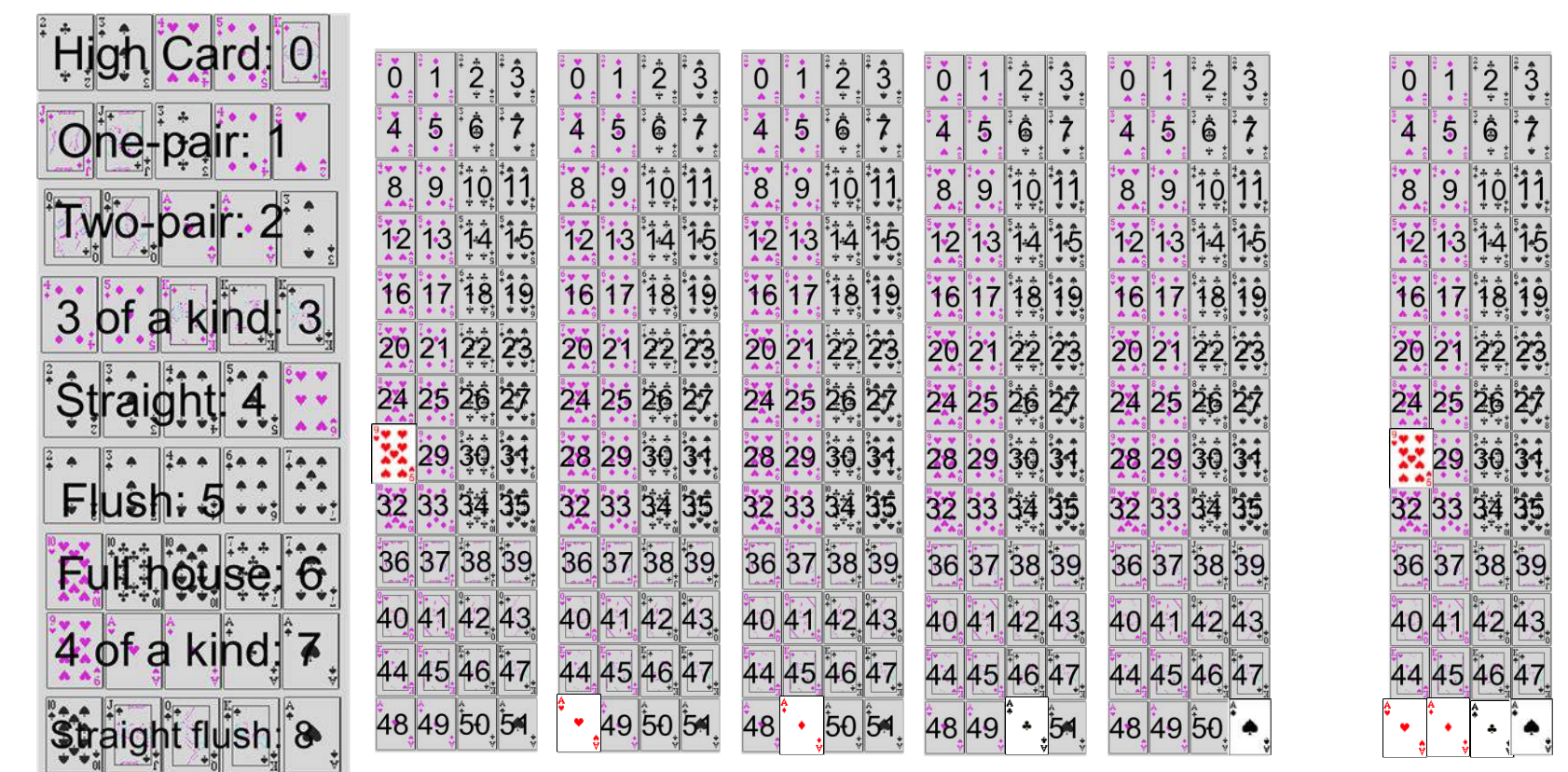


Figure 3 – Unified Representation for Poker Games Four of a Kind in CSV: "28,48,49,50,51,7"

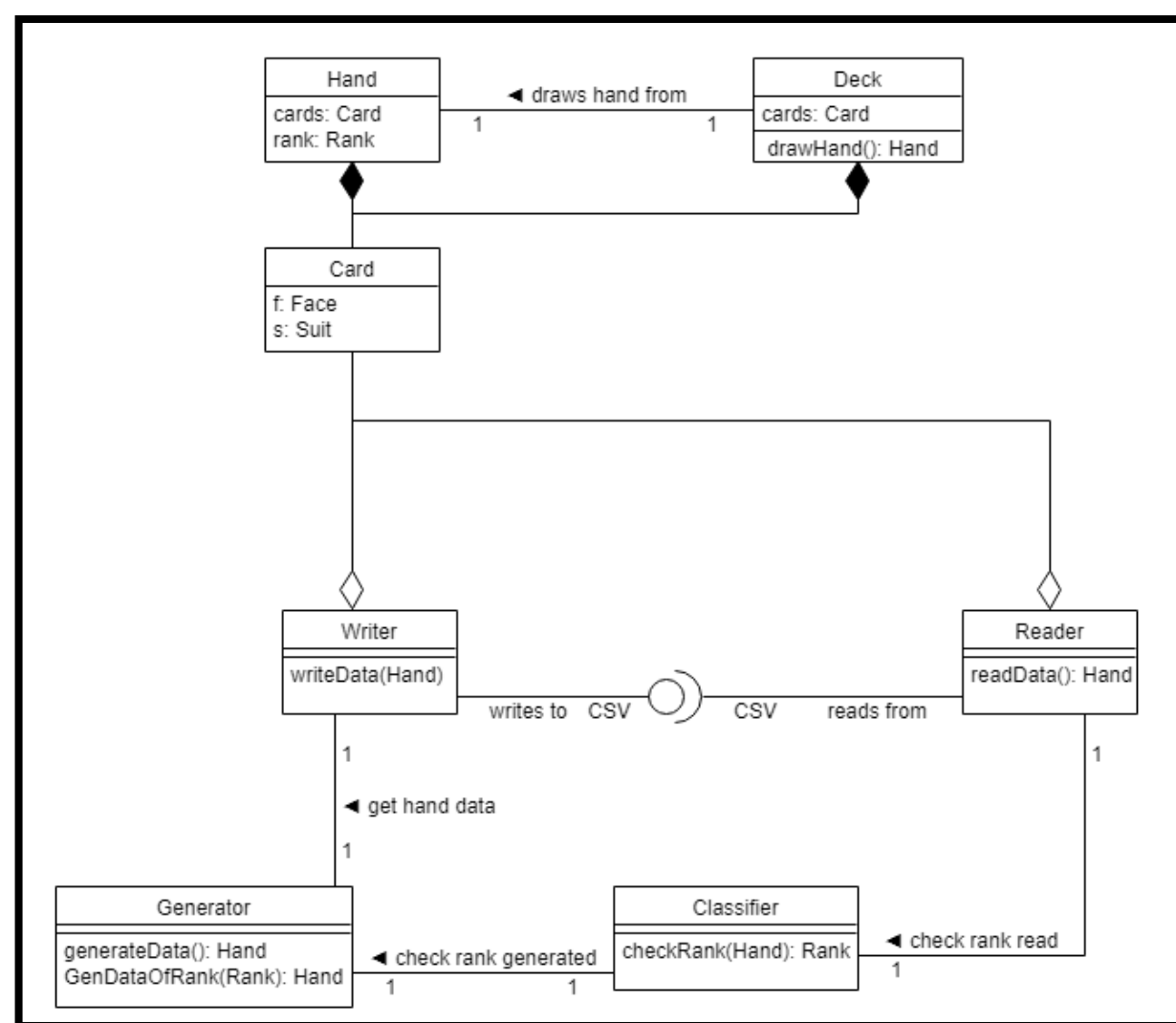


Figure 4 – Dataset Generator Design.

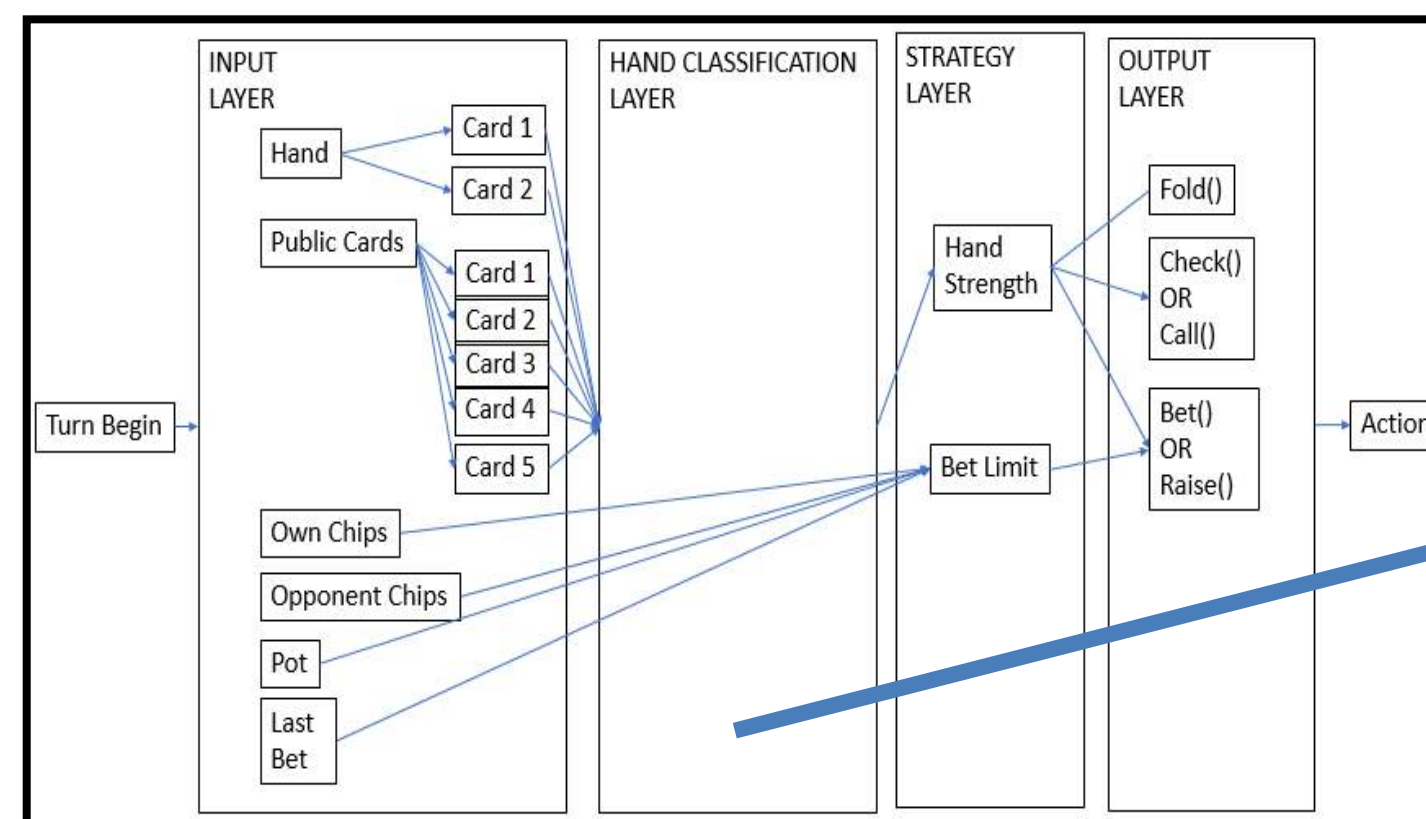


Figure 5 – Target Neural Network: Layers constitute modules based on the poker AI Loki's architecture[6].

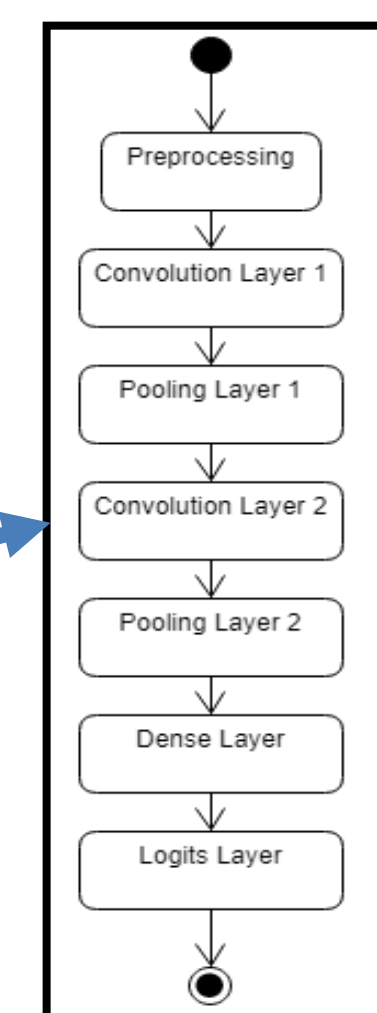


Figure 6 – Hand classifier convolutional neural network design based on Poker-CNN[5] and TensorFlow layers[4].

Outcomes

- Straight Flush hands were being generated slower than the other hands by a significant margin (3-4 hours for 1000 samples) because of the brute-force algorithm. The generator functions were benchmarked for time and the hypothesis was confirmed (Fig. 7,8).
- As a side-effect of developing a data generator, it was concluded that a rules-based classifier can achieve 100% accuracy as a result, this rules-based classifier may be used as a pre-processor for the neural network with the intention that this will reduce training time and resources while costing accuracy or flexibility.

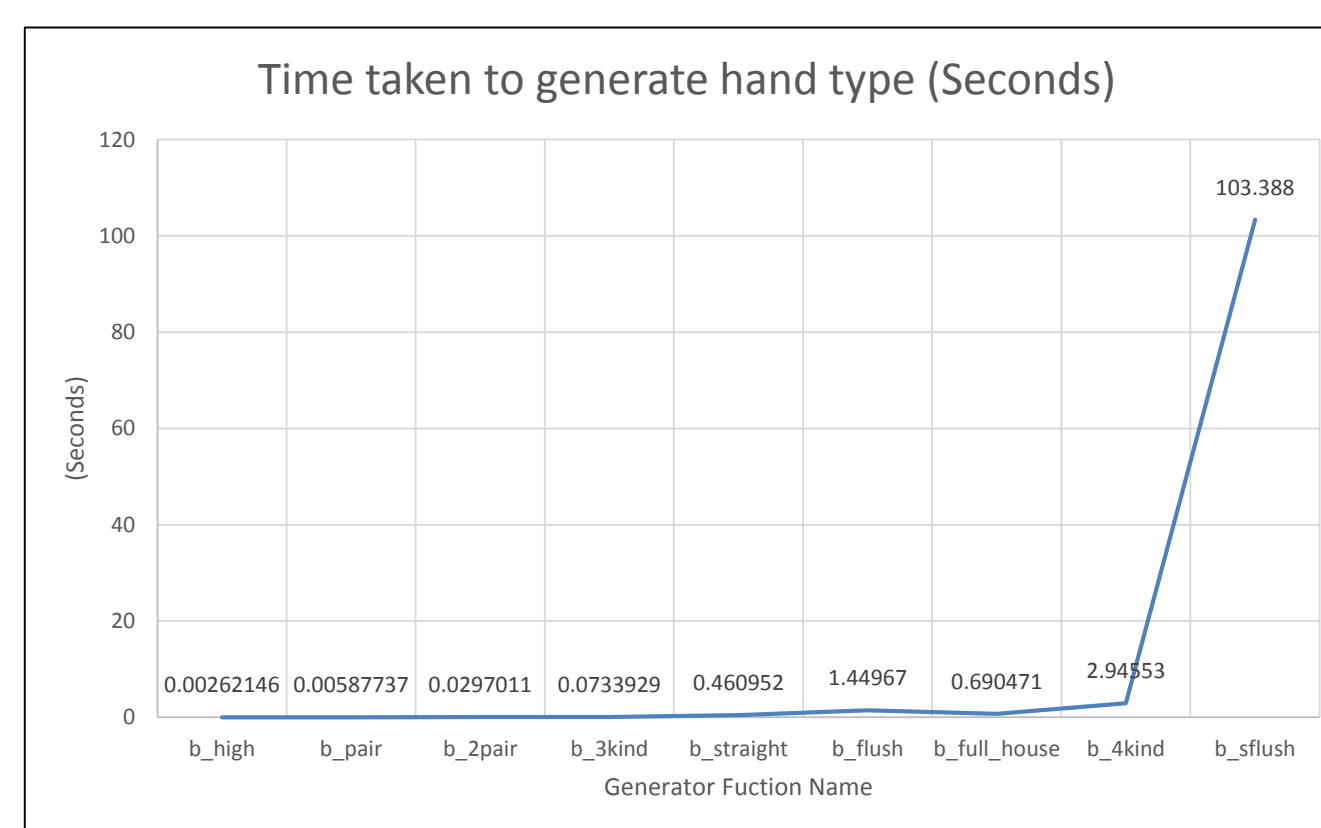


Figure 7 – Initial benchmarking data for hand generation functions in GetHandOfRank().

	Straight Flush (Seconds)	High Card (Seconds)
Largest value in Batch 1	324.2262	0.001387135
Largest value in Batch 2	80.70618	0.001200312
Largest value in Batch 3	60.4747	0.001842314
Largest value in Batch 4	59.34799	0.001567479
Smallest value in Batch 1	0.076061	0.000122569
Smallest value in Batch 2	0.059754	0.000101511
Smallest value in Batch 3	0.131379	0.000100971
Smallest value in Batch 4	0.027454	0.00010961
Average value in Batch 1	16.60548	0.000285814
Average value in Batch 2	11.22539	0.000270206
Average value in Batch 3	11.1925	0.000259257
Average value in Batch 4	9.944892	0.000263304
Largest value in all batches	324.2262	0.001842314
Smallest value in all batches	0.027454	0.000100971
Average value in all batches	12.24207	0.000269645
Sum of Batch 1	4234.397	0.072882622
Sum of Batch 2	2862.475	0.068902641
Sum of Batch 3	2854.088	0.066110553
Sum of Batch 4	2436.499	0.0671424

Figure 8 – Benchmarking summary for 250 sample batches.

Line #	Hits	Time	Per Hit	% Time	Line Contents
14					@profile
15					def parallel():
16	1	8.0	8.0	0.0	jobs = []
17	1	16.0	16.0	0.1	for i in range(4):
18	1	165.0	165.0	0.8	p = multiprocessing.Process(target=worker_sflush)
19	1	6.0	6.0	0.0	jobs.append(p)
20	1	19301.0	19301.0	99.0	p.start()

Figure 9 Line-by-line benchmarks parallelised code proved inconclusive.

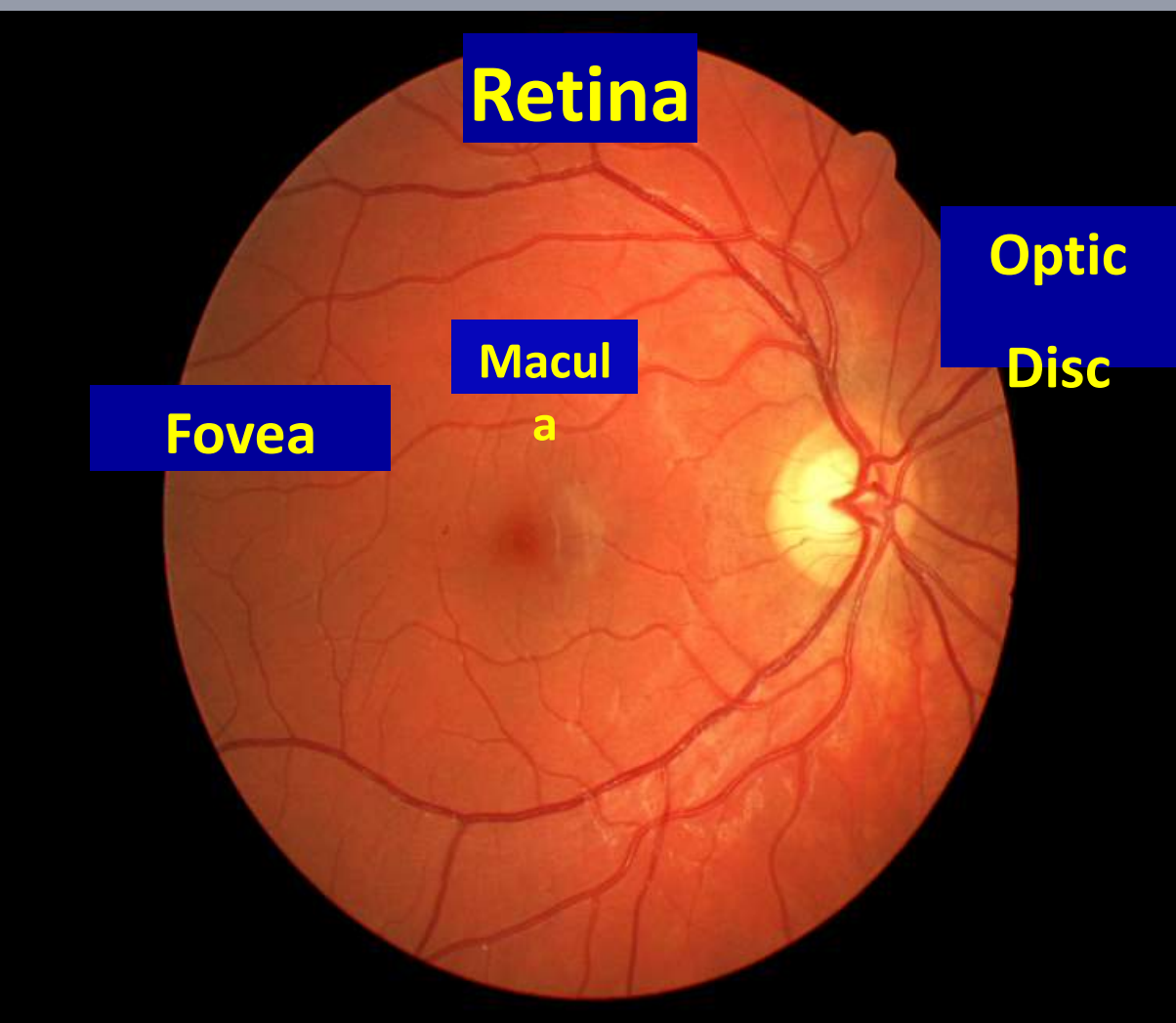
Conclusions and Future Work

- Investigation into parallelising the brute force algorithm indicates that it is faster than serial. Adequate benchmarking could not objectively verify (Fig. 9).
- UCI's dataset and data generated from this project should be used to train separate classifiers and their accuracy compared to confirm the initial hypothesis.
- Although inflexible, the rules based classifier which was necessary to develop for the data generator is accurate enough to be relied on as a classifier in its own right.

Failsafe NHS Diabetic Eye Screening Programme.

Diabetic Eye Screening Wales

Diabetic Eye Screening Wales is designed to detect sight threatening retinopathy at an early stage before visual loss occurs. Every eligible, registered person with diabetes in Wales aged 12 years and older is invited for regular retinal screening. The service is community based, delivering from clinics sites that are chosen to allow patients reasonable and equitable access.



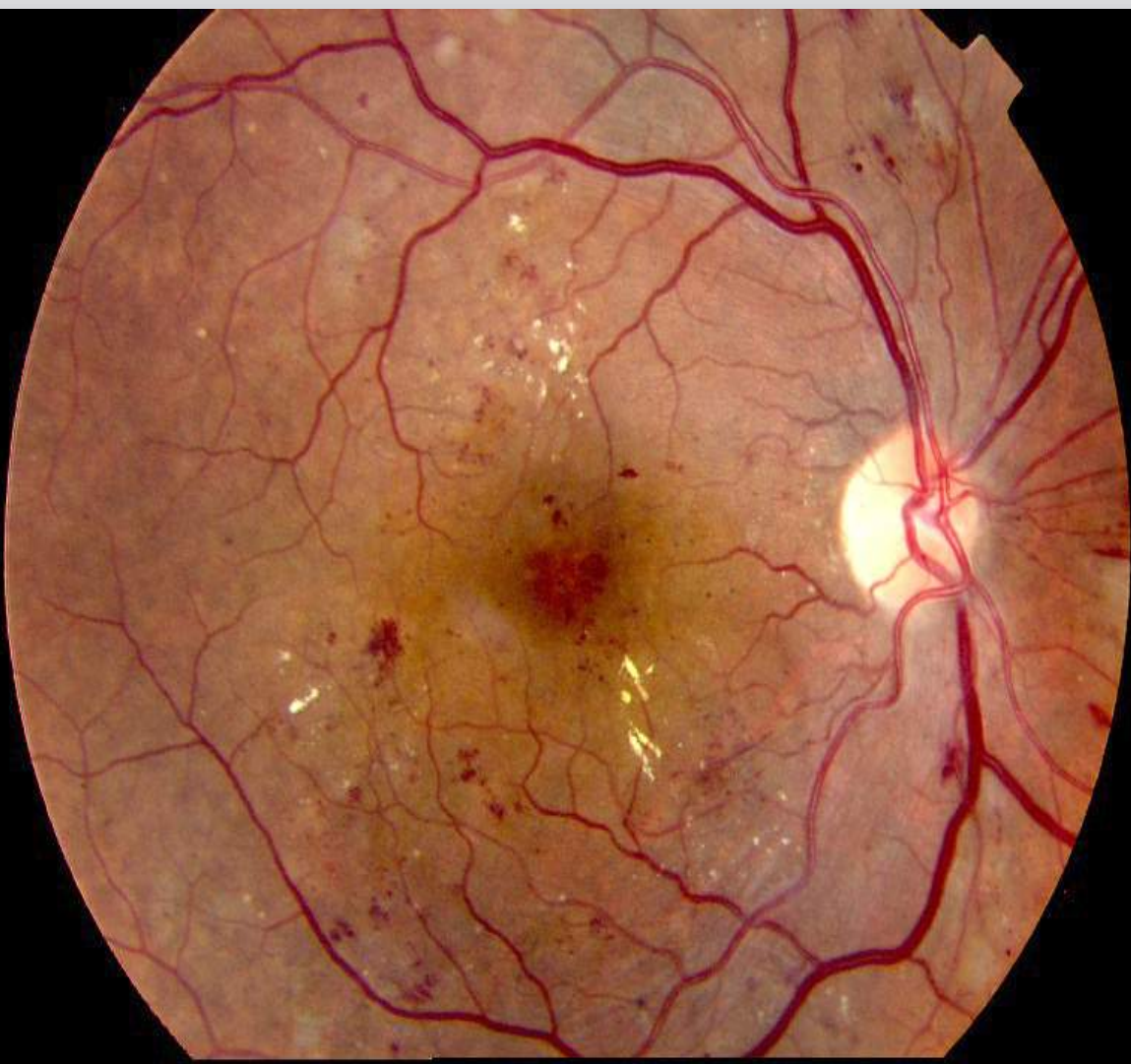
Anatomy of the Eye

What is Diabetic Retinopathy ?

Diabetic Retinopathy is a complication of diabetes caused by damage to the tiny blood vessels in the retina, as a result of high levels of sugar in the blood stream.

The small blood vessels at the back of the eye become damaged, and start to leak. This can lead to sight loss if left untreated.

Diabetic retinopathy may have no obvious symptoms until it is well advanced where treatment is likely to be less effective.



Maculopathy

Aims

The Main Aims of my project is to interrogate the DESW Optimize database and produce through SQL a Number of server based reports (SSRS) while following Information governance guidelines and the Diabetic Eye Screening Failsafe procedures.

To Map the worst cases of Retinopathy in Wales through Mapinfo to determine if Diabetes is more prevalent in Deprived areas.

To develop a dashboard for the Diabetic Eye Screening Wales Management level Key Performance Indicators .

SSRS Failsafe Report

Please Choose Current State		StateAwaitingCareOphtha		Please Choose Hospital Location		Bronglais General Hospital 1		
Please Choose Clinician		Adrian (Consultant Paediatric)		Please Choose Diabetes Type		Type 1, Type 2, Other, MODY		
Eligible Active (12-17)								
Patient Id	Registration Date	Age	Diabetes Type	Town	Hospital Location	Clinician	Current State	Next Pending Event Date
287002	12/19/2017	17	Type 1	Bridgend	Princess of Wales Hospital (Diabetic Centre)	D'Souza (Consultant Paediatrician)	StateAwaitingCareOphtha	1/9/2019
279238	5/19/2017	14	Type 1	Port Talbot	Neath Port Talbot Hospital - Paediatrics	Mann (Consultant Paediatrician)	StateAwaitingRecallForScreening	1/8/2019
158521	7/21/2008	15	Type 1	Cardiff	West Wales General Hospital	Fountain-Polley (Consultant Paediatrician)	StateAwaitingRecallForScreening	1/7/2019
185659	2/10/2008	16	Type 1	Bridgend	Princess of Wales Hospital (Diabetic Centre)	D'Souza (Consultant Paediatrician)	StateAwaitingRecallForScreening	1/7/2019
269988	9/15/2016	13	Type 1	Swansea	Morriston Hospital	Bidder (Consultant Paediatrician)	StateAwaitingRecallForScreening	1/7/2019
187279	6/25/2010	17	Type 1	Cardiff	University Hospital of Wales (Diabetology)	Warner (Consultant Paediatrician)	StateAwaitingRecallForScreening	1/6/2019
220737	12/6/2012	17	Type 1	Barry	University Hospital of Wales (Diabetology)	Warner (Consultant Paediatrician)	StateAwaitingRecallForScreening	1/6/2019
275752	2/8/2017	16	Type 1	Rhyl	University Hospital of Wales (Diabetology)	Bhardvaj (Consultant Paediatrician)	StateAwaitingRecallForScreening	1/6/2019
184391	4/14/2010	13	Type 1	Blackwood	Royal Gwent Hospital (Paediatrics)	Hawkes (Consultant Paediatrician)	StateAwaitingRecallForScreening	1/5/2019
185317	5/6/2010	15	Type 1	Cardiff	University Hospital of Wales (Diabetology)	Warner (Consultant Paediatrician)	StateAwaitingRecallForScreening	1/5/2019
225640	8/6/2013	16	Type 1	Wrexham	Wrexham Maelor Hospital - Paediatrics	Weerasinghe (Consultant Paediatrician)	StateAwaitingRecallForScreening	1/5/2019
59424	3/19/2008	14	Type 1	Mountain Ash	Prince Charles Hospital - Paediatrics	Quanghaes (Consultant Paediatrician)	StateAwaitingRecallForScreening	1/4/2019
209541	2/6/2012	12	Type 1	Swansea	Morriston Hospital	Bidder (Consultant Paediatrician)	StateAwaitingRecallForScreening	1/4/2019
272426	11/28/2016	15	Type 1	Maesteg	Princess of Wales Hospital (Diabetic Centre)	Jan (Consultant Paediatrician)	StateAwaitingRecallForScreening	12/30/2018
156049	6/20/2008	17	Type 1	Neath	Neath Port Talbot Hospital - Paediatrics	Mann (Consultant Paediatrician)	StateAwaitingRecallForScreening	12/29/2018
193758	2/6/2011	17	Type 1	Port Talbot	Neath Port Talbot Hospital - Paediatrics	Mann (Consultant Paediatrician)	StateAwaitingRecallForScreening	12/29/2018
283957	10/12/2017	12	Type 1	Whitland	West Wales General Hospital	Fountain-Polley (Consultant Paediatrician)	StateAwaitingRecallForScreening	12/29/2018
287935	1/18/2018	16	Type 1	Cowbridge	Princess of Wales Hospital (Diabetic Centre)	D'Souza (Consultant Paediatrician)	StateAwaitingRecallForScreening	12/29/2018
176105	10/7/2009	13	Type 1	Gwynedd	Bronglais General Hospital	Fountain-Polley (Consultant Paediatrician)	StateAwaitingRecallForScreening	12/29/2018
288295	1/20/2018	12	Type 1	Merthyr Tydfil	Prince Charles Hospital - Paediatrics	Quanghaes (Consultant Paediatrician)	StateAwaitingRecallForScreening	12/29/2018
156673	7/1/2008	13	Type 1	Cardiff	University Hospital of Wales (Diabetology)	Warner (Consultant Paediatrician)	StateAwaitingRecallForScreening	12/25/2018
540355	10/10/2015	14	Type 1	Swansea	Morriston Hospital	Bidder (Consultant Paediatrician)	StateAwaitingRecallForScreening	12/25/2018

Geographical Information System, MapInfo. Worst Cases of Retinopathy mapped to the most deprived areas of Wales

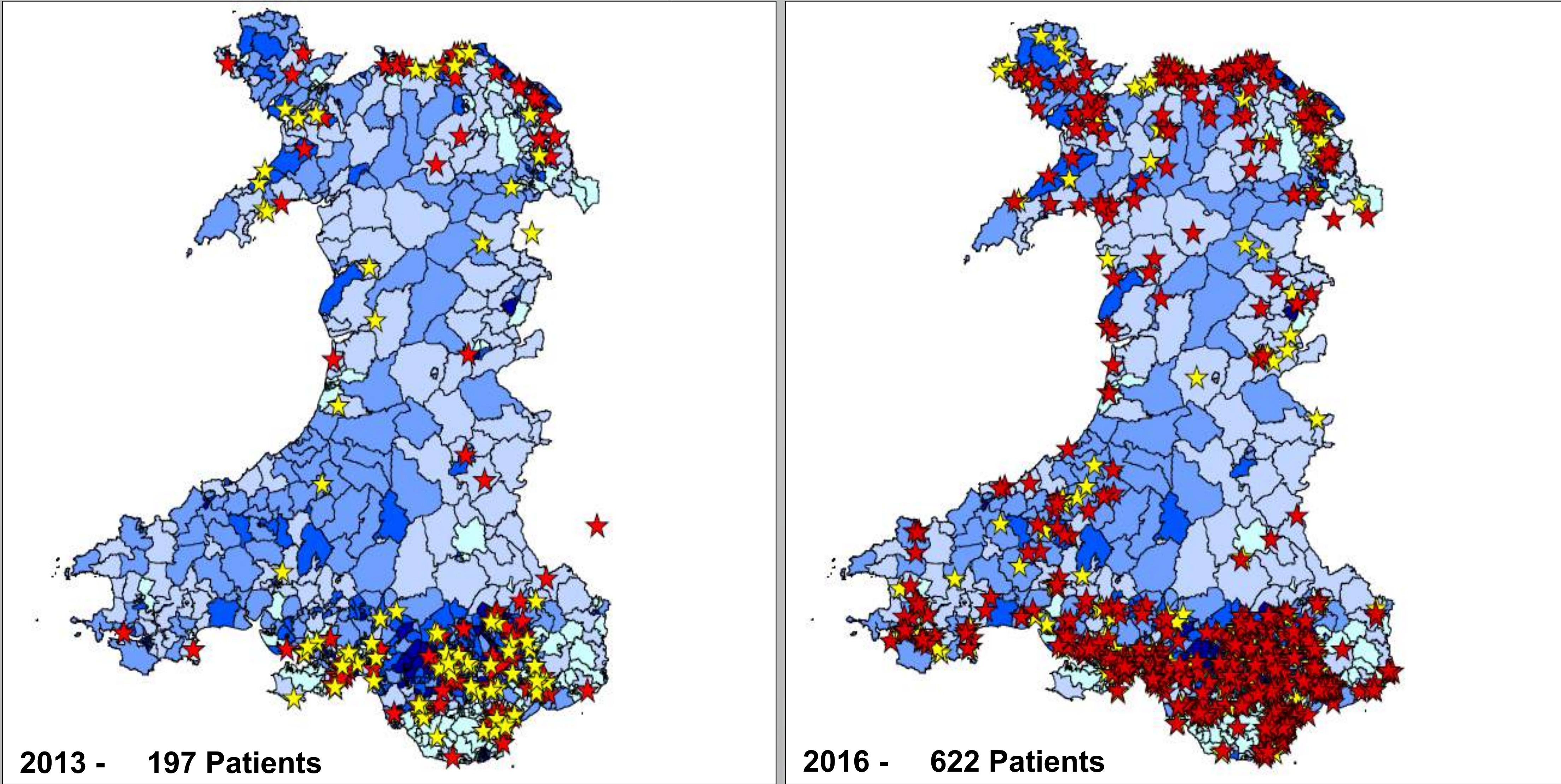
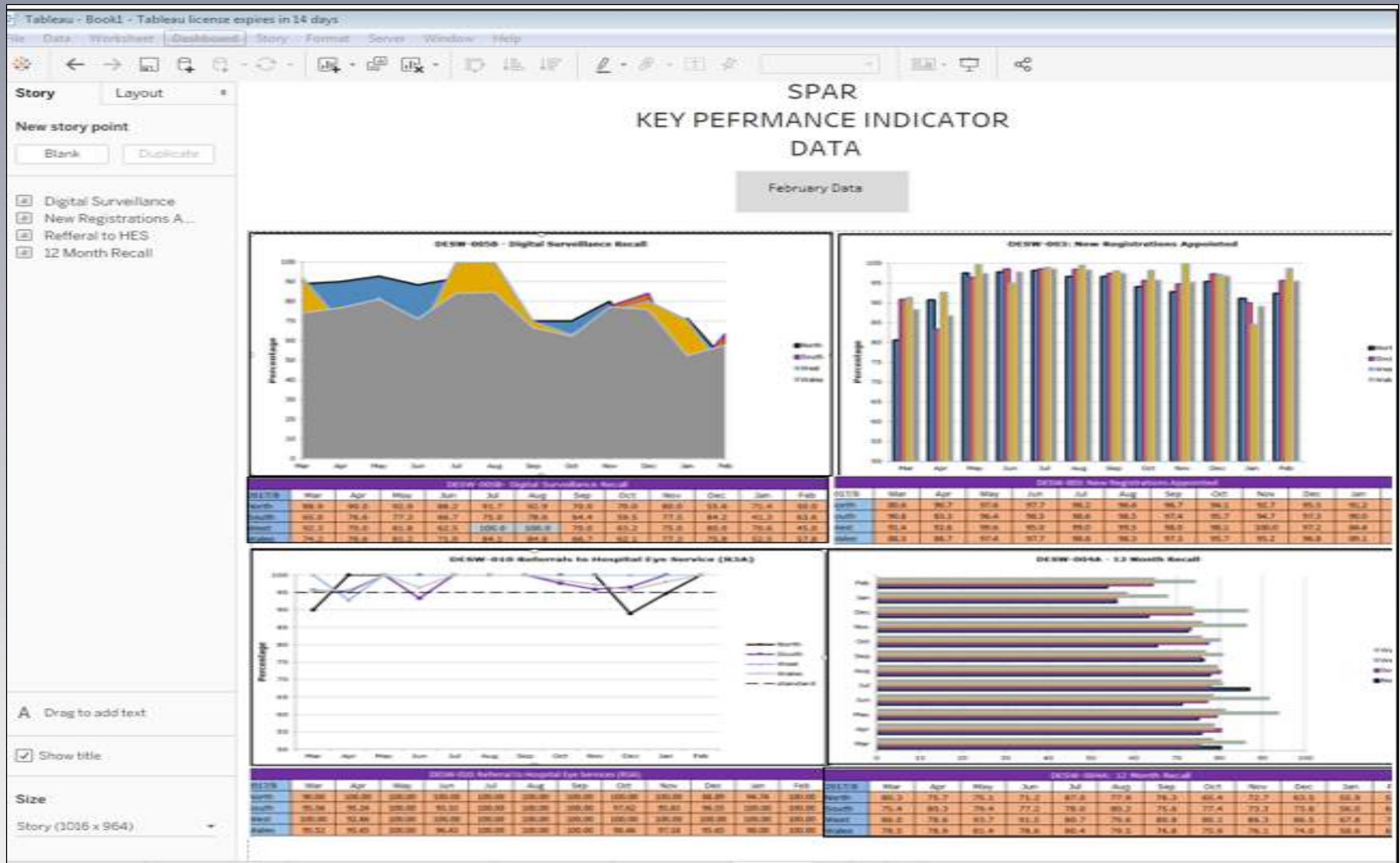


Tableau Dashboard



Deliverables

SSRS Report – to be created from the Optomize Database through Microsoft SQL Server Report Builder.

GIS – Worst Cases of Retinopathy to be created through MapInfo Professional 11.5

Tableau Dashboard – to be created through Microsoft SQL Server Report Builder and Tableau.

Conclusion

Having now reached the end of the project there is now a completed Failsafe Process in place. The project has run smoothly with the SSRS Reports being developed ahead of schedule. The delivered SSRS Reports are fit for purpose and are being used daily to make sure all eligible Diabetic patients are placed on the correct pathway and being recalled for their next screening appointment in a timely manner.

The GIS Maps have been welcomed by The Grading Manager in Diabetic Eye Screening Wales, He has requested more information mapping information to be produced for different cohorts of patients to examine trends. The Admin department have also taken an interest in the Mapping Facility and would like the clinics mapped separated by Local Health Board, so the admin staff can book appointments easier.

The Tableau Key Performance Indicators have now been submitted to The Public Health Wales Executive Board for the first time in April 2018, there is no feedback at present.

Future Work

Previous research for risk-based screening makes a compelling clinical case to appoint low-risk patients every two years, rather than the existing one-year recall.

A low-risk is defined as a patient whose last two screening encounters were either:

- For routine digital screening
- Final graded as R0M0
- Separated by at least one year of time. [1]

Acknowledgments

[1] Extending diabetic eye screening intervals for people at low risk of developing sight threatening retinopathy: <https://legacyscreening.phe.org.uk> [Online]. Last accessed 10/02/2018
(WEBSITES)
<http://www.eyecare.wales.nhs.uk/drssw>
<http://www.eyecare.wales.nhs.uk/news/45815>

Heating and Temperature Control using Wireless Sensors

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1. Introduction

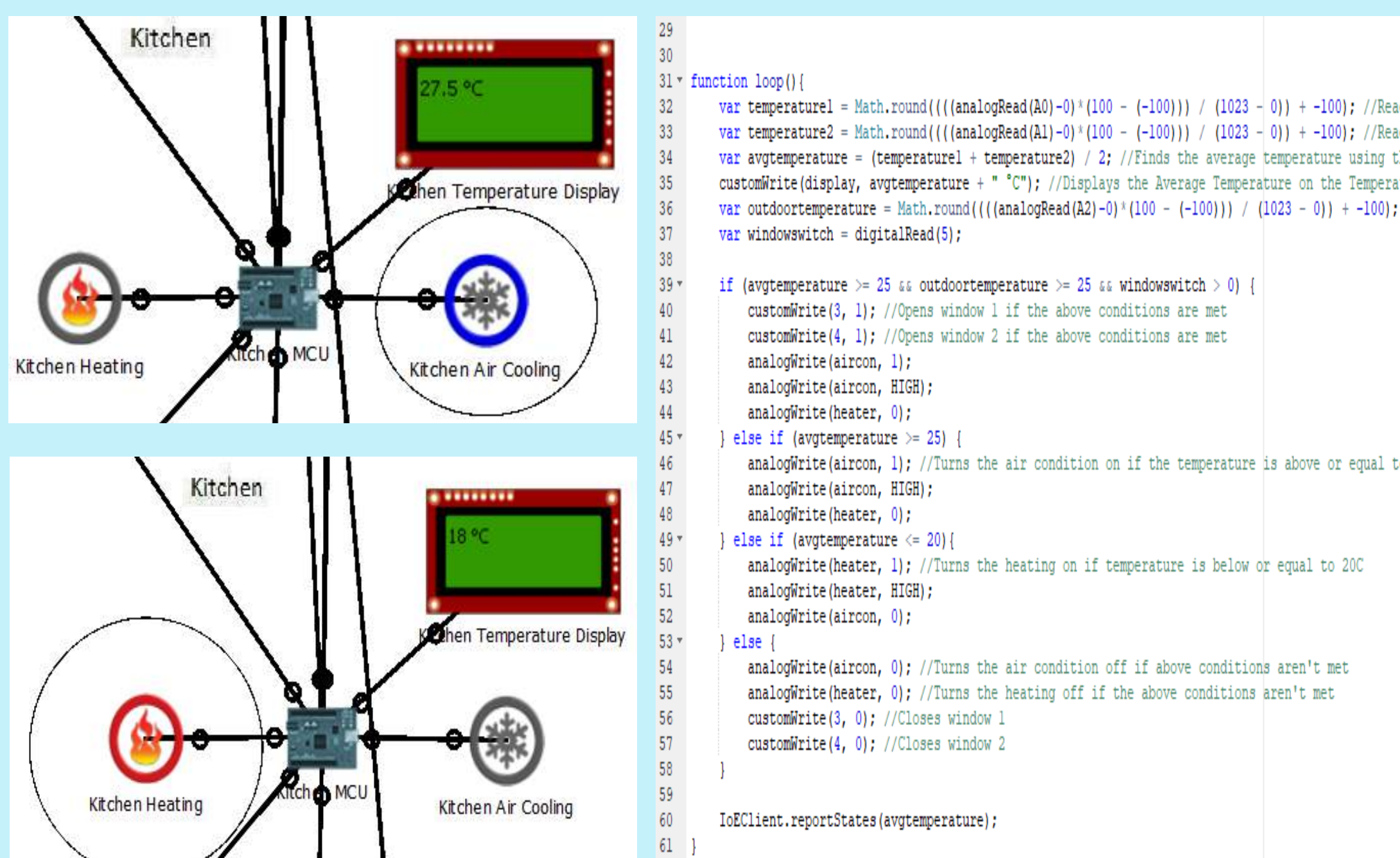
Wireless Sensor Networks (WSNs) are clusters of sensor devices, also known as nodes, which monitor changes within the environment and relay that data to a central receptor [1]. Examples of WSN deployment exist within Smart Homes, which utilise Internet of Things (IoT) technology. IoT utilises smart devices in conjunction with sensor devices to automate device behaviour based on changes detected within the environment [2]. Wireless devices use various wireless communication protocols, such as ZigBee, Z-Wave and Bluetooth, in order to communicate with, and transmit data to, other devices within the WSN [3].



Bluetooth Logo and Wireless Data Transfer

3. Results

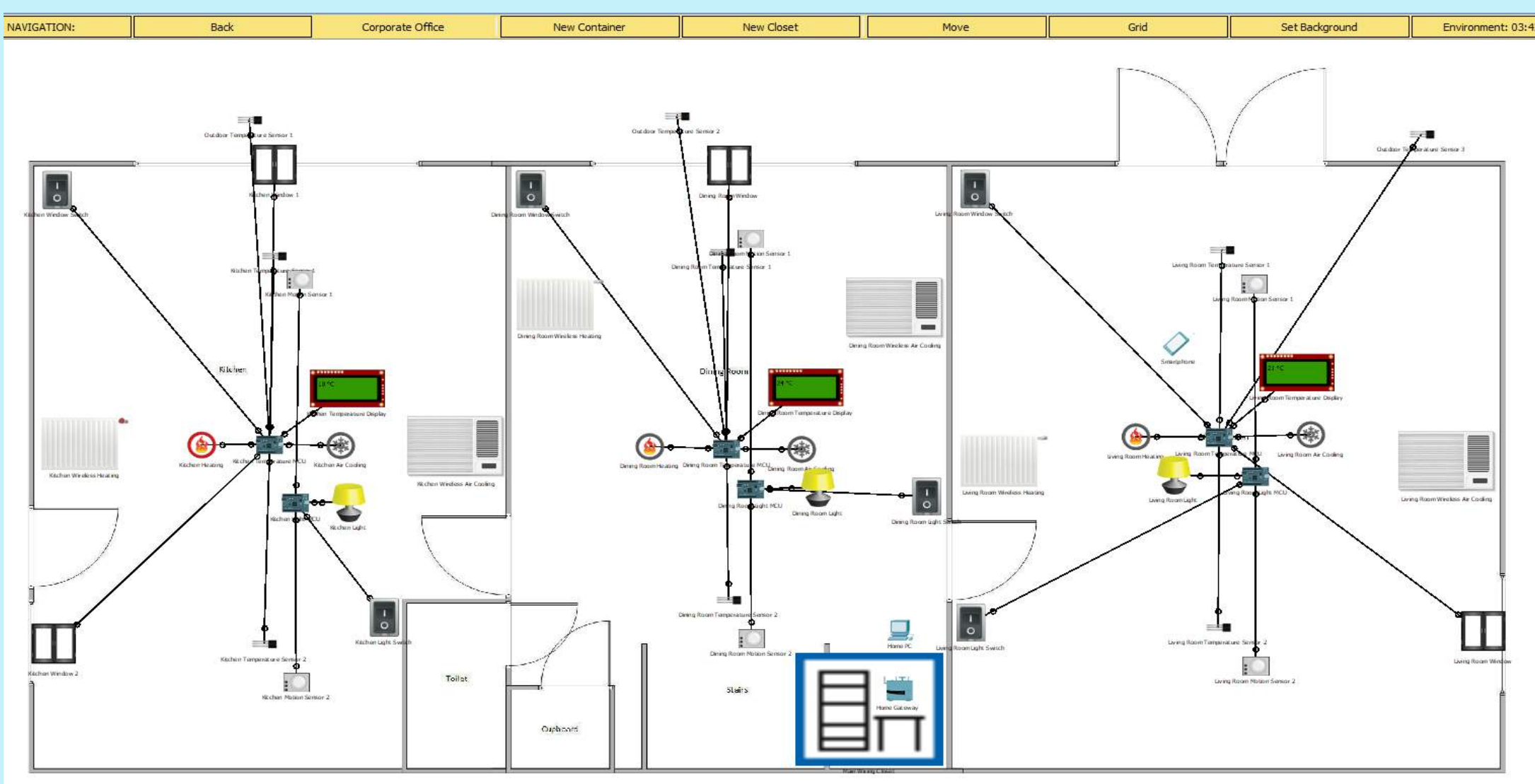
The WSN was successful in analysing and control the ambient temperature within the simulation. Once temperature levels exceeded 25 °C, the network successfully initiated air cooling devices to reduce temperature levels. Equally, once temperature levels dropped below 20 °C, heating was activated to raise temperatures. This keeps temperature levels at preprogrammed levels. Programming used within the network can also be transferred to physical devices to achieve similar outcomes.



Results View and Program

2. Implementation

A WSN was designed within Packet Tracer simulation software to test the functionality of a WSN capable of automated temperature control. Multiple temperature sensors were setup in different areas of a room to monitor and report the temperature to a central Arduino board. A simulated temperature environment was created in Packet Tracer which would act as the effect which each sensor would detect. The Arduino board was programmed to calculate the average room temperature by analysing readings from various sensor devices, and display this information on screen and to a central IoT Server for remote monitoring. Based on temperature readings, the Arduino program sent a signal to either air cooling or heating devices to control ambient temperature. The simulation also includes light control which, while not entirely related to the project aim, does show that WSNs can be used to control a variety of different devices.



WSN Layout

4. Conclusion

The project aim was to create a WSN to automate temperature control. This was achieved, and the project demonstrated the capability of implementing a WSN which can automate temperature control. Arduino boards or server devices and sensors capable of wireless communication, such as Monnit or PASCO, can be used to create WSNs to automate room temperature, lighting or other everyday aspects.

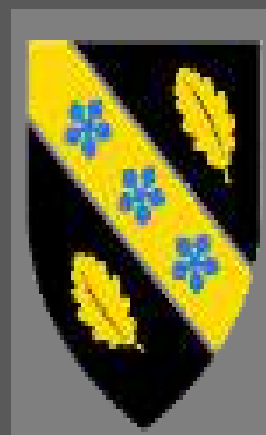
5. Future Work

Certain changes would be made to improve upon the project in the future. These include:

- Creation of a physical network. This would allow for gathering of data over a time period, analysing the efficiency and longevity of different sensor devices and proving the transferability of skills from the simulated to physical devices.
- Incorporating additional devices. Due to limitations of knowledge, certain devices were excluded from the project. Devices such as light sensors could be utilised to further control the network with a greater accuracy.

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- [3] R. Krejčí, O. Hujňák and M. Švepeš, "Security survey of the IoT wireless protocols," *2017 25th Telecommunication Forum (TELFOR)*, Belgrade, Serbia, 2017, pp. 1-4.
- [4] Bluetooth Image, "https://www.codenameone.com/img/blog/bluetooth.jpg", Date Accessed 29 Apr. 2018.
- [5] Wireless Data Transfer Image, "https://www.comsoc.org/sites/default/files/styles/blog_image/public/blog_images/wirelessdata650.jpg", Date Accessed 29 Apr. 2018.



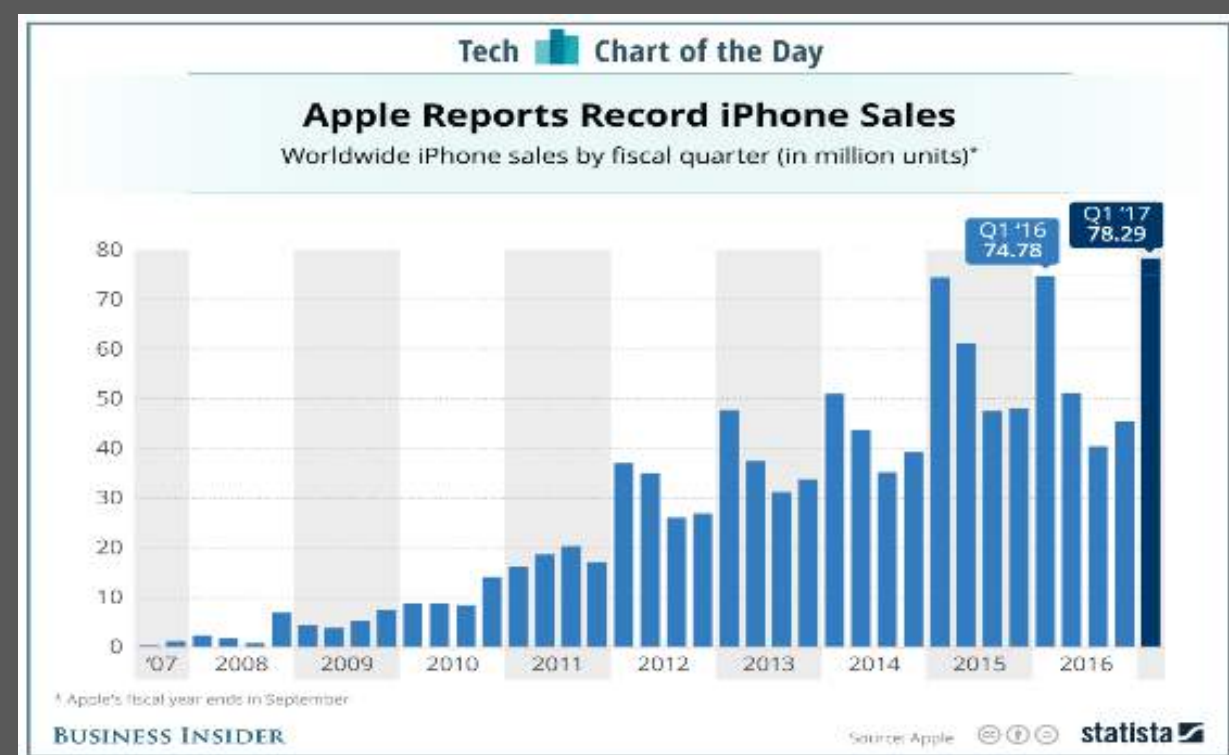
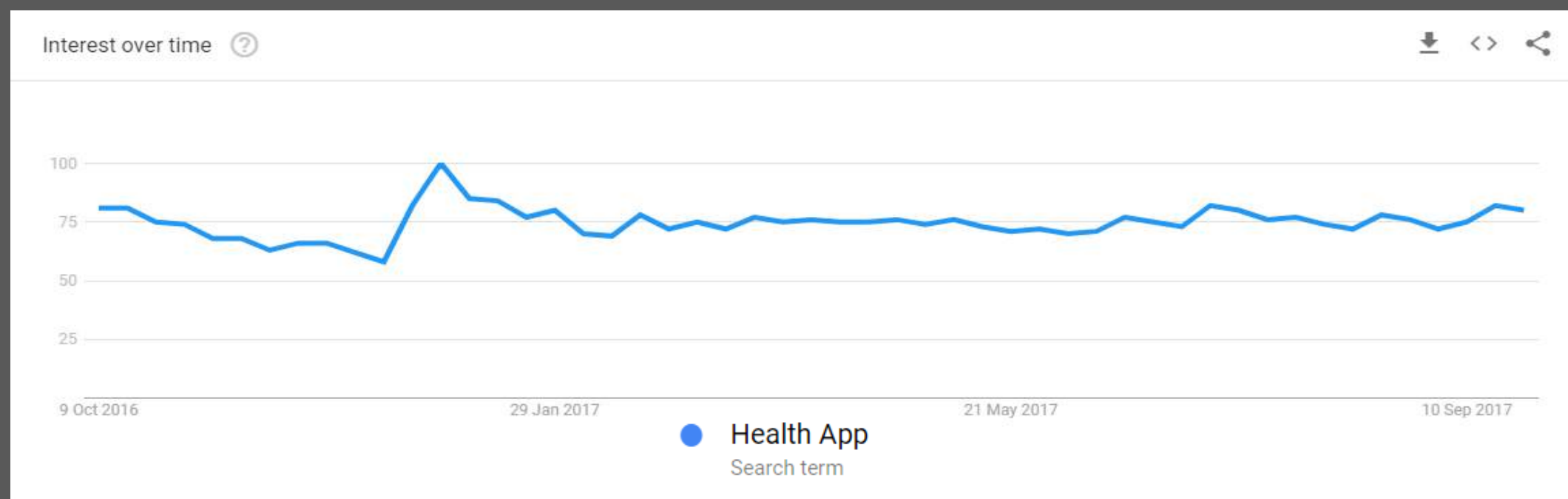
MedMe Application.

Introduction

This application was created as a way for people who suffer from epileptic conditions to help manage and control either for a period of time or for life while also being useful in an emergency situation should a seizure happen.

Findings:

The graph below from Google trends shows that this is something people are interested in and that there is a steady increase in demand for such an application as more people are searching for health applications.



After seeing the demand for such an application I then researched how many people could actually download the app (78.29 Mil as of 2016) to ensure that there was a high demand and large market for the application.

Aims & Objectives

Aims:

- Raise awareness of epilepsy and its complexity.
- Allow those who suffer from epilepsy or seizure based conditions peace of mind and the ability to manage their medication and condition.

Objectives:

- Develop a mobile application that allows the user to store medication, condition, personal details and a notes area for custom information with a emergency button on the lock screen in the event of a seizure.
- A medication reminder for when they need to collect it.
- Preform a pilot and live survey to understand peoples opinions on such an application.

Description

The application will hold data such as:

- Name.
- Age.
- Epilepsy details.
- Medication/Reminder.
- Side effects.
- Next of kin contact details.
- Last known incident and details.
- List of Triggers.
- Notes.

The application will be made in XCode using the Apple made language Swift 3. Information will be stored on the device in the CoreData.

The use of survey will be used along with research from the literature review to decide the final requirements and features of the application so that it can meet all its users needs and aim to become a life changing application.

Carrier 10:53 AM
Details

Name:
Josh Rowland

Contacts:
Dad: 0785467883

Address:
15c William Road

Conditions:
Myoclonic Epilepsy

Triggers:

Condition Reminder All Details Your Details More

Carrier 10:53 AM
Triggers:

Sleep Deprivation

Last Incident
12/5/2017

Medication:
Levetiracetam

Dosage:
500mg

Condition Reminder All Details Your Details More

Carrier 10:53 AM
Medication:

Levetiracetam

Dosage:
500mg

Side Effects:
None

Notes:
Allergic to peanut
Currently using pain killer for leg injury

Condition Reminder All Details Your Details More

Carrier 11:10 AM
Reminder

Repeat Weekly: ☒

Set Reminder

Condition Reminder All Details Your Details More

Carrier 11:00
Sunday, April 29

MEDME now

Medication reminder!
Collect medication today!
Press for more

Press home to open

The target audience is anyone who has epilepsy or a seizure based condition and an Apple device. The application could even be used by parents of children who are too young to use or own an Apple device.

Outcome

The outcome resulted in a functioning mobile application that can help the user manage their epilepsy for as long as they need it. This will provide an efficient and easy way for Apple users to monitor not only their health but that of family members who are unable to use the application themselves by downloading it on their mobile device instead.

The application has been a success as most of the requirements were met and the applications features work. The few who tested the final product used it without issue or error.



The application could still improved to have a cloud backup feature in the event the data is lost. Ideally it would be able to link to a smart watch than can monitor your heart rate and health which can register if the user is having a seizure and send an emergency ping out with GPS location to emergency services to ensure the user is treated.

References::

Search Graph: <https://trends.google.com/trends/explore?q=Health%20App>
Apple report bar graph: <http://uk.businessinsider.com/apple-iphone-sales-yearly-chart-2017-2?r=US&IR=T>
iPhone: <http://www.fanshare.com/gallery/photos/16862321/iphone-transparent-background-3dglavioq>
Cloud Benefits: <http://www.kent-fms.co.uk/what-is-the-cloud/>

MedMe underwent Test Driven Development and unit testing in order to achieve minimal errors and issues. This was the most suitable development method for this application as XCode allows the developer easy control over each individual page and the system as a whole. Those who tested it found it easy to use and had no misunderstandings or unexpected errors. They found the UI very easy to understand without over complicating features.

Building a Secure Home Network

Justin Rastatter jrastatter.141652@student.uwtsd.ac.uk

Introduction

This project was based on researching the fundamentals of home networking and being able to implement that research into building a secure home network, throughout this project It look at the number of threats and issues that home network face on a daily basis and how to protect your network from such attacks.

Aims and objectives

The main aim of this project was to be able to build a secure home network the objective of the report was as follows.

- To gain an understanding of security issues with current home networking.
- To understanding the multiple threats that can affect networking and how to deal with them.
- To determine what protocols to use for the home network.
- Plan a layout of the network and where to place equipment.
- Implement the information gained to plan and begin creating the home network.

Research

With this project there was a number of areas researched which can affect home networking this included DDoS attacks and the different types of DDoS attack (Botnets) ping of death floods. It also covers issues such as ransomware and how to help protect your network/devices from it. It also cover the wireless networking aspect of a home networking since most if not all home have a wireless router, it covers what you should do when getting a new router like change the default usernames and password, the pros and cons of hiding your SSID. Also why you should have a solid antivirus/antimalware on your devices.

Implementation

Taking the information from the research, the building stage of the project started, a plan was created to cover a 2 floor environment(average floors in a home), the project used the Super Hub router provided by Virgin media which was already in use before the project, since these routers aren't that great an external wireless router was used, the plan also included an extra port switch on the 2nd floor of the network, the virgin media super hub was switched to its modem mode which turns off the Wireless aspect of the router, the new router being implemented was the Asus RT-AC66U Wireless-AC1750 Gigabit Dual-Band Router.

This router has a lot more features and security settings than the standard router from the ISP and also came with a mobile app which you can use anywhere to control your network.

This app will show you whos on the network and how much bandwidth they are using, it also allows you to either block their internet access or limit their bandwidth usage.

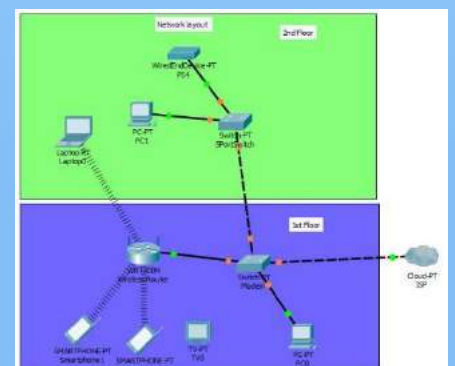
Once the network was setup the configuration started this included changing the defaults of the new router like changing the SSID names or hiding the SSID, change the passwords to something much stronger and harder to crack.

Antivirus was also installed on all devices within the network which could use antivirus software, the one used for the project was Bull Guard this offers real-time protection, adds rules to the firewall automatically of know malicious programs and also show what sites are safe to use when browsing the internet.



References

1. D. Cameran, "Flashlight Apps Snuck Malware Into Google's Play Store, Targeting Bank Accounts
2. Norton, "What is a Botnet?," [Online]. Available: <https://uk.norton.com/internetsecurity-malware-what-is-a-botnet.html>.
3. "Cost of a DDoS Attack," Radware, 19 September 2016. [Online]. Available: <https://www.radware.com/documents/infographics/cost-of-a-ddos-attack>.
4. Cisco, "What is a DDoS Attack?," Cisco
5. N. I. Elisa Bertino, "Botnets and Internet of Things Security," *Botnets and Internet of Things Security*, vol. 50, no. 2, pp. 76-79, 2017
6. "What is a Botnet and How to Prevent Your PC from being Enslaved," Hiemdal Security, 18 February 2016



Investigating Detection Techniques For Real Time Tracking Of Billiard Balls

Overview

- Real time object tracking has become a core an integral part of many systems within sports.
- This research focused on the object detection aspects within billiard sports (specifically Snooker).
- A number of detection techniques were developed and tested within a real environment.
- The accuracy and performance results were analysed to identify the most suited techniques.

Setup Diagrams

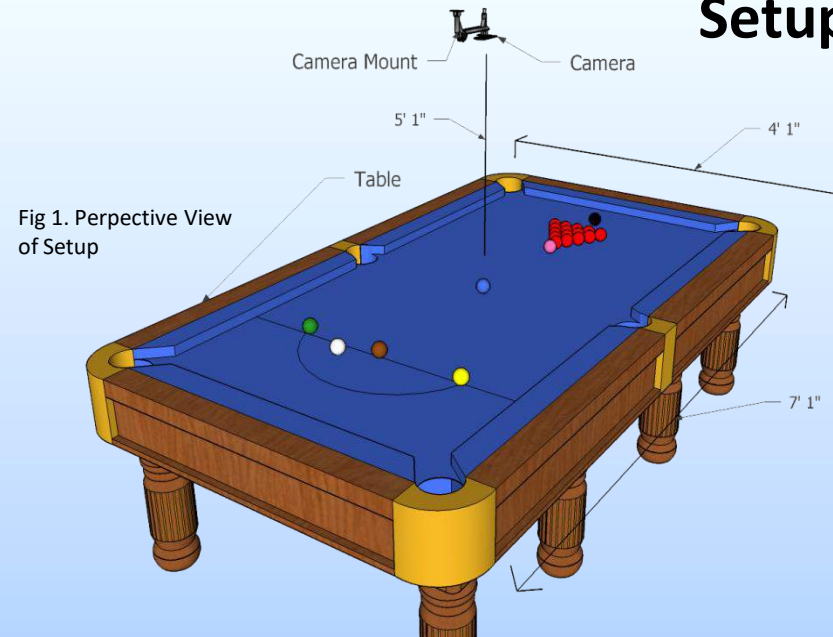
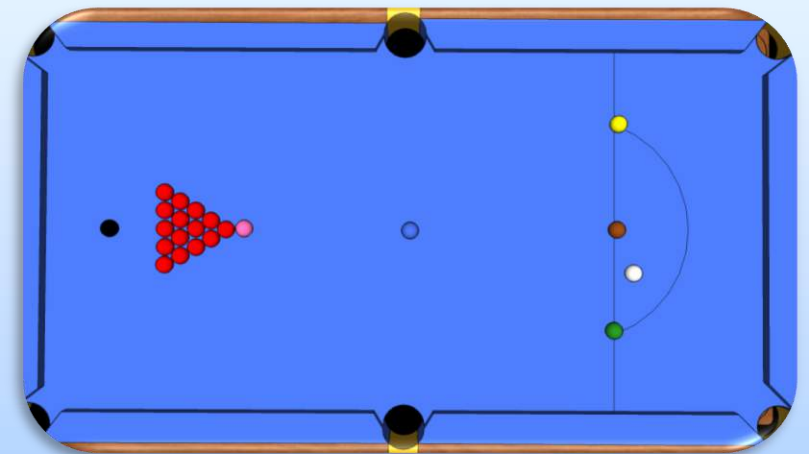


Fig 1. Perspective View of Setup

Fig 2. Initial Camera View



Test Environment

- Snooker/pool table with a single fixed camera mounted directly above it.
- A mobile phone (Android) was used as the camera and processing unit.
- Red, yellow and white ball were tested.

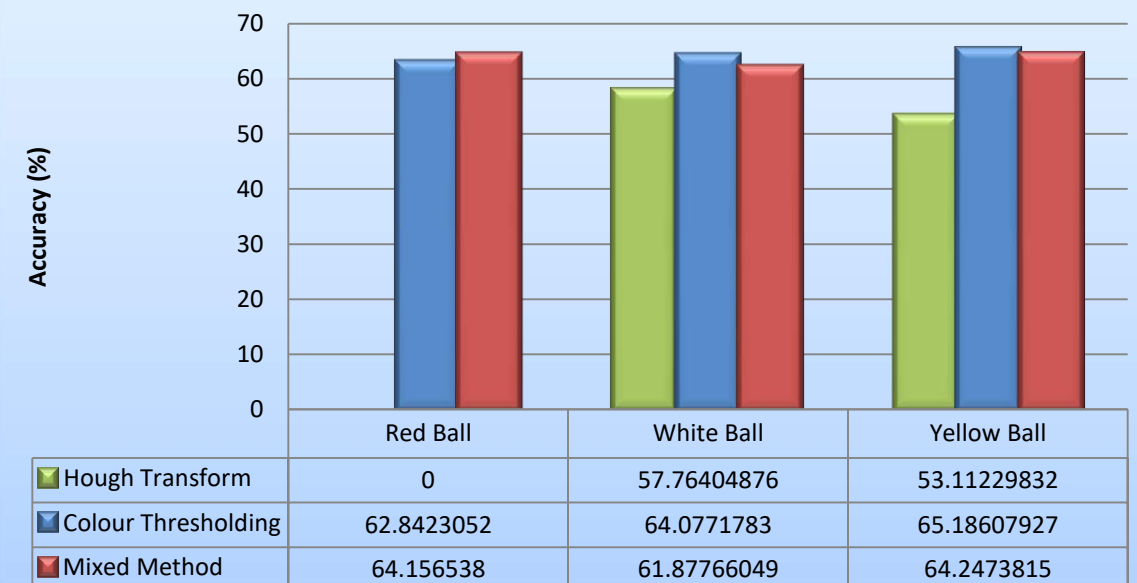
Proposed Techniques

There are a substantial amount of techniques and approaches that can be utilised for this specific problem. These can range from the relatively simple, to more complex and computationally expensive algorithms. Within these initial tests, a range of lower level functions were used to try and achieve some working solutions. Commonly used detection and performance enhancing techniques included :

- Colour Based Thresholding
- Morphological operations (Erosion & Dilation)
- Linear Filtering (Blurring/Smoothing)
- Contour Matching (Hough Transform)

Data Analysis

- Over 7000 individual frames were analysed for accuracy and performance.
- ANOVA tests were used to prove any significant variation between techniques.
- Of the techniques tested, a mixture of both colour based thresholding and contour estimation (Hough transform) seem to perform best overall.



Implementation

To implement and test potential techniques, a benchmarking application was created for the Android phone. The strategy design pattern was used to encapsulate and interchange detection techniques at run time. The application also gathered the necessary data samples.

A Usability Study of Mobile Applications

By Leah Cahill P140092 BSC Web Development



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Abstract

The usability of an existing app is evaluated through a questionnaire. A new app, using a hybrid mobile application framework have been designed and developed upon the results. The questionnaire will then be carried out on the implemented app.

Aims and Objectives

The aim of this project is to evaluate usability of an existing app and to create a mobile application based upon feedback on how users find the usability.

An objective of this project is to research and fully understand how the designers design with usability in mind.

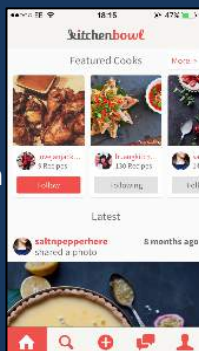
A second objective is to be successful in implementing an application using a hybrid mobile application framework.

A third objective of this project is to receive feedback by questionnaires.

Initial questionnaire

An SUS questionnaire was used for the usability evaluation method in this project. Users answer statements that range from strongly disagree (1) to strongly agree (5). The questionnaire was carried out on an existing app called Kitchen Bowl.

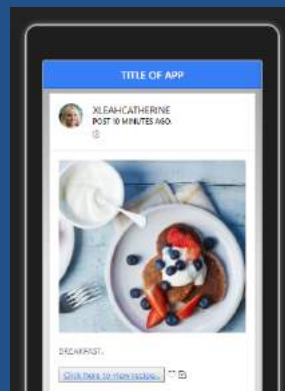
The users liked the layout and navigation but some did not understand the customised icon of “Klipt”. Others did not like suggested content on the newsfeed.



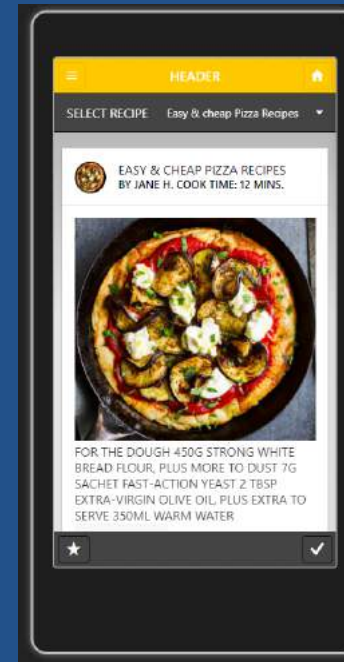
Design and implementation

The chosen framework for this development project was Ionic 2, therefore the interface for this project have been created with Ionic components.

The design strategy for this project was experimental design. The designs of the interfaces were decided by testing and retesting them against the usability guidelines identified in the literature review.

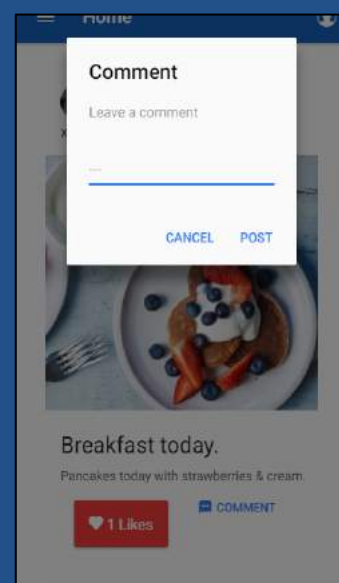
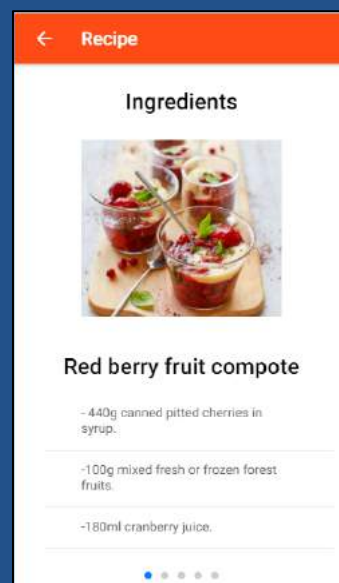


The designs were created using visual studios and the screenshots are taken when running it in the browser on an LG device.



The Ionic framework is built upon Angular and Cordova and can be used to develop a cross platform mobile app using HTML, CSS and Typescript/JavaScript.

A combination of development methods have been used in this project such as feature driven development, by using a MoSCoW list to prioritise the development features implemented. An iterative design approach have been used for the UI.



Ionic and Cordova provide a set of plugins which provide access to native device functionality.

These plugins enable the app to use the native functionality of the device such as the camera for the “share” page of the app.

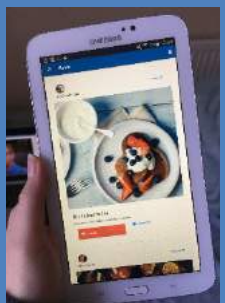
The ionic app was loaded onto a Samsung tablet for the questionnaire.

Results from questionnaire

The SUS score of the existing app was 54, the SUS Score of the Ionic app was 58. To measure the SUS scores: anything below 51 means it fails the usability test. 68 is considered the average score and anything above 80.3 means that the usability is really good [1].

The positive points of the developed app was that the layout was clear and the users liked the simplicity of the newsfeed.

A negative point is that the recipes page could have had more content overall, and a user also commented that they did not like they layout of the share page.



Conclusion

Overall, an understanding of usability and how it is implemented have been achieved by the research for the literature review. The objectives have been met as a mobile app have been successfully implemented based upon feedback from the questionnaire done on an existing app.

However, as the app scored 58, this shows that There are still areas for improvement regarding usability.

Future work would focus upon the lowest scoring statement and the negative comments from the participants.

Reference

[1] N. Thomas, “How To Use The System Usability Scale (SUS) To Evaluate The Usability Of Your Website,” Usability Geek, 13 July 2015. [Online]. Available: <https://usabilitygeek.com/how-to-use-the-system-usability-scale-sus-to-evaluate-the-usability-of-your-website/>. [Accessed 20 November 2017].

Investigation and Implementation of Uses for the Physical Web on a University Campus

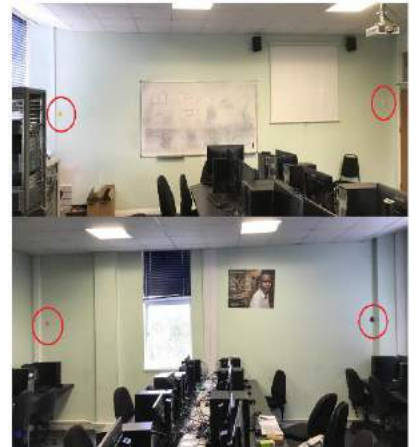
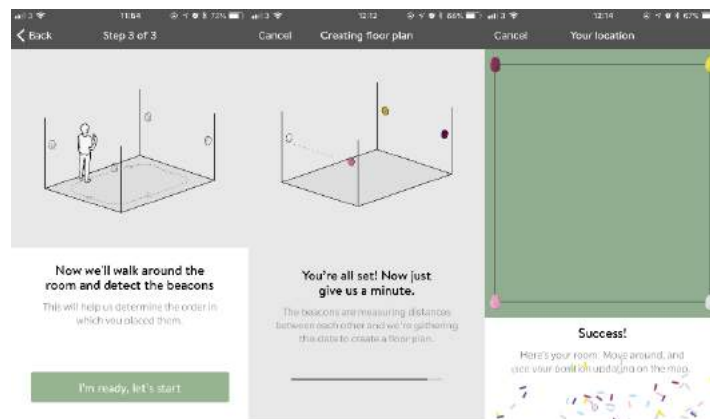
Liam J Ridley – BSc Computer Networks and Cybersecurity – liam.j.ridley@gmail.com

1. Introduction

The aim of this project was to investigate and implement different uses for the physical web on a university campus, and to conclude whether the systems should be implemented on a larger scale. The Physical web uses Bluetooth Low-Energy (BLE) beacons to broadcast URLs which complete different tasks or provide information [1]. Within the report is a literature review, this looked at how the physical web can be used, finding two uses for this project; indoor location-mapping, and broadcasting location-based information. The review also looked at the hardware that will be used, finding; Estimote UWB location beacons, and the Eddystone beacon protocol. The review also covered software and security.

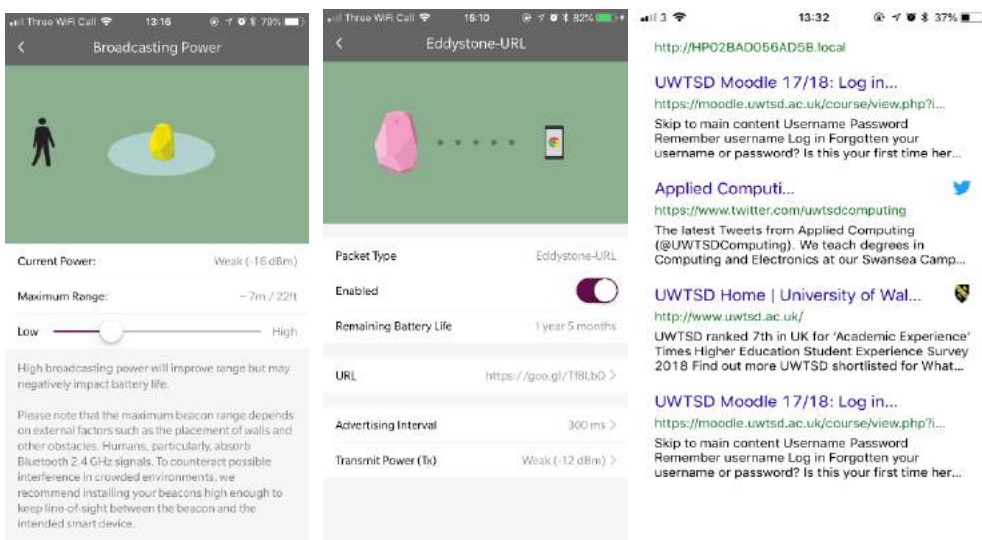
2. Location-Mapping

The location-mapping system was implemented in two scenarios, a Hallway and a Classroom. The system used Estimote UWB location beacons to map the layout of the room. One beacon was placed in each corner of the room, the user then walked around the room from beacon to beacon to allow the beacons to communicate with each other and automatically map the size and layout of the room. Below are some of the configuration steps, and the positioning of the beacons within the classroom.



3. Location-based information

The Location-Based information concept was implemented in four separate scenarios; a classroom, hallway, 3rd floor of a building, and a reception. The beacons broadcasted URLs leading to different websites such as the university website, twitter, etc. For each beacon you can configure; what URLs are broadcasted and to what distance. The implementations were tested on an IOS and Android device.



4. Results

The mapping system in the classroom and hallway did not perform as expected, positioning on the map was delayed, making it inaccurate. The location-based system worked fully when tested on an IOS mobile device, the IOS device received all of the broadcasted URLs. However the android mobile device only picked up half of the URLs being broadcasted.

5. Conclusion

Overall, the aim of the project was met, however, based on the results produced, the mapping system should not be implemented on a larger scale using these particular beacons. The location-based system, however, should be implemented further, as results show that it does work, but due to the Android device used in this project, the results were negative.

An Investigation to see whether the use of a GIS can inform Marketing Strategy

Melanie Lawlor-Fellowes

Conclusion

Three workspaces, one for each of the mainland UK countries has been built. Each of the workspaces contains multiple layers of data that are displayable. From the data visualized in the workspace, it has been possible to prove the hypothesis that the use of a GIS can inform Marketing Strategy for the recruiting of students to a University.

Introduction

In an aggressive and competitive market, Universities vie to recruit potential students to their courses. For those who have seen falling numbers, would visualisation of their applicant data on a Geographical Information System identify trends or patterns that reviewing spreadsheets alone would not.

Aims & Objectives

The aim of this 'proof of concept' project was

- To prove or disprove the hypothesis.
- Identify a correlation between applicants from areas of deprivation and students recruited to the Faculty of Art & Design.

The project objectives were to

- Build a work base session solution for each country, i.e. England, Scotland & Wales
- Applicant data for each Academic Year, 2011-12 to 2016-17 to be added as separate layers
- Add layers for competing Universities and Local Education Authority offices displayed as a geo point

Materials & Methods

MapInfo selected as the GIS software to be used. MapInfo is a desktop client that required data to be saved in a .TAB format.

Boundary data for the three workspaces was downloaded from the the UK Data Service at the Mid Super Output Layer (MSOA) level.

The Applicant Data contained fields that included full name, home and term time address, applicant outcome and date of birth. This data was cleansed with longitude and latitude co-ordinates added so that points could be created in the workspace.

RecordType	Academic Year	Course Code	Course Title	Campus Code	Campus Name
Application	2016/17	612C	BA (Hons) 3D Computer Animation	MP	Mount Pleasant Campus
Application	2016/17	628T	BA (Hons) Music Technology	MP	Mount Pleasant Campus
Application	2016/17	102V	BA (Hons) Digital Film & Television Production	TC	Carmarthen Campus
Application	2016/17	102V	BA (Hons) Digital Film & Television Production	TH	Town Hill Campus
Application	2016/17	101P	BA (Hons) Photography in The Arts	TH	Town Hill Campus
Application	2016/17	101P	BA (Hons) Photography in The Arts	TC	Carmarthen Campus
Application	2016/17	101I	BA (Hons) Illustration	TC	Carmarthen Campus
Application	2016/17	101D	BA (Hons) Graphic Design	MP	Mount Pleasant Campus
Application	2016/17	101I	BA (Hons) Illustration	TC	Town Hill Campus
Application	2016/17	102V	BA (Hons) Digital Film & Television Production	TH	Town Hill Campus
Application	2016/17	612H	BA (Hons) Automotive Design	MP	Mount Pleasant Campus
Application	2016/17	102V	BA (Hons) Digital Film & Television Production	TH	Town Hill Campus
Application	2016/17	612H	BA (Hons) Automotive Design	TH	Town Hill Campus
Application	2016/17	101P	BA (Hons) Photography in The Arts	TH	Town Hill Campus
Application	2016/17	602P	BSc (Hons) Product Design & Technology	TH	Town Hill Campus
Application	2016/17	666H	MDes Automotive Design	TH	Town Hill Campus
Application	2016/17	602P	BA (Hons) Product Design	DP	Dunfermline Campus
Application	2016/17	115P	MArts Photography in the Arts	LAD	London Campus
Application	2016/17	100K	Diploma in Foundation Studies (Art & Design)	MP	Mount Pleasant Campus
Application	2016/17	115V	MArts Digital Film & Television Production	MP	Mount Pleasant Campus
Application	2016/17	102V	BA (Hons) Digital Film & Television Production	LAMP	Lampeter Campus
Application	2016/17	101D	BA (Hons) Graphic Design	LAMP	Lampeter Campus
Application	2016/17	101D	BA (Hons) Digital Film & Television Production	LAMP	Lampeter Campus

Figure 1: Wales Applicant Data 2016-17

Deprivation was displayed as a thematic layer on the work base sessions. Deprivation data used was very similar to that of the Townsend Index, classifying household deprivation using information obtained during the 2011 Census.

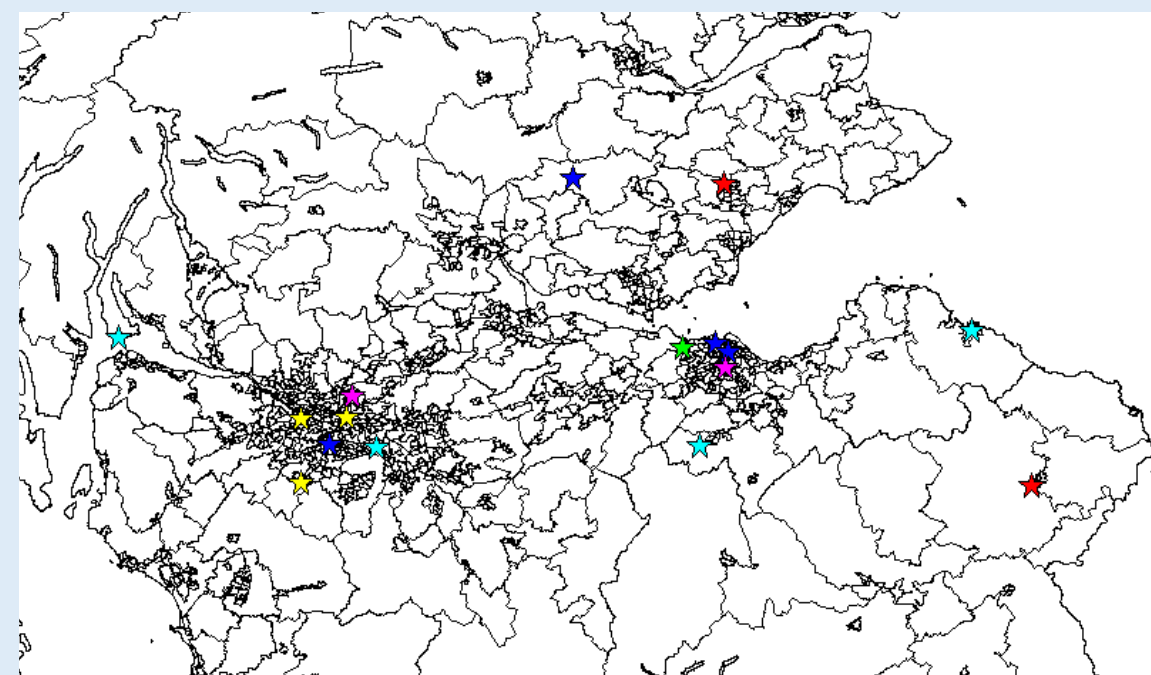


Figure 2: Scotland work base displaying all applicants

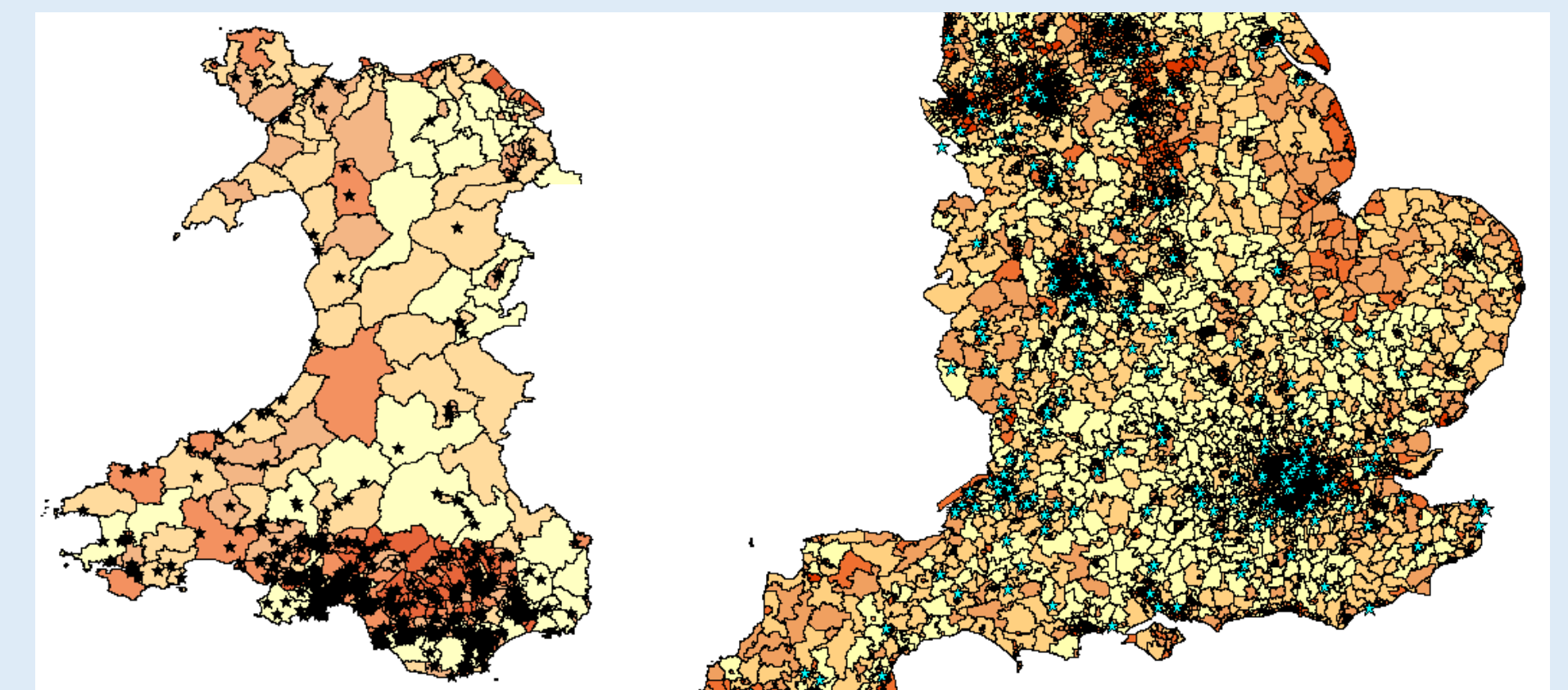


Figure 3: Wales and England work base session displaying 2016-17 applicants and 3 dimensions of household deprivation

Results

The outcome of the project identified the following

- Correlation in England & Wales between applicants and deprivation
- Applicants that apply are on the whole from less affluent areas.
- Scottish applications are mainly from the Glasgow & Edinburgh areas

Further Research

Further research to the project that could be carried are

- Review applications across the remaining four Faculties to make a comparison
- Consider applicants by their outcome, specifically the offer received e.g. rejected, declined or withdrawn
- Design and build a web front-end to display all the maps and applicant spreadsheets
- Investigate the benefits of creating a dashboard in software such as Tableau

Introduction

Industrial metal detection systems are important in industry to protect consumers and to protect valuable industrial process plant equipment. Industrial metal detectors detect and remove metal contamination in products where the metal may cause harm to persons or damage to plant equipment. Some metals may not damage plant equipment or affect the product that it is contained in while others might. Therefore it would be more efficient to only remove the metals which are damaging than to remove all metals creating large amount of reject waste. An industrial metal detector discriminator is a solution to this where it can discriminate against ferrous and non-ferrous metals.

Aims & Objectives

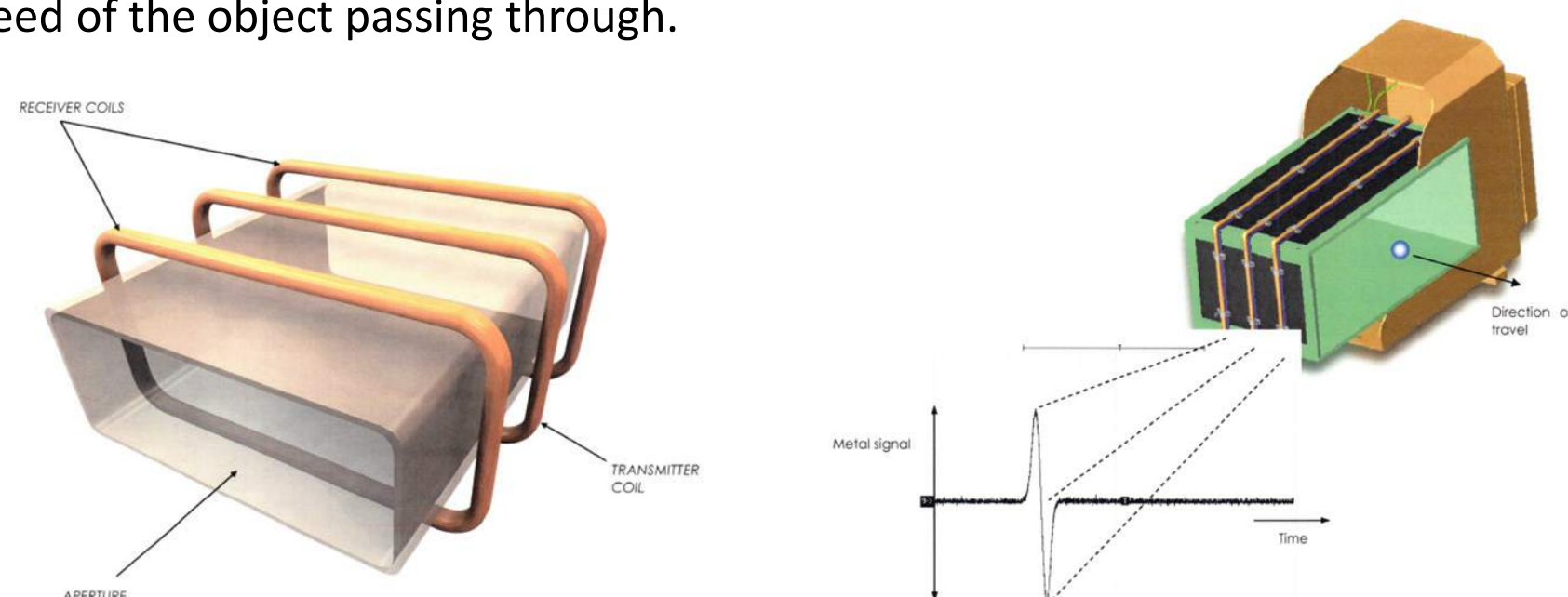
The overall objective of the project is to design and build a metal discriminator circuit which works in conjunction with an existing metal detector.

The following objectives are to be met;

- Research into metal detection technologies
- Research a solution for discriminating metals
- Design and build a circuit with separate relays for ferrous and non-ferrous detections
- The discriminator circuit must not affect the existing metal detectors sensitivity specification

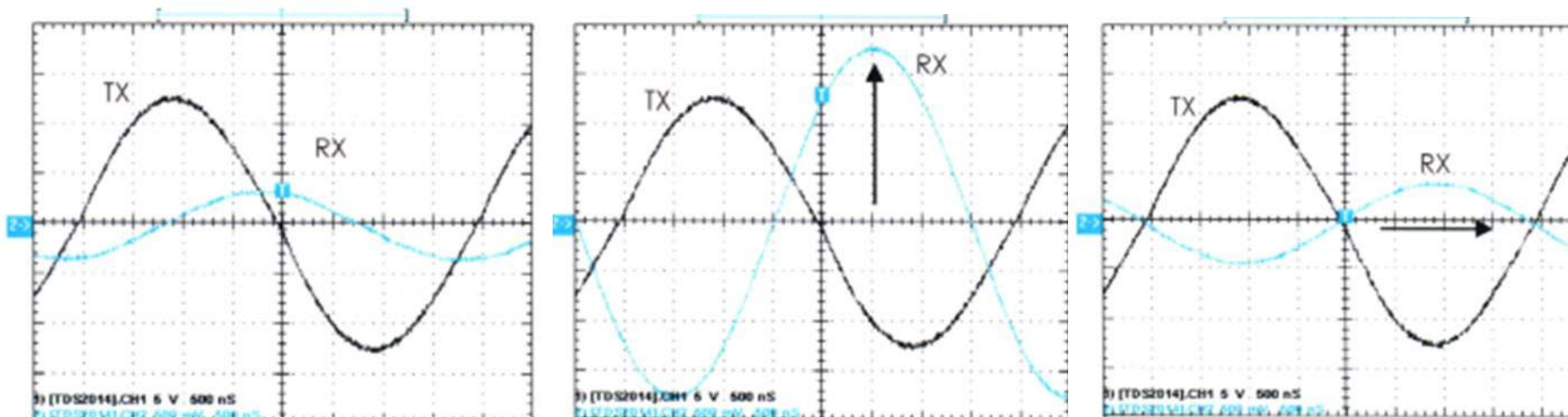
Metal Detection Technology Research

The metal detector chosen for the project is an 'E-Z Tec 9000' supplied by Eriez Magnetics. This metal detector uses balance coil technology. A Transmitter coil (Tx) is driven by a continuous sine wave which creates an electromagnetic field around the coil. Two receiver coils (Rx) are placed either side of the Tx coil coupling the signal generated from the Tx. The two Rx coils are balanced so that they are in equilibrium. Metal objects which pass through the coils changes the state of equilibrium generating a sine wave output. The frequency of this signal is determined by the speed of the object passing through.



Solution To Metal Discrimination

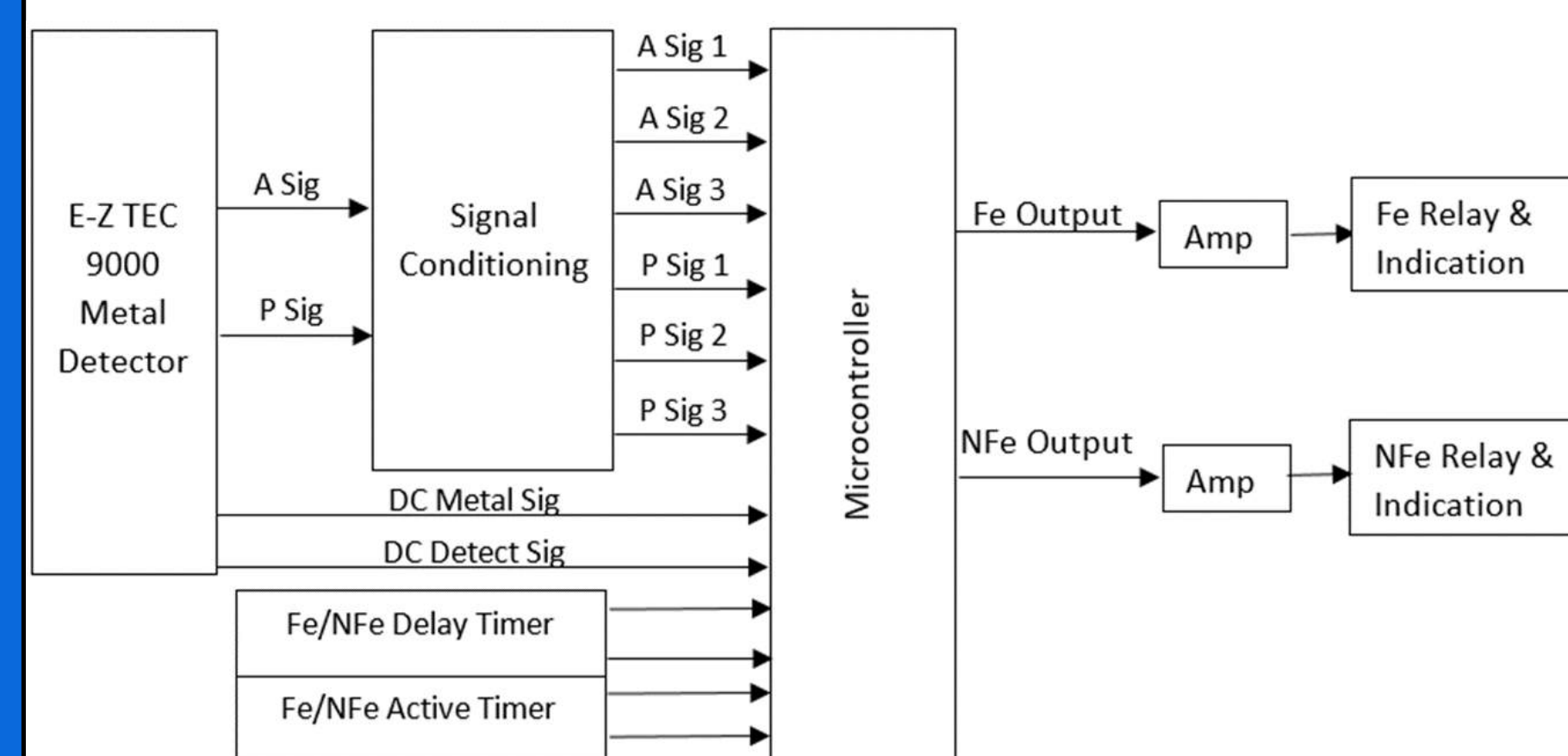
Ferrous metals have a high 'penetrability' factor which causes the coupling factor between the TX and RX coils in a balanced coil metal detector to increase. This is a reactive effect and creates a signal output with high amplitude. Non-ferrous metals are conductive and absorb some of the energy in the electromagnetic field. This is a resistive effect and creates a phase shifted output signal.



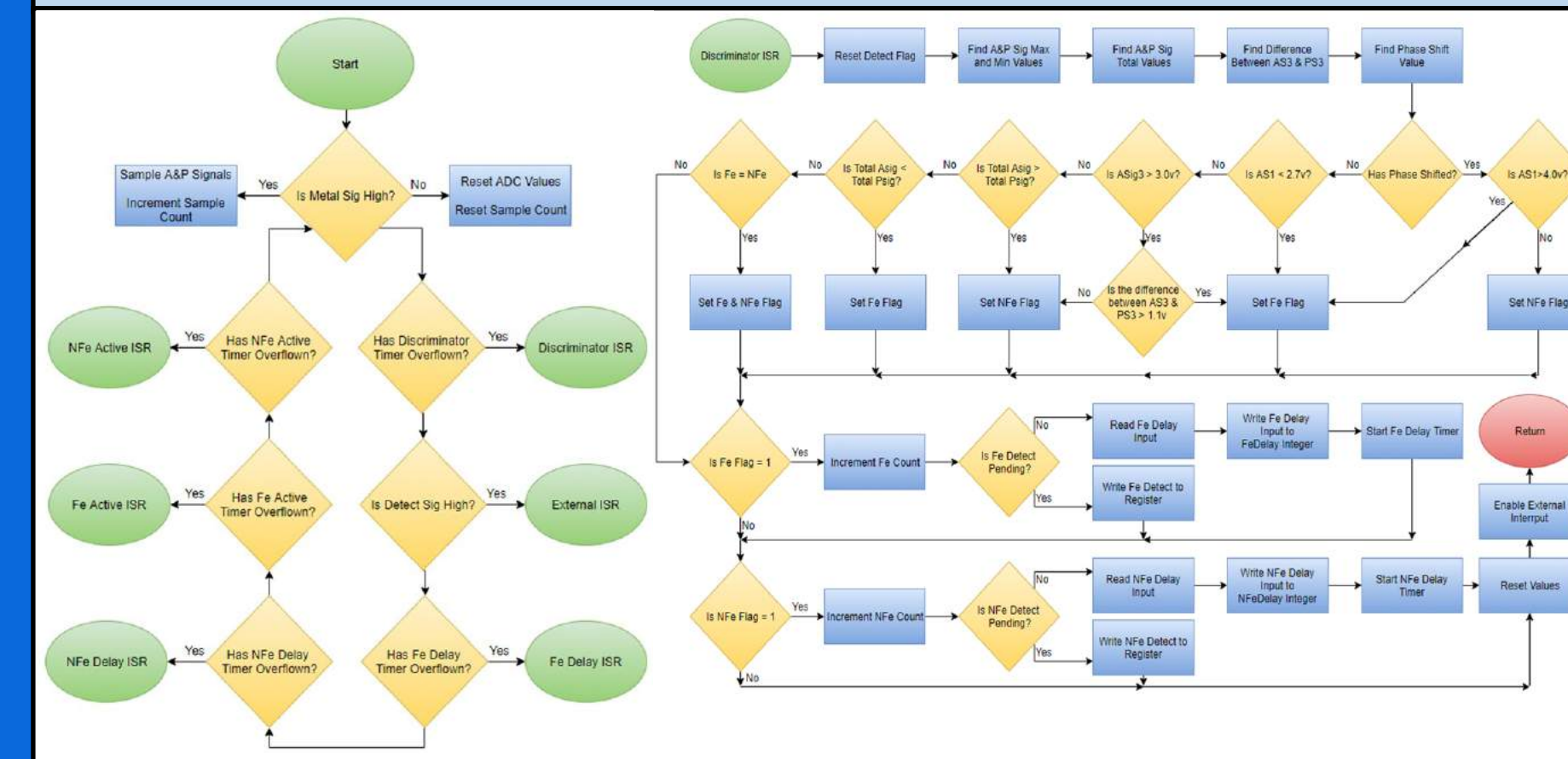
Implementation

The E-Z Tec 9000 metal detector uses two demodulator ICs which output an analogue signal that represents the amplitude (A Sig) and phase change (P Sig) in the Rx coils. These two signals can range from a few millivolts for small metal pieces to ± 15 volts generated from large metal objects. These two analogue signals are passed through three signal conditioning channels. The signal conditioning channels are used to scale the voltage from ± 15 v to 0v-5v while also having different amplification values so that the signal resolution is not lost. These signals are then connected to a microchip PIC16F1829 microcontroller. This microcontroller has a built-in analogue to digital converter used to digitise the analogue signals. The microcontroller digitally measures the analogue signals and discriminates by comparing the difference in the peak voltage and phase shift of both A Sig and P Sig.

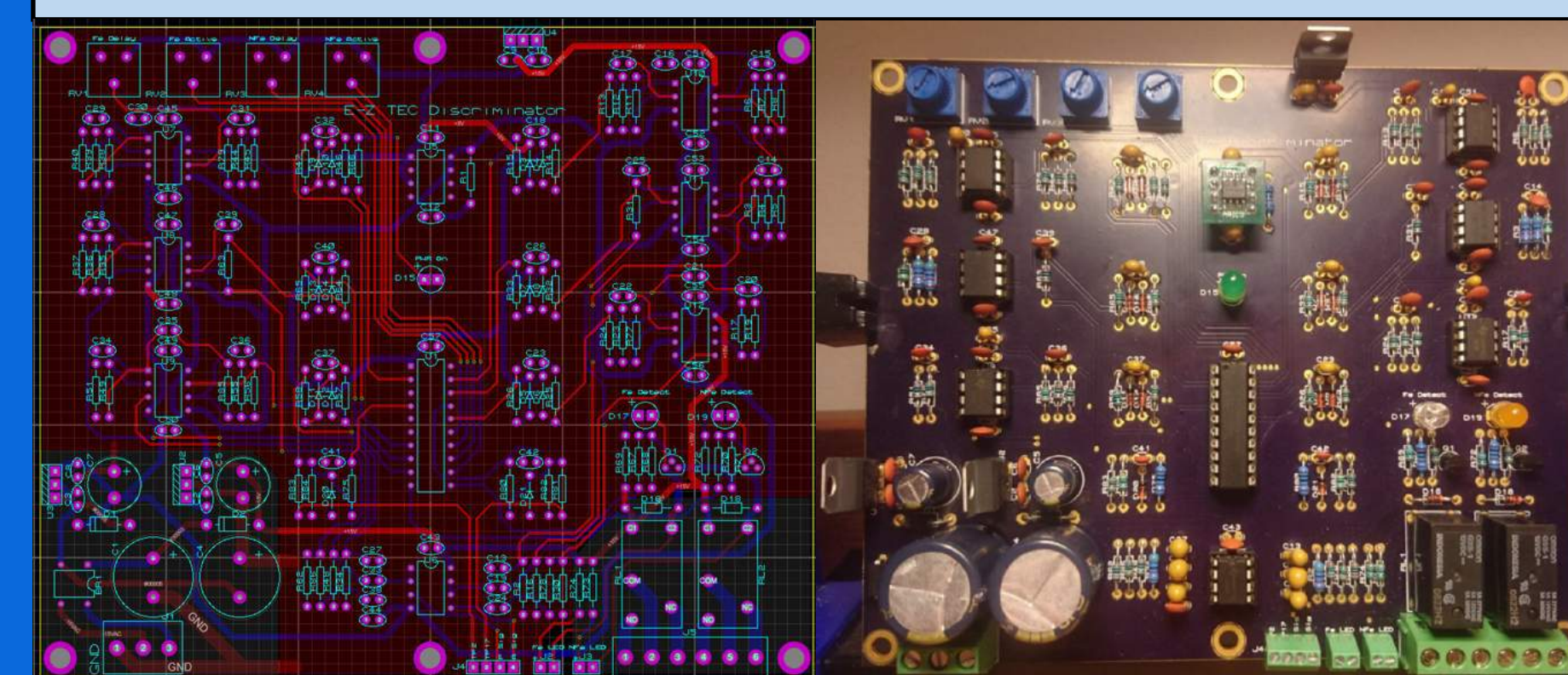
Circuit Block Diagram



Software Flowchart



PCB Design



Conclusion

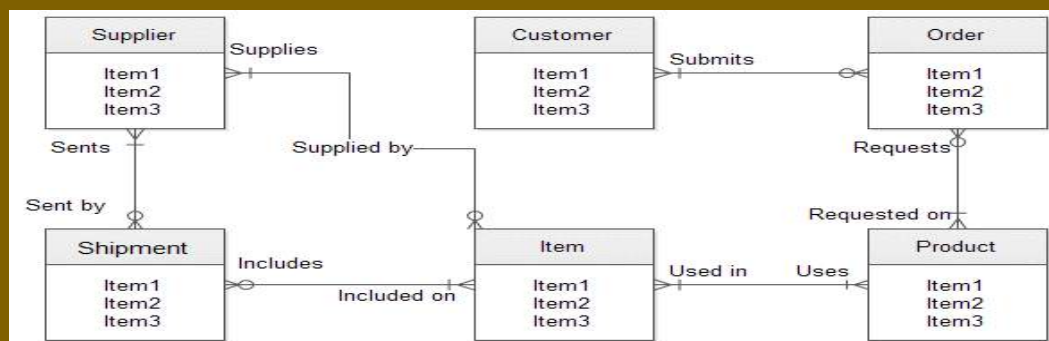
In conclusion the overall project was a success. The objective was to find a solution to industrial metal detection discrimination. Research was carried out to find out how metal detection technologies work and how ferrous and non-ferrous metals affect metal detectors differently. A solution was implemented using the knowledge gained from the research and through experimental testing. A final product was manufactured that is capable of discriminating against ferrous and non-ferrous metals using an Eriez E-Z Tec 9000 metal detector.

The discriminator circuit offers a fully automated solution which could prove useful in industry by increasing productivity, increasing quality control capabilities and reducing the amount of waste material from rejected metal contamination which didn't require rejection.

Database Performance analysis

Database management Systems

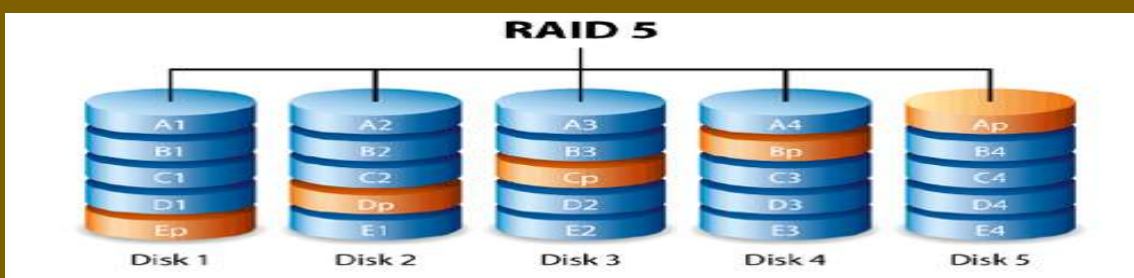
Database management Systems (DBMSs) are used to handle data for commercial applications that include scientific and engineering data, images, geographical information systems among others



Hardware on database performance

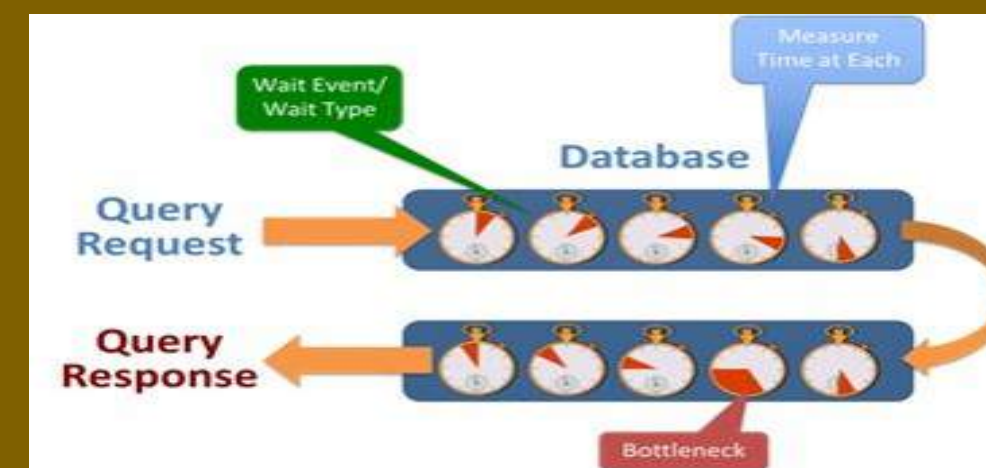
The performance of database is affected by hardware resources. This include factors such as the workload, the query optimizer and the database design among others.

Hardware resources can always be improved through a well-balanced allocation of data on Disk through striping.



Performance of DBMS

The performance of DBMS is very important when it comes to online transaction processing applications whose response time is stringent when there are high through puts for example airline reservation systems. The relational database model is important for the application of decision support.



Database Benchmarks

There are several benchmarks for database most of which target relational database. However, they only show the speed of hardware, system software efficiency as well as the proficiency of bench marking team.

The main measure of performance in a database is the maximum system throughput where there are certain percentile of transaction response does not exceed the value that has been pre-specified.

Investigation and Evaluation of the Impact of Information Technology on Marketing and Sales within the Retail Industry

Abstract

The overall aims and objective for this project was to find out about the different technologies that are being used within retail to help a business perform, and the different ways Debenhams is marketing to potential customers and encouraging them to visit Debenhams.com and the physical store and how and if those customers are using the technologies available to them to make their shopping experiences easier.

Introduction

This project will investigate the current and previous standards for online purchasing, including the techniques which businesses use to market their products and services. It will also look into the technologies used within the business to aid the everyday functions of a store. It will also be evaluating consumers and how they are currently purchasing goods by using surveys and

Objectives

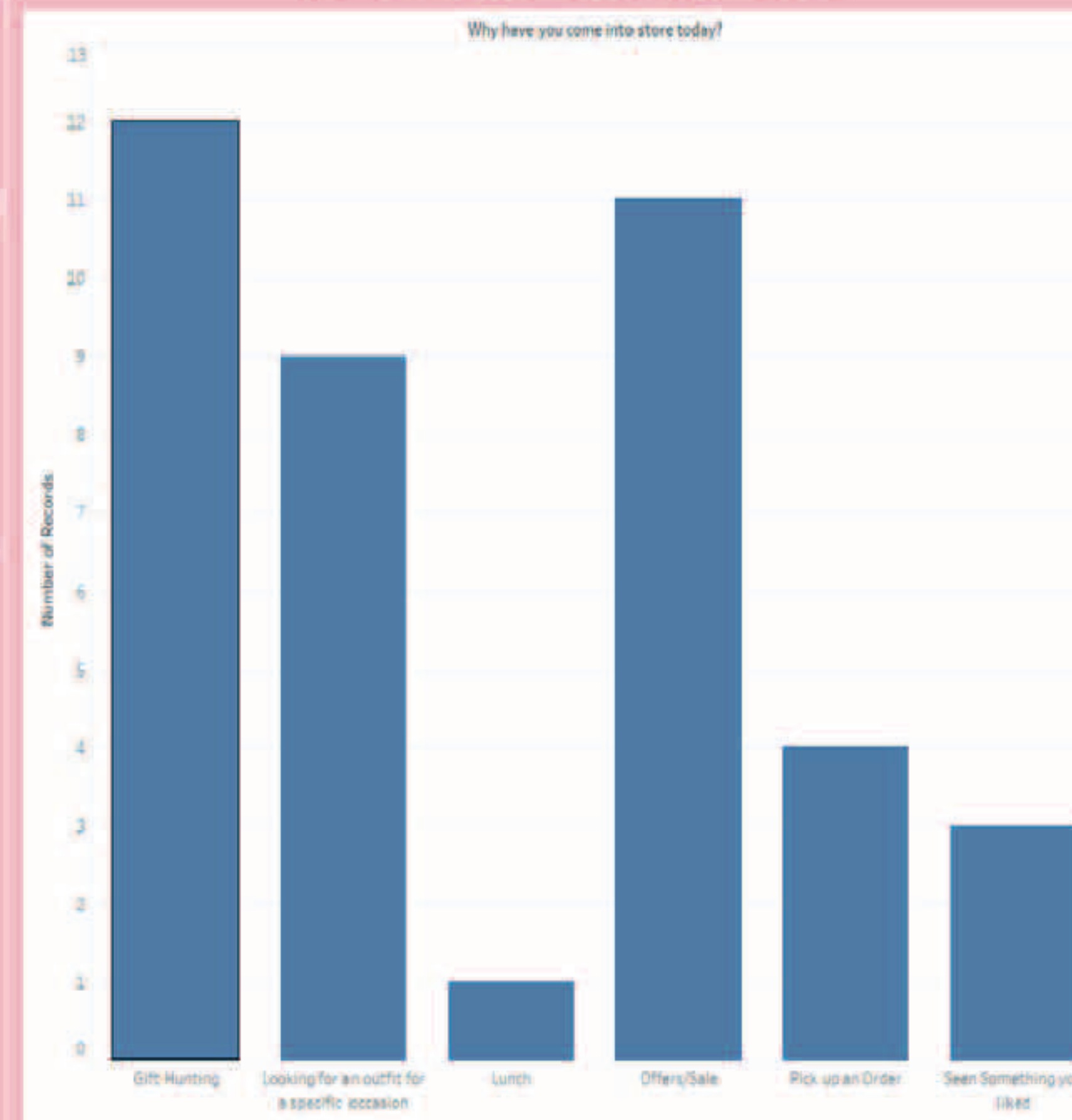
1. Conduct a literature review on the current digital marketing techniques used in retail.
2. Discover information about marketing history and how it has changed to match current technologies.
3. Discover information on technology used within the retail sector and how consumers feel about shopping.
4. Analyse positive and negative Impacts on the way Debenhams markets to consumers.
5. Analyse positive and negative impact of the technology within the retail sector.

Methodologies

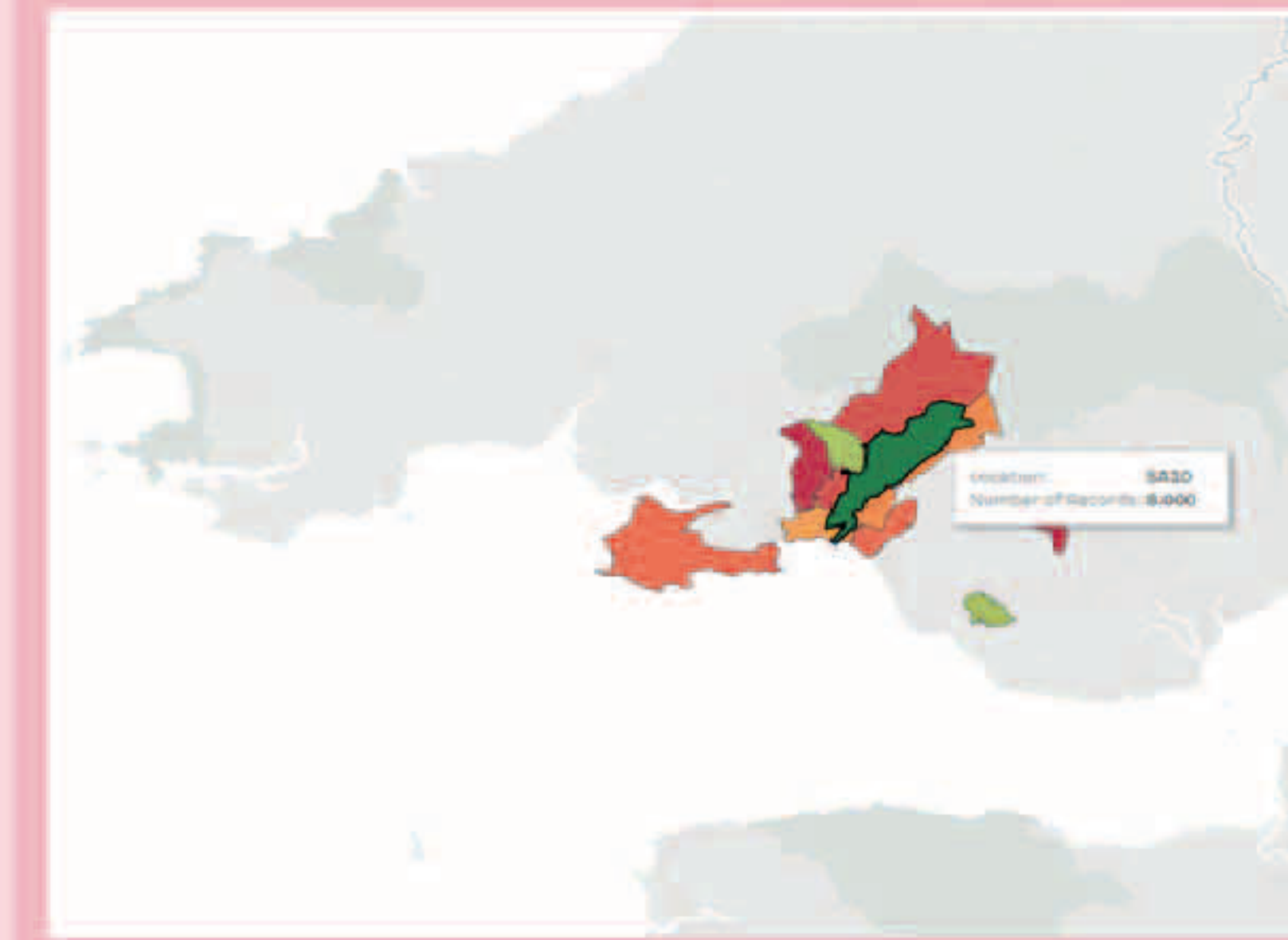
The method type which has been used for this project is Phenomenology which is an inductive method which involves collecting and analysing data to develop a theory.

The approach used for this project is more to gain a meaning from the data that's is collected. By this approach, the data is able to be analysed to identify patterns within the data to be able to build an overall conclusion of the data.

Reasoning Behind most Customers visiting the Debenhams Swansea Store



Visual Representation of How Many Subjects Filled in the Questionnaire depending on their home Postcode.



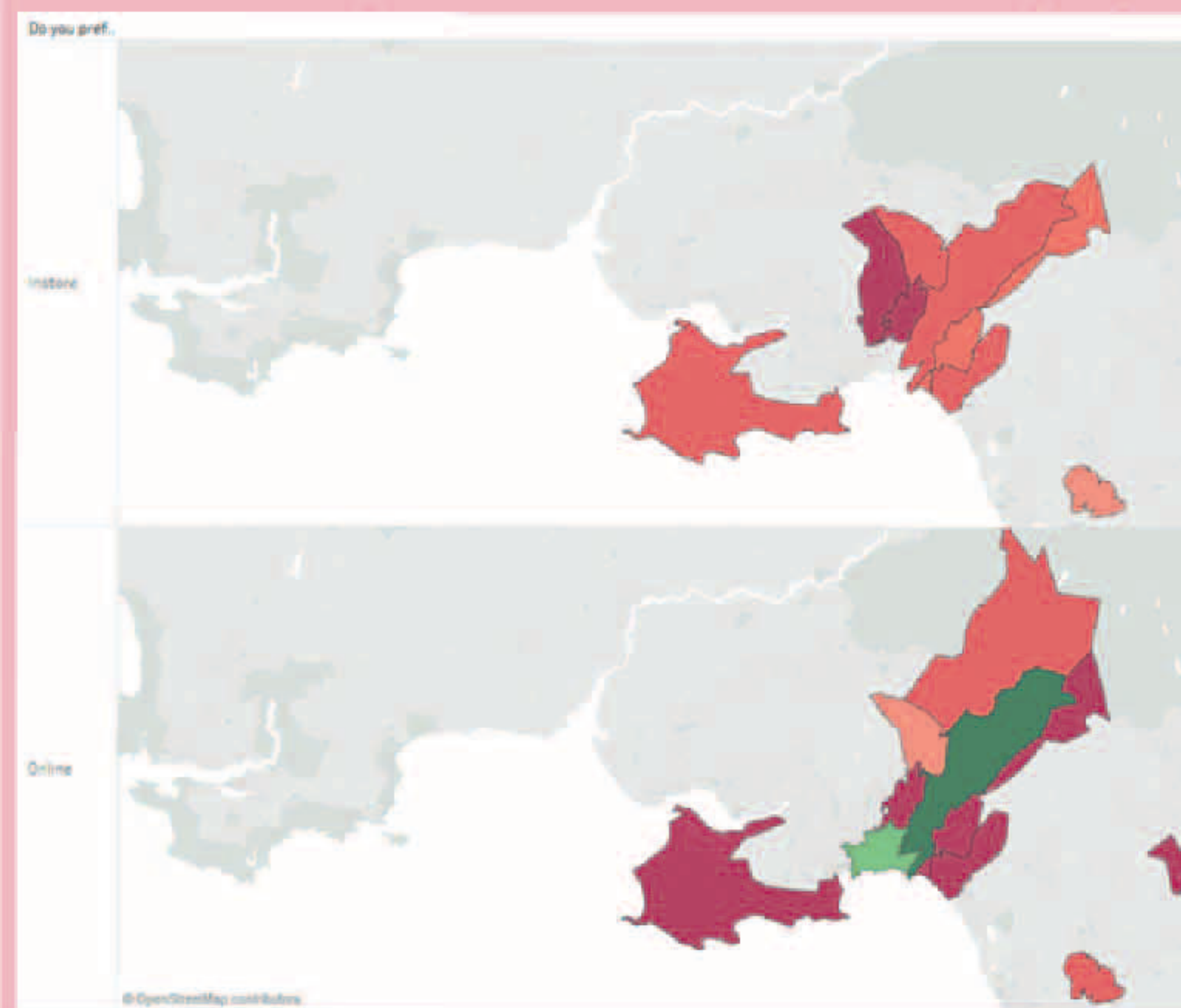
Conclusions

The majority of customers who have filled in this questionnaire are from the Neath area, this can be seen from the first map. The second map that within the area tested, a lot more people preferred to shop online rather than instore. The most common customer to shop at Debenhams was female and was in the age range 25-44 and they also preferred to shop online than instore. The females who answered the questionnaire who were in the age range 15-24, all answer that they preferred to shop online than instore. This could be down to the popularity of teen clothing being found online at Boohoo.com and Misguided, along with other competitors who also do not have a store presence. The age group 65+ for both males and females did not shop online at Debenhams.com. Nearly half of the people answering the questionnaire did not personally receive any form of marketing from Debenhams. Debenhams should therefore attempt to encourage those who receive postal mail, to convert to e-mail as it saves paper and postal fees.

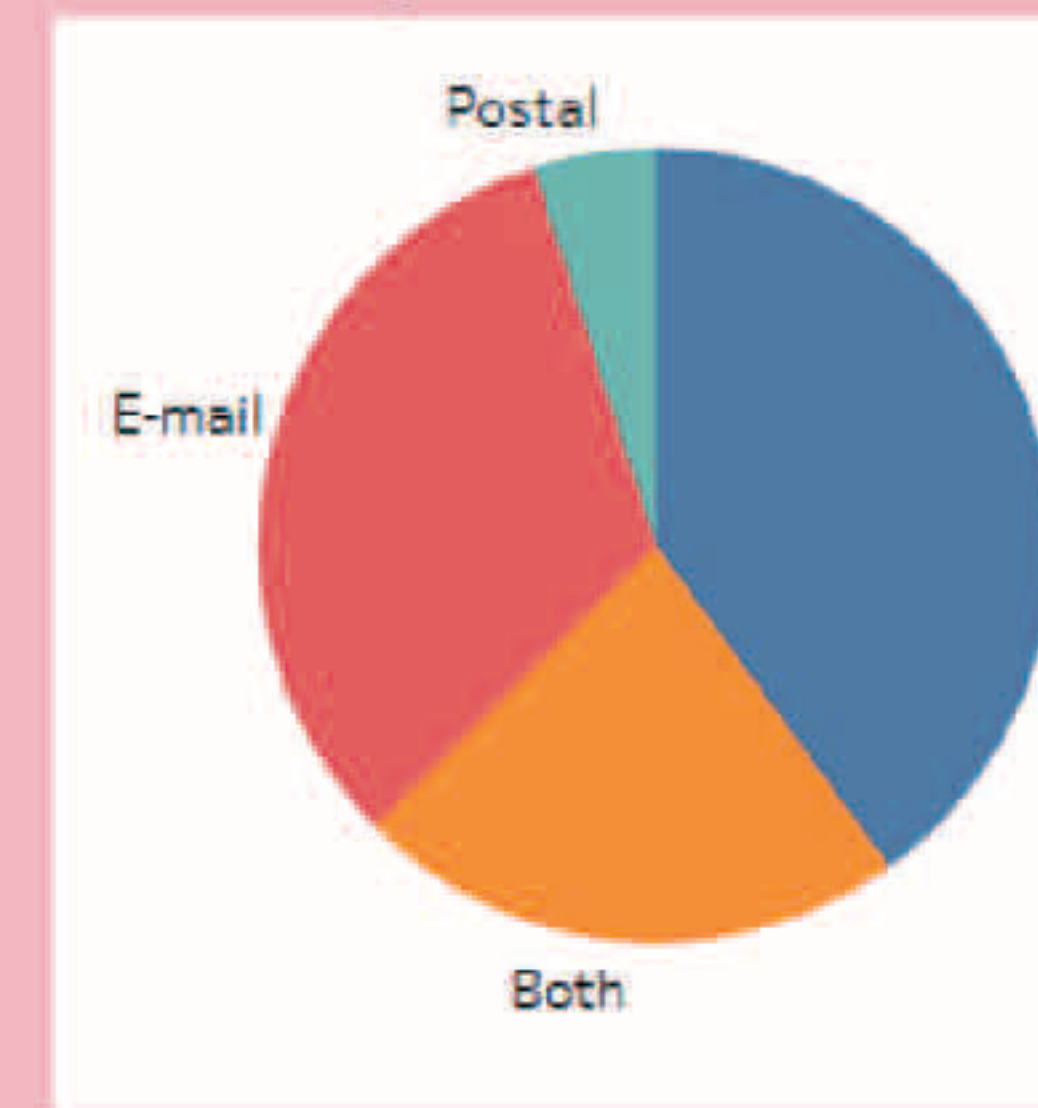
How many Customers were using a Debenhams Card vs those who didn't

	Using Debenhams card	Using Vouchers	Not using Their debneham card	Do NOT have a debneham card
Saturday	50	24	20	124
Sunday	27	7	1	48
Totals	77	31	21	172
Total have a card				98
Total do not have a card				172
Total served				270
% Of customers served who have a debneham card				36
Total using Card				77
Total Using Vouchers				31
% of customers using vouchers				40

Number of People who Prefer Online or Instore Shopping



What marketing are customers receiving?





Prifysgol Cymru

Y Drindod Dewi Sant

University of Wales

Trinity Saint David

1.Introduction

This project will focus on addressing the problem of air quality in outdoor, and Indoor environments, giving a simple response to the user, to show the danger limits of harmful CO2 levels surrounding them.

A air quality device will be created to help people in heavy air pollution countries where there is no way of measuring the quality of the air easily. This would then allow for users of the product to know when it is necessary to wear protective masks or ventilating a room.

The world is developing at an explosive rate, producing more CO2 lever in an urban environment than ever before. Some house near the busy road can suffer from over expositor of a CO2 levels or VOC levels every day. Research shows that people surrounded with a large amount of CO2 levels or VOC levels can suffer from many ailments .

The overall aim of this project is to design and prototype a product that can detect CO2 in a local environment and advice user on potentially dangerous levels. Added feature of VOC, temperature, pressure and humidity will be added to help with outdoor factors. VOCs will be added to help with home and indoor quality.

2.Outline

After reviewing different sensors and their ability to gather different data types, an appropriate sensor was chosen that’s able to measure CO2 and VOC levels, while only need a lower power supply, and come in a tiny package. This will allow for the device to be compact and allow for better portability and will give it a better chance to be added in to daily life, without any inconvenience. The key features as identified are as following;

A USB will also be used for Transferring data.

One button with 3 modes will be added it will be holed for 8 seconds to turn on the device. Pressed once to show embedded readings. 8 seconds to turn off.

This device will measure a range of things from temperature to humidity, CO2 and VOCs, these can all play a factor in air quality and was needing to give the user more accrete data.

Some functions for this device is to be able to collect data save it to the SD card. And use the USB slot to transmit its data to PC

This device will also come with one button and four LED these will show the danger zone levels of your environment.

The button will have three modes hold down mode will turn the device off and on 1 push will pause the device.

It will read all data such as temperate, humidity, VOC, CO2 to screen for the user.

Device Name	Type	Features	Negatives
Atmotube (Still In Development)[1]	Consumer	Able to measure CO2 and VOC Bluetooth capability Low-powered	Only one was created, hence is not available on the market Only ready CO2 and VOC
Series 500 – Portable Air Quality Monitor[2]	Medical	SD card Can connect to external control systems Can read, but not exclusively, NH3, CO2, CO, CH2O, NO2 and SO2	Expensive Complex for the user
E-Instrument AQ VOC Air Quality Monitor [3]	Industry	Able to measure 400 different VOC gasses Able to measure 0-2000ppb and 0-200ppm SD card and USB	Bulky High power consumption Short runtime Use IR detection technique

3.Background Research

CO2

Introduce to Research into CO2

Due to the high levels of atmospheric CO2, carbon dioxide levels within the past decade, with a growth rate, for the years 2015 and 2016, of double that between 1990 -2000[4]. Due to this fact, there have been many proposed and implemented developments which aim to reduce our impact on the environment and hence humanity, with regards to CO2, and in some cases, the reduction the current CO2 levels. This section shall explore methods that have been proposed and implemented as well as policies and international agreements such as the Paris Agreement.

Indoor CO2 levels have been increasing inside buildings, this is attributed to high-rise housing and poor air ventilation in homes. The high concentration of CO2 can impair performance of the Health of the Occupants.

Sick Building Syndrome is on the increases in most counters. This syndrome is caused when the air quality within a building is dangerous or causes sickness. The NHS Online[5] state that “symptoms of sick building syndrome get worse the longer you’re in a particular building and get better after you leave”

Cyclists are exposed to Large Amounts of CO2 while bike riding behind cars[6]. City Lab has done extensive research in how CO2 effect cyclists - The study shows Bikers inhale black carbon than pedestrians do. A study led by Professor Jonathan Grigg from Bart’s and the London School of Medicine “bicycle commuters had 2.3 times more black carbon in their lungs”. Some People who go running in city climates with heavy car usage will also see an increase of Carbon levels in their lungs[6]

The United Kingdom ratified the Paris Agreement in November of 2016[7]. Nick Hurd MP, the Minister of State for Climate Change and Industry of the time, stated that intends on using the Paris Agreement as an opportunity to transform aspirations into implementations, stating that the UK has provided “secure, affordable and clean energy” to both businesses and British families. The Energy and Climate Intelligence Unit, a UK not-for-profit organisation[8], claims that the Paris agreement will have a wider impact upon 14 mains areas, these being; policy, energy, business, investors, weather, nature, security, international politics, civil society, faith, international development, farming, the media and more-so health.

VOCs

Volatile organic compounds or VOCs contain a variety of chemicals, that are emitted from solids or liquids, these chemicals in the air can be very dangerous in long term or short-term exposure, VOC are at their highest indoors, as many products contain VOCs, this combined with low airflow can create an unhealthy or deadly situation.

These Organic chemicals are used in a lot of household product, vanishes and pain, etc.

EPA’s Office of Research and Development’s “Total Exposure Assessment Methodology (TEAM) Study” (Volumes I through IV, completed in 1985) found levels of about a dozen common organic pollutants to be 2 to 5 times higher inside homes than outside, regardless of whether the homes were in rural or highly industrial areas. TEAM studies indicated that while people are using products containing organic chemicals, they can expose themselves and others to very high pollutant levels, and elevated concentrations can persist in the air long after the activity is completed.[9]

TVOC (total volatile organic compounds) is often the name give VOC that are indoors. Having an idea of the health and risks related to the measurement of this element was needing to be able to convey to the user of this product. Many different organizations have sent their own limits and health-related to them this table shows some of the originations and agency own results[10]

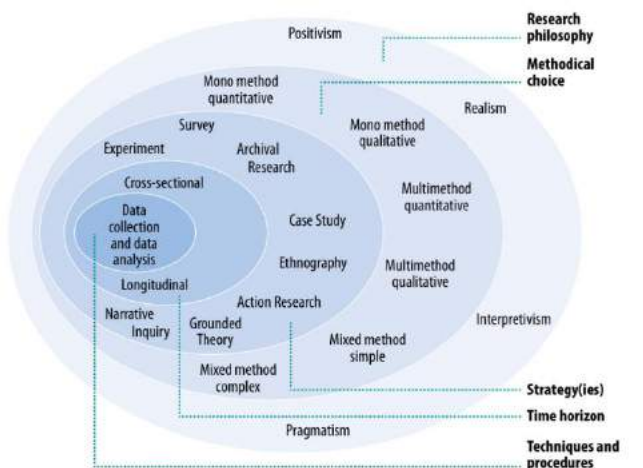
All results are related to the same measurements taken in this project TVOC parts per billion.

4.Research Methodology

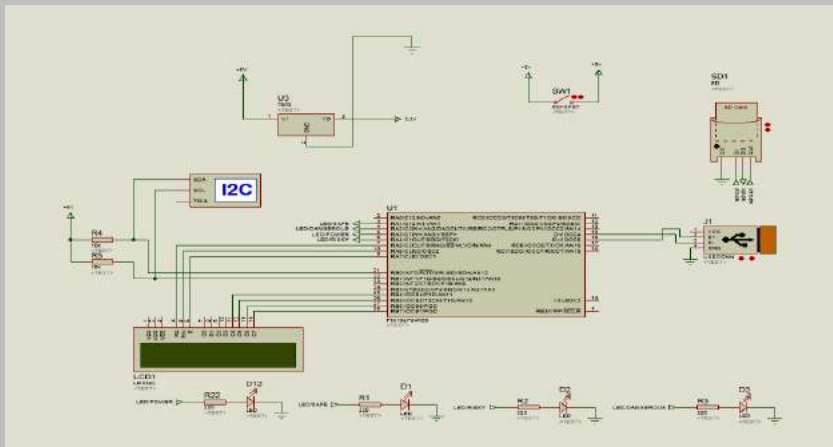
The metaphor of the Research Onion is used in order to understand the complex processes of research and its related decisions, this metaphor takes a layered approach, hence its name of Onion, these layers, in according order, being, research philosophy, methodical choice, strategies, time horizon and technique and procedures

Saunders and Tosey, 2013, state that “Most researchers design a piece of research to answer a question or address a problem”, by doing this they have less of a focus on the outer layers of the onion.

Research Philosophy	For this report, a pragmatism approach has been taken, to focus on the complexity of air quality and the impact that this has upon health.
Methodical Choice	Within the project, mixed method simple was chosen allowing for the research of the qualitative impact upon health and related legislation, as well as quantitative research regarding co2 levels and VOC levels.
Strategies	A variety of methods, for the report the main strategy was archival research, whereby journals, report and legislations are used, amongst others.
Time Horizon	This project focuses on a combination of long-term and short-term studies, hence has a both cross-sectional and longitudinal strategies.



5.Components and Design



The IAQ sensor was chosen for this project as it fit the needed categories very easily with low power usage running on 3.3v and being Able to measure the Total CO2 levees and VOC levels give this sensor and step up from its competitors.

The chosen microcontroller had to have be able to handle all communication need for all components in this project doing this ultra-low power the Pic18Lf25k50 this had all the communication need for this project such as i2c, SPI, analogy, rs232 and digital with 28 pin O/I this PIC would allow for the fitting of extra components

The MOD board is the pre-mounted PCB bored contains the two sensors that are used in this project. The IAQ core and the BME280 both work of 12c so no need extra pins were needed for the PIC18f. Running on 3.3v created by embedded adventures.

The BME260 sensor is an environmental sensor able to detect Temperature, pressure, humidity this type of data is needing to calibrate the MOS sensor these types of sensor can have their data altered by the effects of Temperature and Pressure on CO2/VOC Measurement.

Component	Functions/Features	Why Chosen
BME280	Environmental sensor - Measures temperature (-40 – 85 °C), pressure (300-1100 hPa), humidity	Small Low Powered – 3.3v Need to apply molecular density of gas laws
IAQ-Core	Metal Oxide Semiconductor - Measures CO2 and VOCs	Compacted Low Powered Measures both CO2 and VOC
PIC18Lf25k50	Embedded Microcontroller	
MOD1023	Pre-mounted PCB board	

6.Implementation

Implementing

Issues arose with false data being read or no data at all be shown on LCD, all other Bit of code seemed to be run as simulated, the issue was due to the fact that the addresses that were needed for this project was the 00x85, which not being used here.

Another issue that was only found out in implantation was the need for a slow clock speed on the Pic18 this was needed to function with the 12c. Invalid BME280 Data readings was an issue once loading simulated program, after researching the BME sensor it was found that it was in sleep mode , meaning that the BME was working correctly but was just set in a sleep mode, this was not able to be programmed as a time restraint .

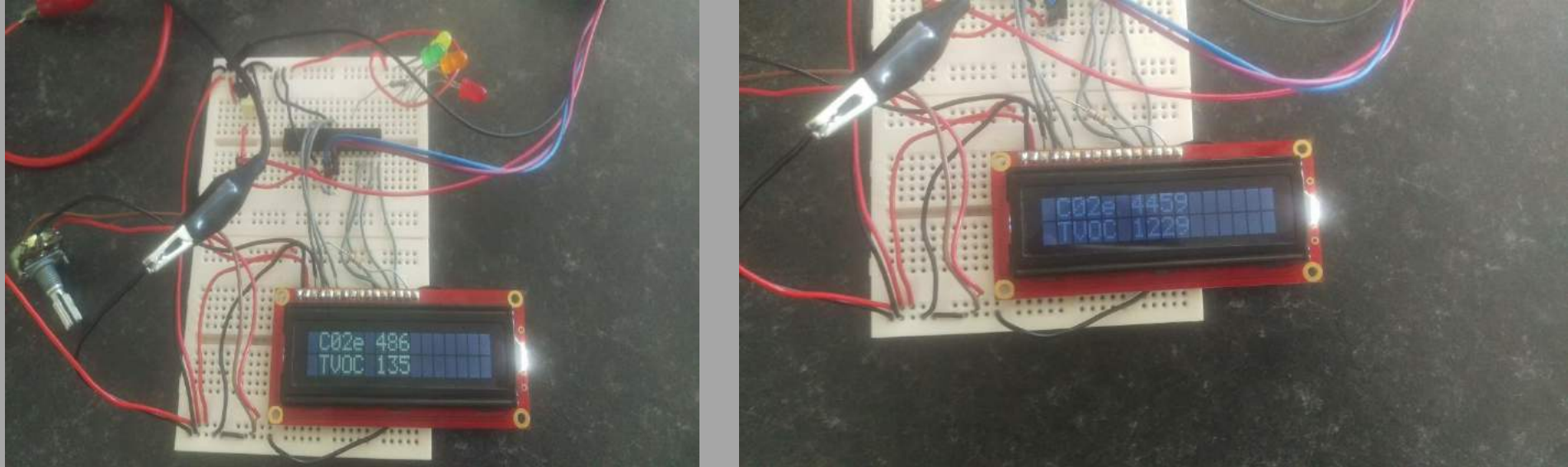
Prototyping

The simulation shows that this project can effectively read i2c results from an 12c device. Effective aids such as an 12c debugger and 12c registry reader advanced the observation of 12c infecting. The BME280 and IAQ core were not already build within Proteus, instead, a chip called the 24LC08N, which caused errors in prototyping stage of 12c not being interfaced correctly in prototyping.

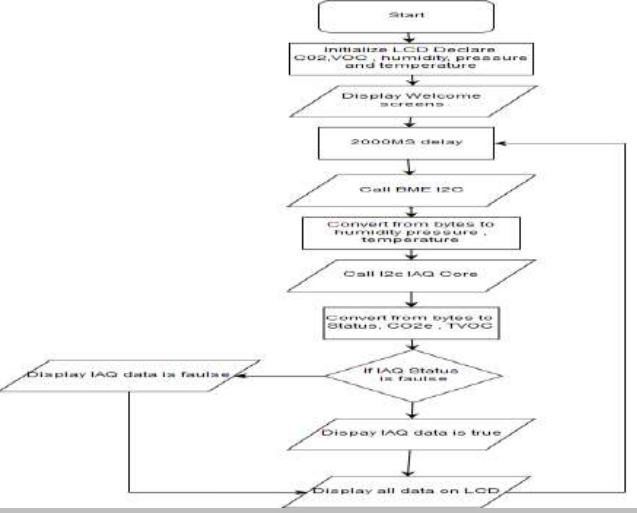
Prototype Board

The final board achieved basic implantations by being able to detect VOC/CO2. The molecular density of gas laws could not be implemented, to correct errors, thus, this device was not able to be portability used as a chance in pressure or CO2 could affect reading dramatically.

The schematics for this project show the achievement of low power consumption and a small confirmation this was made to interlink with portability.



7.Programming



```
izc_start();           // send start condition
izc_write(0x5B);       // point to first address
for (q=0;q<7;q++)
{
    data[q]=izc_read(TRUE); // read sequential bytes with acknowledge
}
data[q]=izc_read(FALSE);  // read final byte without acknowledge
izc_stop();
```

This project has done all coding in Proteus with the assistance of CCS compiler this project was aiming to display all data from Chosen sensors on an LCD screen. Background research was done on how 12c Coding practices and using CCS compilers help files.

When calling 12c there a few steps to be taken depending on the product being used datasheet may vary.

First, a Start bit is sent. Second, the Device address is call. Third Read sensor data . Fourth send the last reading without Acknowledgment. Fifth send a stop bit.

This combined with LCD display, Warning light and composite calculations build are a coding structure.

8.Evaluation

This project was created for initial from research in to how CO2 can kill people premature like in London, which estimated that 9,416 premature deaths were caused by air pollution in London alone. This report chose to informed people on air quality and from this research create a detect device.

The objective set-out in this report was not full achieved but the basic outline was informing people and developing a CO2/VOC detection device. The BME 280 was not integrated fulling having issues with its communication though 12c.

Further Development

- Implementing Bluetooth and WIFI capabilities, in order to display data on mobile devices
- Adding a fan or pump, to give more accurate indoor reading
- Creating a case of the device, in order to protect and make it more portable
- Condensing the size of the device, and its screen through ASIC to make it more portable and to lower long-term costs.
- Adding the ability for a SD card/USB giving the device the ability to save environmental data, and transfer it to a PC.
- Implementing composite calculation to correct errors created by temperature and pressure.

Topic	Discussion	Evaluation
12C	12C brought about the most time-consuming error, this being the fact that it was hard to program.	This was the case due to the fact that 12C data transmitting can be difficult to program. The solution used resolve this issues was to research more into the coding required.
BME280 (general)	The main issue regarding the BME280 sensor is that it has not been calibrated and a casing has not been built for it.	This is the case due to time limits as well as a lack of funding. The issue means that the device will not effectively function within an outdoor environment. This could be improve through less financial and time constrains.
BME280 (Humidity, pressure, and temperature)	Another issue with regards to the BME280 was the fact that it was not reading humidity, pressure or temperature values.	This is because the BME280 was stuck in sleep mode, this could have been resolved by having more flexibility with regards to timings, in order to research this issue more.
IAQ (VOC/CO2)	With regards to the IAQ sensor, there were no major issues concerning CO2 or VOCs.	This element of the project functioned, as planned, with testing showing this to be the case.

9.Conclusion

Project Conclusion

In conclusion, the main requirement for an air quality detection device was achieved in this project. As programming for the BME280 is still an ongoing problem that needs to be resolved, apart from this, the project meet the basic specification that was planned and has worked effectively.

This report has overviewed many areas of CO2 levels and VOCs. From the beginning of this report, one of the fundament aspects was to create a device that would be able to help people acknowledge and act on dangerous levels of CO2 and VOC exposure. This has been set out through researching, design, simulating and prototyping. From this, the report has set out the full potential of a potable air quality device. From research, it had been easy to observer and understand the risk of CO2 and VOC, this knowledge has been implanted in LEDs, which show hazardous air quality levels, which have been deeply investigated, and are up held by many agencies.

Learning idle air laws, and how pressure and temperature can cause errors when dealing with air quality gave this project the ability to make this device portable, without these laws this device would not be precise at reading CO2 and VOC with fluxing pressure and temperature. The final prototype device created in this project did not fit its full role of portability, it was able to measure VOC and CO2, but not with assistance of idle laws as the BME280 device would not seem to function after testing the device with Arduino, it was observed that this issue occurred due to a lack of knowledge with regards to imbedded C.

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How the Implementation of a Bounding Volume Hierarchy Affects the Time Taken to Render a Ray-Traced 3D Scene

Introduction

In computer graphics, ray-tracing is when a series of light rays are cast from an image plane into a scene, with the colour of each pixel determined by how its corresponding ray interacts with the objects.[1] As ray-tracing is often a costly process, acceleration structures are often implemented in the scene to reduce the time taken to render an image.

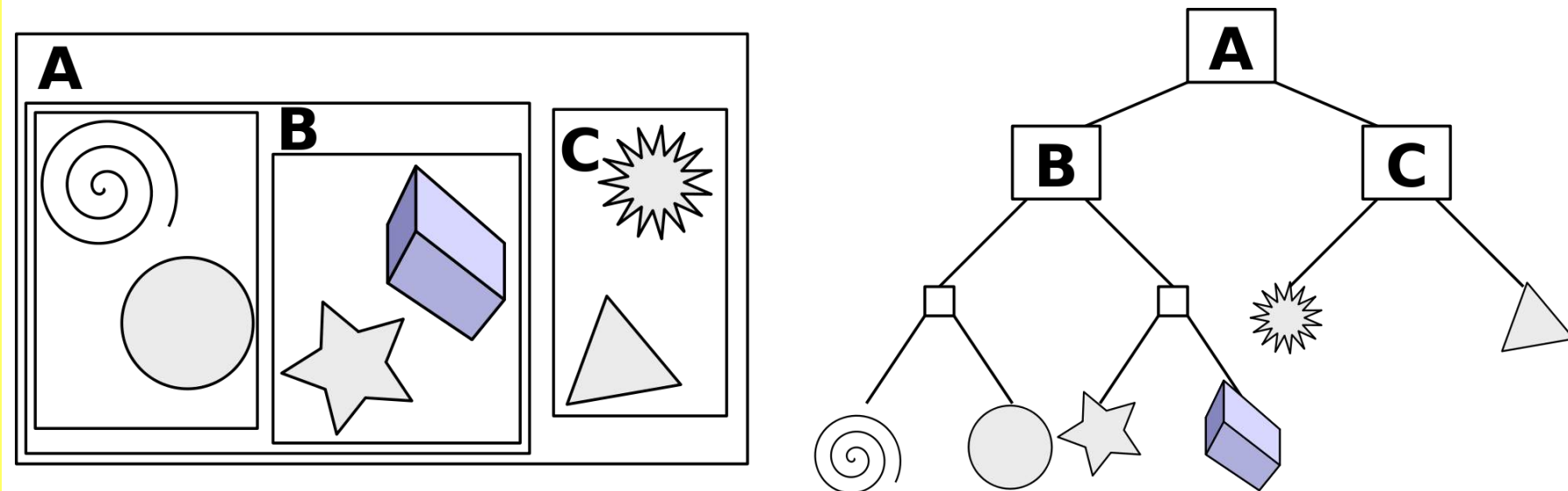


Figure 1: Bounding volume hierarchy[2]

Background Research

There are three primary types of acceleration structure that are commonly implemented in ray-tracing. Spatial subdivision algorithms divide each section of the scene into a number of smaller, non-overlapping regions.[3] The uniform grid splits the scene up into a number of equally-sized voxels.[4] The bounding volume hierarchy, which splits a larger bounding volume containing every object in the scene into smaller volumes.[5]

Aims and Objectives

The aim of this project is to design, develop and test a ray-tracing program that incorporates a bounding volume hierarchy. The rendering times of the scenes with and without the hierarchy are compared alongside the number of ray-object intersection tests performed. The bounding volume hierarchy has been chosen because it is the simplest structure to implement.

Conclusions

The first iteration records the time taken to produce scenes without the bounding volume hierarchy. The scenes containing a larger number of implicit objects took more time to render, as well as scenes with larger objects.

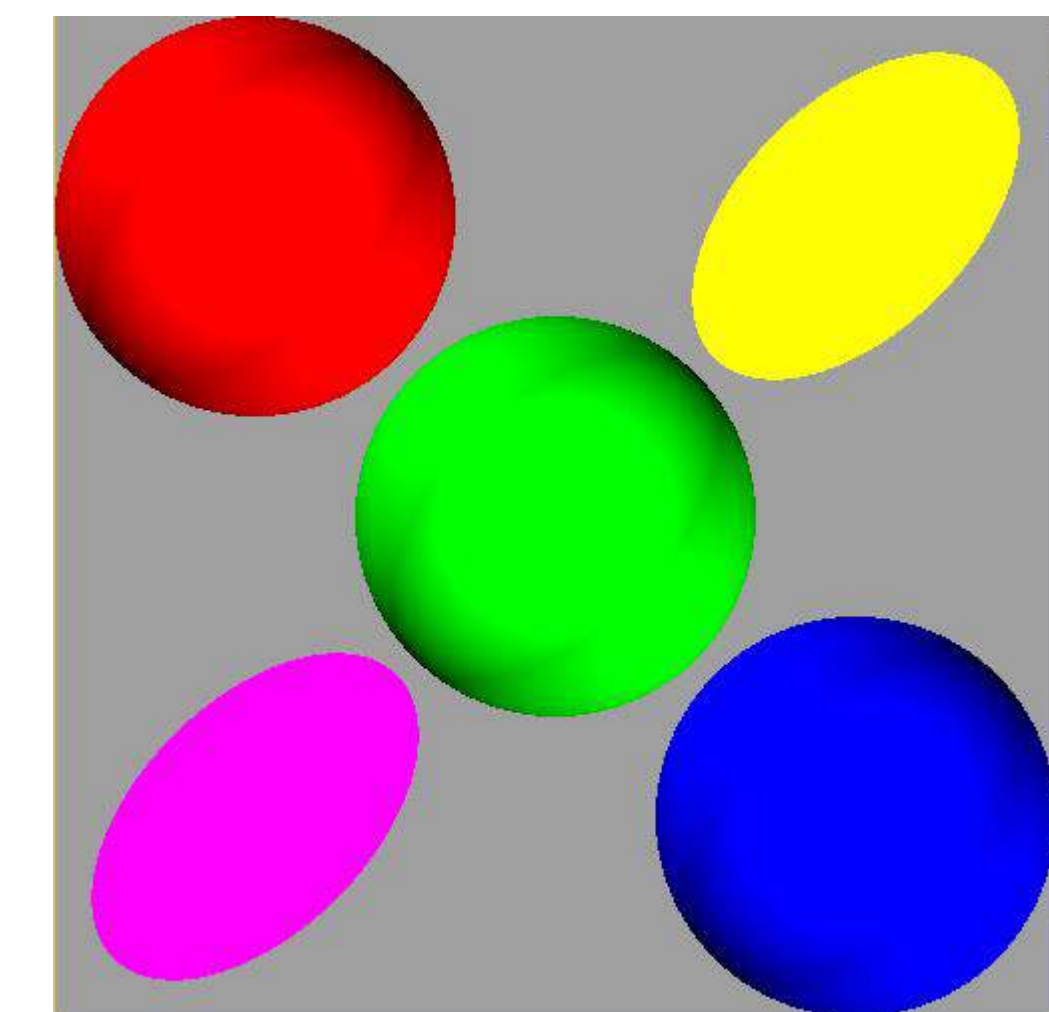


Figure 2: Test render using implicit objects

The second iteration incorporates the bounding volume hierarchy into the scene. This results in a reduction in collision tests and rendering time compared with the first iteration.

The third iteration loads polygonal models into the scene from an .obj file. Increasing the number of polygons loaded caused the hierarchy building time to increase, whereas increasing the scale value increased the image rendering time.

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BSc Web Development

1. Introduction

Global adoption of the internet is increasing at a rapid pace, by 2% each year. [1] On the other hand, smart-phone adoption is increasing as well for the past few years. [1] In the last five-years, mobile-broadband subscriptions have increased by 20% each year. A study by Google finds that the average load time for sites over mobile broadband is a significant amount of 19 seconds. [2] On the other hand, another study from 2011 points out that 74% of users expect a maximum amount of roughly 5 seconds before abandoning a page [3]. Finally, web page load performance affects a business' online presence such as the page's Google PageRank [4] and Bounce Rate [5, p. 39]. In the meantime, the size of web pages is in a steady increase [6]. With the scope of solving page speed issues, various client-side performance techniques are practiced.

3. Research Methodology

A deductive approach will be used which involves the use of quantitative data. On the other hand, an inductive approach will also be taken for some of the techniques as their effectiveness cannot be measured with quantitative data.

An experiment coupled with grounded theory will form the basis of analysing and measuring performance techniques. The experiment involves running several tests on the web page after which data is collected in tabular form. The main metrics consist of **Content Download/Download Time** and **file-size**, as well as other metrics for specific tests.

The experiment is designed after the test-retest pattern and uses Google Chrome's Dev Tools as its benchmarking tool.

5. Tests, Evaluation

Resource Hints

Resource Hints: **DNS prefetching** reduces time required for a DNS lookup to an indistinguishable **31 microseconds**.

In theory, the **preconnect hint** would eliminate all collection latency including TCP handshake and TLS negotiation.

CSS minification: According to test results across a wide variety of CSS minifiers/optimizers with differing levels of compression, CSS minification reduces time required to fetch CSS by **40% to 77% on average**.

JavaScript minification: The results of applying 2 JavaScript minifiers, Esmangle and UglifyJS 3 result that assets could be compressed from **70 to 90%**, including further compression with data compression programs such as gzip and Brotli.

PNG to WebP: Converting PNGs to Google's WebP format impacted the pictures' size by a **37% to 39%** reduction. In total, loading time was reduced by **40540 ms or 40 seconds** (on a fast 3G connection where the total size of all images adds up to 2.5 MB)

6. Conclusion

Judging from the data, WebP and JavaScript minification along with possibly resource hints are the most effective techniques for reducing page load. The results mostly align with the research done in the literature review.

To effect, it is undoubtedly images and JavaScript code that contribute most to slowing down web pages, as images and separate files with JavaScript code are the most prevalent factors in slow web pages. Connection latencies as well have a significant effect.

Development and engineering effort must be taken into consideration towards reducing the impact images and JavaScript code have on reducing page-load speed.

7. Recommendations

Only a set of client-side performance techniques have been reviewed, of which there are many more, for example delivering images at different resolutions depending on the viewport's width [7, p. 103]. Another is using CDN-hosted assets such as JS and CSS libraries instead of using local assets [7, p. 261]. More material for research and self-study of various other ideas and concepts can be found in "Web Performance in Action" [7] as well as "High Performance Browser Networking" [8]. A general overview of data compression concepts can be found in "Introduction to Data Compression". [9] Future technologies which may impact client-side performance as a whole are Google's QUIC transport protocol [10], Progressive Web Apps [11], the HTTP/2 protocol [12] and the decentralized file-sharing IPFS protocol [13]. As such they warrant future research.

2. Aim, Objectives

The aim of this research is to measure and analyse several techniques, concepts and practices employed by developers with the scope of increasing Client-side performance.

Its' objectives are to:

- Engage in a thorough literature review on concepts, issues and techniques pertaining to Client-side performance
- Build one or more mock web pages for each technique as necessary
- Take note of speed metrics for the initial unmodified version of the web page using benchmarking tools
- Apply and experiment with each practice on the mock website
- Run benchmarking tools on modified versions of the web page
- Lay out & format speed metrics data inside of tables for accurate measurement and evaluation of client-side performance effectiveness

4. Design, Implementation

The web page is comprised of a simple HTML web page with minimal CSS styling applied to it. JavaScript and CSS libraries as well as pictures of all types have been added so that the client has a decent amount of content to fetch. The web pages are in turn hosted on a free hosting service based in Romania. The 3G network throttle option from Chrome Dev Tools has been chosen as it is more relevant to the background and motivation behind this research. The process is as follows:

- Note performance results of original web page as reference
- Open web page in Google Chrome and open Dev-Tools
- Go to the "Network" tab
- Disable caching so that tests can be re-run with accuracy
- Set network throttling profile to "Fast 3G"
- Run the test by doing a refresh of the web page
- Gather "Download Time" data of each asset and place it in the table
- Apply a different technique on the web page
- Repeat steps 2-9

8. References

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[12] S. Ludin and J. Garza, Learning HTTP/2: A Practical Guide for Beginners. O'Reilly Media, Inc., 2017.

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Developing a GPS Based Tracking Camera System

by Steven Woodford – BEng Electrical & Electronic Engineering

Introduction

The aim of this project was to develop a GPS based Tracking Camera System, that could be used on moored platforms at sea.

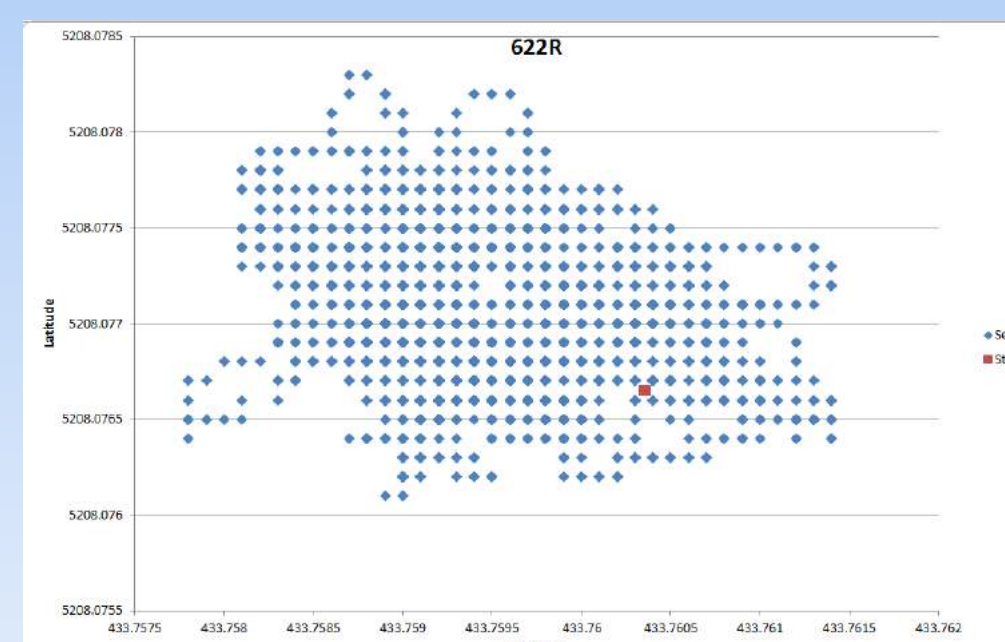
This would work by transmitting the GPS position of the remote unit back to the camera position. With another GPS receiver at this location, the range and bearing could be calculated between the two units, with the output adjusting the camera azimuth.

Aims & Objectives

- Investigation of GPS technology.
- Investigation into wireless data transmission.
- Transmission of the objects positional data back to the base (camera location).
- Processing the data and calculating the difference between the two positions.
- Build the system.
- Processing the data and enabling the camera to adjust its position, to locate target.
- Is tracking a stationary object possible with the system?
- Is tracking a slow moving object possible with the system?

GPS Comparison

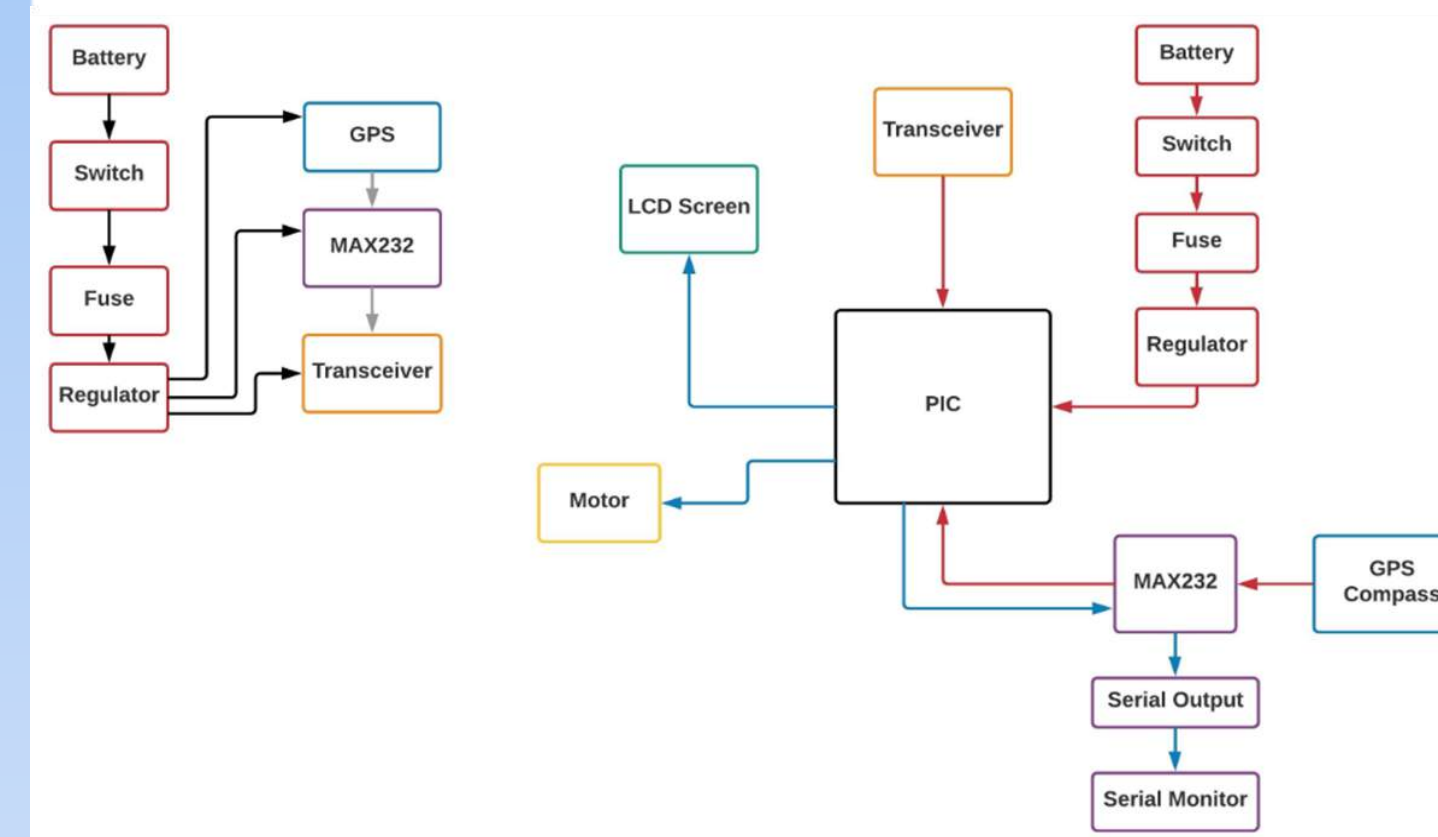
GPS Receiver placed on a surveyed position, with data logged for an hour. The precision and accuracy could then be calculated



- RF Solutions 622R
- 3600 Data Points
- 13.37 ft latitude Spread
- 11.84 ft longitude Spread

Block Diagram & Completed Units

Block diagram shows the remote unit on the left & The main unit on the right. Data direction going to and from the PIC MCU. The finished products were assembled in IP rated enclosures.



Haversine Formula

This is used to calculate the great circle distance between two GPS coordinates, A & B.

λ = Longitude

ϕ = Latitude

R = Earth's radius (6,371km)

$$a = \sin^2\left(\phi B - \left(\frac{\phi A}{2}\right)\right) + \cos\phi A \times \cos\phi B \times \sin^2\left(\lambda B - \left(\frac{\lambda A}{2}\right)\right)$$

$$c = 2 \times \text{atan2}(\sqrt{a}, \sqrt{1-a})$$

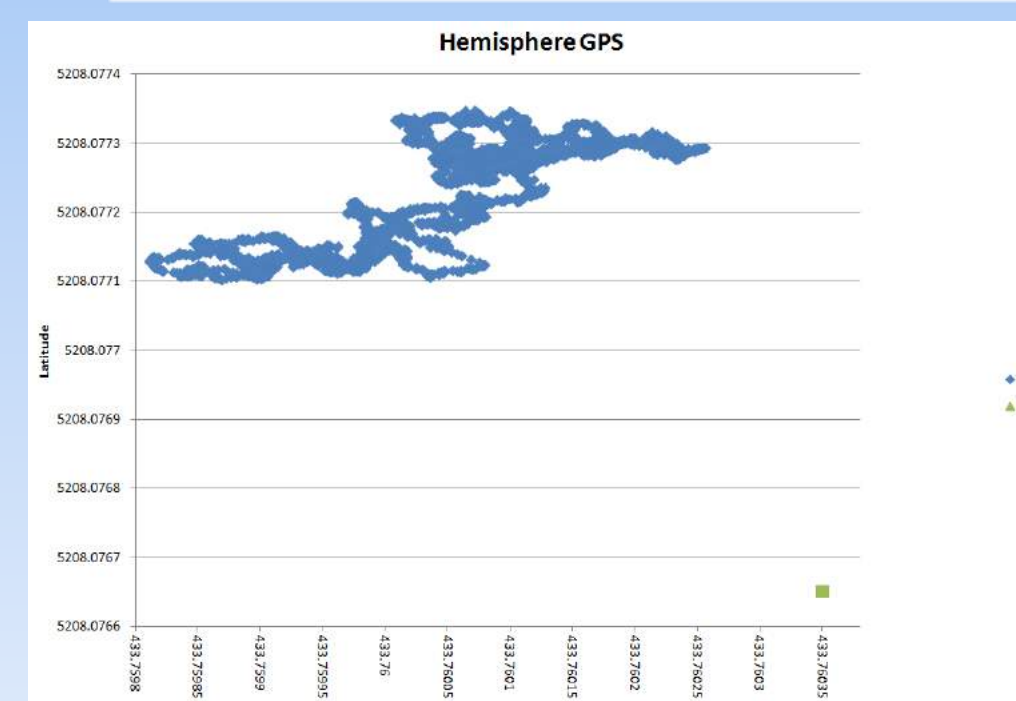
$$\text{Distance} = R \times c$$

Conclusion

Unfortunately the Aims & Objectives for this project weren't fully met, due to the steep learning curve involved in this predominantly software based project. That said the system was built and tested, calculating the bearing between the two units with $\pm 2^\circ$ accuracy. This was based on comparisons with the output from a GPS compass. The data link was also tested to 4km on land, which was more than sufficient for the application. The future work will include developing the system further to incorporate the camera output, as the initial use of GPS for this application has proved promising

Hemisphere GPS Test

Repeat of the earlier test, with a high end GPS Receiver



- 3600 Data Points
- 1.52 ft latitude Spread
- 1.48 ft longitude Spread
- 0.9m Positional Error

```

Virtual Terminal - PORT3
GPS1 -- $GPRMC,16.3801283,A,52.09.5938,N,004.28.0132,E,0.0,0.0,0.0,0.0,0.0,0.0
GPS2 -- $GPRMC,16.3801283,A,52.02.6415,N,004.41.5615,E,0.0,0.0,0.0,0.0,0.0,0.0
GPS1 Latitude = 52.09.5938
GPS1 Longitude = 004.28.0132
GPS1 Lat Float = 52.09.5938
GPS1 Lon Float = 004.28.0132
GPS2 Latitude = 52.02.6415
GPS2 Longitude = 004.41.5615
GPS2 Lat Float = 52.02.6415
GPS2 Lon Float = 004.41.5615
Distance RAD = 0.00388117
Distance = 19.67m
Bearing RAD = -2.26519298
Bearing = 230.214 Degrees
  
```

An Investigation into GIS and GIS-T to aid the development of a GIS-T Application for student use

Introduction

Travelling is a big part of a university students life, for students that come from other cities, countries or different parts of the world. The students that come from different places have to adjust to the place where they are studying as they are not familiar with the place. They will come across different challenges when it comes to travelling into their university or even just around the city. The use of public transport is popular among students when getting from point A to point B. This project is going to be focusing on the development of a GIS transportation application that can be used by students to travel around their city of study. The development of this application will make it easier for the students that travel using public transport to get from one point to another.

Aims & Objectives

The main focus of this project is to investigate the application of GIS in transportation to assist in the development of a GIS-T application. The research carried out looked at things like:

Aims

- What is GIS?
- Advantages and Disadvantages of GIS
- Basic uses of GIS
- What GIS-T
- History of GIS-T
- How Data is presented in a GIS-T
- GIS-T Analysis and Modelling
- GIS-T Applications

Objectives

- Collection of data to aid in the development of the website application
- Produce a design of the web application
- Develop a web application
- Provide quality content within the application
- Improve student satisfaction with the public new transport system

Tools used in the development of the web application

- IDE (software) used is Visual Studio 2013. Visual Studio is one of the most feature complete and thought through IDEs for any of its supported programming languages and is used by many professional coders out there.
- Languages and Framework used are ASP.net web forms with C# for backend coding and MySQL for Database operations.
- Use of Google Maps Embed API which provides very useful features such as displaying routes in google maps with the target source and

Results

Following the completion of the project the results are quite satisfactory. Most the objectives have been met even though some of the feature of the web application aren't fully functional. The research carried out has a lot to contribute to the success of this project. Given a little bit more time the web application would have been free to be released for public use.

Conclusion and Future Recommendations

Over the course of the project there were many problems that occurred but were quickly tackled, like errors during the testing stages of the application. One of the main parts of this project was the research, the research carried out allowed the project to move at a quicker pace because it brought to light many ideas as to how to tackle the project. Research made it easier to design and develop the website application due to the information found. A recommendation would be to add the final touches to the application as its almost fully functional. There are a few things that could use tweaking but they wouldn't be too time consuming.



Swansea Transport System

Student Feedback

Select your driver's name	
Is the driver punctual in timing ?	☐ yes ☐ no
Does the driver obey the rules of the road ?	☐ yes ☐ no
Does the driver overspeed ?	☐ yes ☐ no
How is the condition of the Bus ?	☐ excellent ☐ moderate ☐ poor
Do you reach your classes in time ?	☐ yes ☐ no
Any Comments or Suggestions ?	

Your feedback is very important to us and we take your comments seriously as the comfort and satisfaction of students is our priority.

By Tapi Matuwi
 Email: tapimatuwi97@gmail.com
 Phone: 07428733022

RFID Attendance System

Todd Renton (1503526@student.uwtsd.ac.uk)

Abstract

This project is set around using a database system to act as a registration system which run off users using cards as a form to confirm their attendance. This project will look into how different type of registration system and how they could make work with a card system. Other feature will be to look into different types of database and how they can work with card system. After the Research above then the system will be design. And start to be create step by step by the development method which has been chosen. Results will be displayed of the reports based of the student information stored in the attendance database.

Aim/Scope

- To design a database which can be used to store information done from the a daily registration.
- A card can be used to enter users detail of time to a database.
- User information of being login will auto fills to database upon card reading.
- To replace the one paper/ spreadsheet system
- To be able to update product a set of reports from the database.

Background Research

Registration system

- History of use of registration system
- Types of registration system

RFID

- Different RFID technology
- What an Passive tag
- What an Active tag
- Card scanner

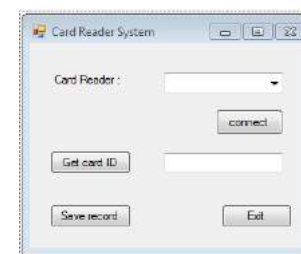


Database

- Information of different database system
- Transaction type database

RFID scanner

- Using a ACR 122U card Reader
- Drives of for the scanner installed by plugging in the card reader or install from a disk
- Using C# created a Card reader program
- This program is link to an access database when save record is pressed



Results

Result could be display in the form of a reports. These are example reports made by the system.

- Report list of students

List of students

student ID	ID	forename	surname	Year
1	1503526	todd	lysee	02/10/2017
2	140278	wsdls	tdclassd	13/02/2018
4	p-2343893	bill	montain	01/10/2015
5	p93849835	raining	cold	03/04/2018
6	name work	superbox	2000	09/03/2016
7	2333312	food	Aes	11/04/2018

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- Report list of student that are late to classes

Class1 late

Class ID	End time	Module Title	student ID	ID	forename	surname	Time/Stamp
1	14/02/2018 14:00:00	some text for now	1	1503526	todd	lysee	14/02/2018 11:16:38
			2	140278	wsdls	tdclassd	14/02/2018 11:20:43

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- Report list class

Class_Table

Class ID	Module Title	End time	student ID	ID	forename	surname	Time/Stamp
1	some text for now	14/02/2018 14:00:00	1	1503526	todd	lysee	14/02/2018 11:16:38
			2	140278	wsdls	tdclassd	14/02/2018 11:20:43
2	griff	13/02/2018 11:00:00	1	1503526	todd	lysee	14/02/2018 11:16:38
			2	140278	wsdls	tdclassd	14/02/2018 11:20:43
3	data mining	20/04/2018 11:00:00	4	p-2343893	bill	montain	01/10/2015 11:17:53
			5	p93849835	raining	cold	03/04/2018 11:13:07
			6	p-2343893	bill	montain	01/10/2015 11:17:53
			7	p93849835	raining	cold	03/04/2018 11:13:07
			8	p93849835	raining	cold	03/04/2018 11:13:07
			9	p93849835	raining	cold	03/04/2018 11:13:07
			10	p93849835	raining	cold	03/04/2018 11:13:07
			11	p93849835	raining	cold	03/04/2018 11:13:07
			12	p93849835	raining	cold	03/04/2018 11:13:07
			13	p93849835	raining	cold	03/04/2018 11:13:07
			14	p93849835	raining	cold	03/04/2018 11:13:07
			15	p93849835	raining	cold	03/04/2018 11:13:07
			16	p93849835	raining	cold	03/04/2018 11:13:07
			17	p93849835	raining	cold	03/04/2018 11:13:07
			18	p93849835	raining	cold	03/04/2018 11:13:07
			19	p93849835	raining	cold	03/04/2018 11:13:07
			20	p93849835	raining	cold	03/04/2018 11:13:07

Conclusion/ outcome

An analysis of the newer system. A check of the database performance for the task and the result that are produced. A check of how the design Aim has be meet. What was missing and why some feature might not be include in the current system and improvement to the system.



Teaching Through Motivation in Video Games

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1. Introduction and Aims & Objectives

As the key factor in influencing our decisions and actions, motivation has a high importance within education. Motivation is also a factor involved in development of video games and over the years as more and more research has gone into improving the techniques & mechanics deployed to promote play and enjoyment. As both fields benefit from motivation, this project will investigate the binding of education and video games with motivation to promote learning.



There are 2 Aims which were outlined to be followed to the completion of the project:

- To Investigate the Techniques and Mechanics that promote Motivation.
- To Develop an Educational Video Game incorporating Motivational Techniques.

To achieve these aims, 4 objectives were designed to guide the flow of the project to achieve the aims:

- To Research Popular Motivational Theories in Psychology.
- To Research Motivational Techniques and Mechanics used in Video Games.
- To Implement the Motivational Elements into the Game.
- To Promote Learning through Gameplay”

2. Methodology

A review of literature was conducted to research and discover motivational theories and techniques before design & development began. An adaptation of the SCRUM methodology was used with adaptations to accommodate the lone developer nature of the project. Some features of Feature Driven Design were brought in to guide the development also, promoting completion of features in every SCRUM sprint.

3. Design & Implementation

3 Motivational Theories were decided to be gamified and implemented which were:

- Don’t Break the Chain/The Seinfeld Hack - Habit Motivation [1]
- Reward Motivation Theory [2]
- Goal Setting Theory [3]

Other Key Design Decisions that were Implemented include:

- Unity was chosen as the development engine due to it’s ability to produce fast prototypes and the range of documentation and features it possesses.
- Short but Regular Lessons in order for flexibility in allowing the game to fit into busy schedules.
- Emphasising the player is learning on a journey by exploring for one’s self to give sense of control.
- Quiz levels differ from the learning levels to keep game fresh and test progress.
- Interesting words extra feature to allow motivated individuals to explore further.

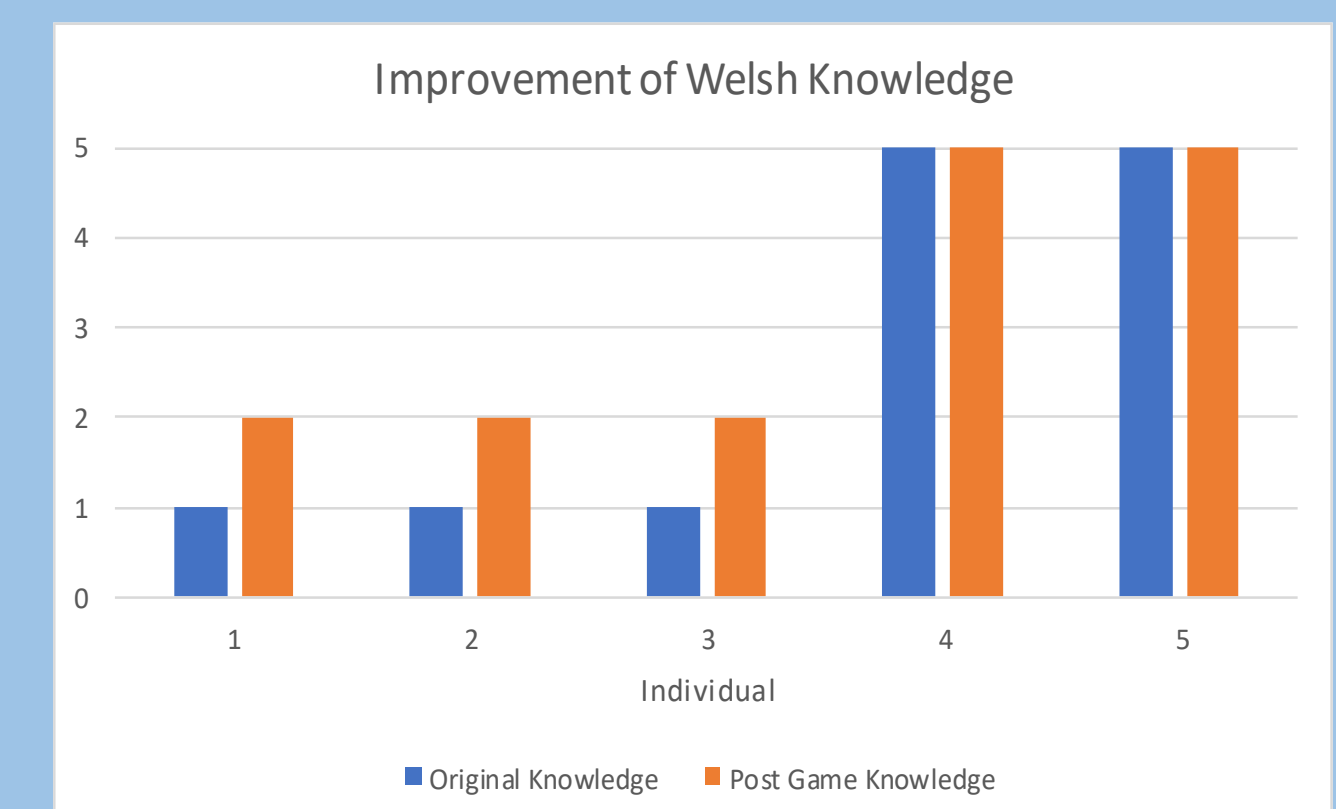
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- [3] E. A. Locke, “Toward a theory of task motivation and incentives,” *Organ. Behav. Hum. Perform.*, vol. 3, no. 2, pp. 157–189, 1968.

Conclusion & Future Improvements

From the feedback of the survey, it can be concluded that the 3 motivational theories contribute greatly to improving the motivation of an individual within the game in their gamified versions. Along with these, the other key decisions made during the design phase of the SCRUM seem to have also had the desired effect. In general, there was an improvement seen in the knowledge of over half the users playing the game for the 2 week period.

Despite this feedback proving positive, there is still room for future improvement of these techniques which is reflected in the scores achieved by these methods.



The feedback provided has allowed many improvements to be planned in order to further boost the effectiveness of this game. Some of these improvements include:

- Improve the Learning Levels by introducing Scoring or other Competitive nature features.
- Daily Streak Rewards to Further Reward continuous play.
- Mix up the Testing Levels by introducing an adaption on the learning levels to pair the words without help.
- Graphical upgrade from the textured cubes to 3D rotating words.

An investigation into the development and data mining application analysis of a book management system

Zuhua Liu Business information technology

1.Introduction

Library management system belongs to MIS (management information system), which becomes more and more popular in the society of emphasizing and management.

The book management is facing more difficult problems than the past, such as massive data, personality needs and so on. Data mining technology has great advantages in solving these problems.

2. Aims and objectives

The aim of this report is :

An investigation into the development and data mining application analysis of a book management system .

The objectives are to:

- 1.Secondary research into personal and professional book management system.
- 2.Understand the Development environment and tools and design the basic structure of book management system.
- 3.Develop a book management system prototype.
- 4.Evaluate the book management system prototype designed.
- 5.Discuss the commercial application direction of data mining in book management.

3.Personal prototype requirements

1. Login function
2. Book information management
3. Book inquires

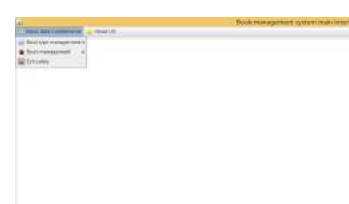
3.Prototype interface

Login → Book → BookType

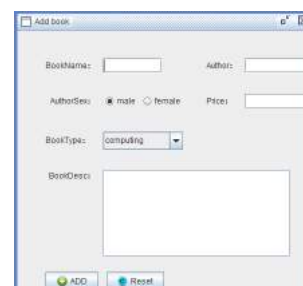
Login



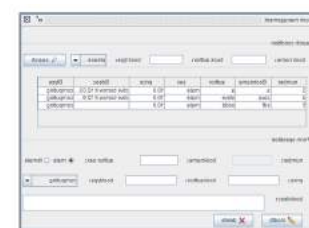
Main interface



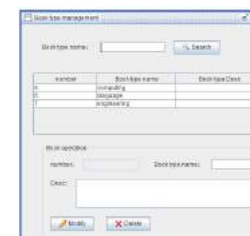
Add books



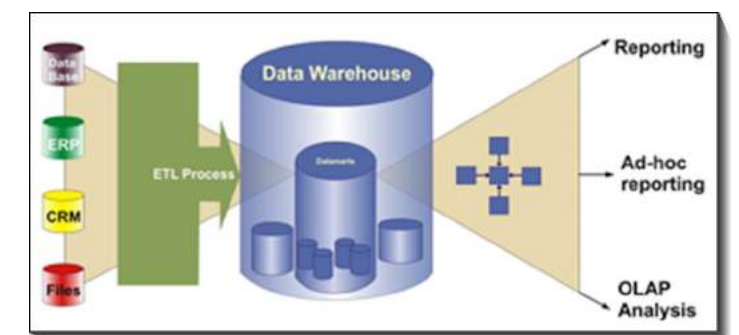
Book management



Add book type Book type management



4.Data mining prospect



1. classify readers group
2. improve the attraction of library to readers
3. Improving the lending rate of collections
4. Improve the efficiency of library management

5.Conclusion

This system is an idea for personal book management system and also give some proposals for professional book management system. It will be convenient for managing book information for person and organization.

Future work:

- 1.build more beautiful and friendly interface
- 2.chang it to web
- 3.Build more complicated database
- 4.Use other programming language it
- 5.Design a professional version
- 6.Do more research and get some creation.