Introduction –

The research being completed in the project is to answer, “Investigating the use of individuals mobile devices as a mechanism to enhance locational information within a geographic setting”. The project will require research into multiple different area about networking and electronics. The literature review is here to analyses different websites, project and articles that may support the development of the devices to answer the statement given for the project.

The main tasks that will be researched throughout this project is to create a device that will provide solutions towards the use cases that were given within the Project Outline. These use cases are;

1. Small Event Visit Counter
2. Medium Event Visit Counter
3. Path Tracking Application
4. Rerouting Application

This will require development into a device that has the possibility achieving these use cases. The main application will collect the primary data of a mobile devices Mac Address, RSSI and a timestamp of when the device was recorded to be seen.

Similar Projects –

The initial part of the research for the project is to look towards similar ideas that may indicate different solutions and their limitations or flaws. Therefore, providing a guide to help create a path in which the project should take and show the possible problems that could occur throughout the project.

The project that was first found to help support the new report around the project of ‘Smart Bins’ that were placed around London by Renew. The BBC news explain the problem areas around the project and Quartz go into further details about the development of the project. The main issue that was found during these reports is that the Renew company had developed these bins to count Footfall data around the area of the bins and provide advertising at the same time, however, the company collected more data than required and started providing select advertising based on paths the device took. This was a breach of personal data was shut down due to this cause. They had further plains to expand to other cities and use the location tracking to gather other personal data, such as the gender of the device holder.

The ‘Smart Bins’ were useful for displaying that is possible to create a Footfall counter and to demonstrate the ethical and legal issues that lay around a project of this design. As the data collected could be abused to collect personal data on a device holder without them even know, this is due if the device is in promiscuous mode the device will pick out packets and leave no trace that the packets being sent was read.

The next report that was useful towards the project was about position tracking using an Arduino with a wifi shield by Nathan Conrad at Western Michigan University. The device that was being developed was a network of devices that would help indicate where an employee or object is within the workplace. Each employee would hold a device that would have a tracker connected to it, that only worked within the company building. This device would allow for a button to be pressed to indicate and emergency inside a building and could provide a map the location of the device throughout the building. The main issue that was found during the development of this project was that depending on the amount of access points that are inside a building, the signals may be interrupted or become confused due to noise. Therefore, meaning the reading could contain error within the RSSI, this would cause problems with location tracking as it is the main method of determining the location of a device. The wifi shield was changed from a CC 3000 to a Arduino Wifi Shield that would provide a more efficient solution as the device was less confused by noise within the building.

The report displays the possibility of location tracking through wifi tracking and a clear position of a device can be indicated if a network of device work together to collect appropriate results. However, their can be issues with accurate recordings that depend on the environment that the network is being used within. Meaning during the testing of this project different environments should be experimented with to gather information about the possible flaws of the design, such as too many access points could generate a lot of noise within the network.

Development Research –

The development of this project initial ideas are dependent on looking into key variables that will determine how the project will move forward and the key variables that will support the final solution of the use cases. The following section will indicate the key variables and how they are useful for the progression of the project.

* RSSI – Resource Strength Indicator – the signal strength between the two devices, the strength values range between 0 to -100. The stronger the signal the higher the number. The RSSI will give the possibility to determine the range for readings inside the event and will be the primary resource to determine the location of a device.
* Mac Addresses – is a unique identifier for each device that is connected to the internet. The variable will look like ‘0c:cb:85:25:d1:f1’. The mac address cannot be used to trace any data back to the owner of the device and can only provide information about the vendor of the device. This data will be used to uniquely identify the device and record data about when it seen and the RSSI at that given time. It is key to counting the footfall in a given area and not counting the same person twice.
* Timestamping – this variable will be used to give a time of when each individual signal was received. The variable will look like ’2019-08-01 20:59:02’ and will be used to calculate dwelling time and help compare individual signals and see if they are related or not.
* Access Points – this is a device that creates a wireless local area network. These devices will be the receivers of the packets that we are trying to intercept and get the Mac Address and RSSI from. Therefore this will be key in collecting the key data as the device will need be place in a location that are intercepts the two devices to gather accurate data.
* Data Packets -
* ESP8266
* Arduino IDE
* Arduino Uno
* Raspberri Pi

Use case 1 –

Use Case 2 –

Use Case 3 –

Use Case 4 –