Literature Review

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# Introduction

This literature review will cover the different technologies that we have researched and are planning and some that we might use or *implemen*t in our upcoming project. The technologies involved are Azure for our SQL and web hosting needs, Bluetooth Beacon, NFC & QR Code Technology etc. Our main target of usage will be colleges, hospitals, airports & so on. Buildings where people usually most struggle to orientate themselves in. We will do a research, how indoor GPS was implemented and where used before. Our main goal to achieve not just cheap & cheerful version of indoor GPS system for people, but also make it precise & efficient one as much as possible by using mix of technologies mentioned above. We want to prevent people from getting lost, where our application/system is supported & help people to find the best way to their destination with less stress & on time.

# Pre-existing Technologies

The first thing we did as a group was to do research about the different companies that have implemented or are planning to implement indoor GPS navigation and companies who are doing research and are inventing new tools to make implementing this technology easier.

The first company I researched was Infsoft which was one of the leading indoor GPS navigation companies around, the research I did into them helped us understand exactly how this company was using their software in conjunction with hardware to map out their warehouses. (Infsoft.com, 2019)

The hardware the used was a Bluetooth beacon to setup positions inside a building injunction with Wi-Fi to have a constant signal which they can use, they have also created Infsoft Locator Nodes and Infsoft Locator Tags which actually allow them to track people and assets in real time in any of their buildings. (Infsoft.com, 2019)

The most interesting aspect of indoor navigation is the absolutely amazing amount of versatility it offers different people and companies through tracking different machines, packages, people in factories and collecting analytical data to help optimise their system and work output, one of the most surprising things that I discovered about this was tracking different customers inside a shop that has a specific layout to see how much each person spent at one zone or what path they choose to take information like this has an immense value to business owners because it can help them optimise their store to make more money. (Infsoft.com, 2019)

One of the most important factors in indoor GPS navigation I researched about was there essential need for reliance, one important case I researched showcases what would happen if multiple vehicles that were all automated and guided by an indoor GPS navigation system were not efficient and caused different vehicles to run into each other causing untold amounts of damage this is a very real and serious situation and has the potential to be quite dangerous for people as well because of congestion in buildings or vehicles moving around that had incorrect sensors that might crash into a person all these factors must be taken into account when designing a system like this.

# Web Hosting

The web hosting I companies I choose to do my research about were Amazon Web Services and Azure Hosting, the first company I did my research on was Amazon Web Services which I had learned offered a free 12 month subscriptions on multiple different services such as database, web hosting etc. which we will need in our project.

The first thing I looked at were the differences between the 2 different services just to check did either have any large negative service that would impact our project and my research lead me to believe that both companies offered quite similar services with negligee differences.

Azure hosting is the main hosting company we are planning to use for our database and web hosting needs in our application, the research I did lead me to learn that because we are students we actually already have a free 12 month subscription because our college created us student accounts with Microsoft which allows us to use all Microsoft applications which include Azure which is an incredible benefit to us because of the wide array of options it offers us and with it being free that this has also allowed us more flexibility because we save money by not needing to use other hosting applications which depending on the company are either trash hosting sites which are free or reliable and good hosting companies which charge an extraordinary amount of money which we could not afford.

The reason I chose Azure Hosting compared to Amazon Webserver or Bluehost which both offer very good services is because I believed Azure offered the best mix of these services compared to the other hosting companies.

* Availability
* Azure SDK
* Scalability and flexibility
* Stability
* Recovery
* Integration Tools

Azure hosting had a nice mix of all of these features and even more that made me realise that this is the best choice for our project. (TechRepublic, 2019)

# Bluetooth Beacon Technology

Bluetooth Beacons is hardware data transmitters at short-wavelength radio waves, from 2.4 to 2.485 GHz, between 2 & more devices that are near and performing actions when we are close to the beacon. This technology usually used to determine physical location & to respond as a location-based action to a device. Bluetooth Beacons come in variety of forms, from coin-size cell to USB stick.

From Bluetooth 4.0 version, it is possible 1-way communication, when Bluetooth device just transfer the data, but not listen for it. Also, it works with less impact on the battery life and with good extended precision.

Bluetooth Beacons come with variety of powering design as well: battery powered, which we are probably going to use, & USB powered, which are really good for a long-term installation option. As we are going to use battery powered beacons, we need to check manufacturer specifications related to power consumption, interval transmit power, also must be in count approximate frequency of usage and think by what kind of phones, it might be use. Battery powered beacons life range is about from 1 month to 2 years.

There is two most popular version of this technology – 4.2 and 5. Bluetooth 5 improved version, of course, with more speed, which is 2 times higher than at 4.2 - 2 Mbps against 1 Mbps & with more range, which is 4 times higher – till 40 metres indoor range. Power consumptions of Bluetooth is less than previous version & battery life is longer. Also, capacity of message larger, 255 bytes against 31 bytes.

We are going to use about 2-3 beacons per building, just as checkpoints of user’s location.

Mobile Device support – Android and iOS doesn’t do it natively, we need a generic application for that.

*How it works (in details)*

*What inside (hardware)*

*Other usage of the beacons*

# NFC Research

NFC tags (abbreviation for Near Field Communication) are basically, small stickers, of round or square shape and the size of the coin, with integrated circuit that able to store data and transfer it between NFC-enabled devices such as smartphones and tablets. In wireless world, NFC’s closest relative is RFID, which stands for Radio Frequency Identification. NFC readers work at ~10 cm of maximum range.

NFC tags are passive, because they don’t have any power source. They take power from the device that reads them by using magnetic induction. When reader-device gets close enough to a NFC tag, it energizes the tag and then transfer the data from the tag. There is always some power lost during the transmission, but it is usually still enough to power the NFC tag. They ‘steal’ a bit a power battery of the phone to kick in, basically.

NFC tags can be with different memory capacities. It’s possible to store a telephone number or URL (web address), also there is opportunity to add the protection – NFC tags can be locked, once data has been written, it cannot be changed. They can be re-encoded a few times before they are locked forever. During the research, 5 different types of tags were found, with different capacities and data transfer speed:

Type 1 & 2 store from 48 bytes up to 2 kilobytes of data and communication speed is up to 106 Kbit/s. These types of tags can be rewritten several times and also be permanently locked, so no one could apply any changes to data. These tags able to store something short like a website URL – a simple piece of information.

Type 1 is used for read-only applications, business cards etc. Type 2 is more popular, because offers more functionality and has relatively cheap price. Type 2 used for low-value transactions , event tickets, URL redirects etc.

Type 3 stores up to 32 KB and communication speed is up to 212 Kbit/s. It provides a wide range of the functionality, but price is quite high. These type can be written only once and has the lack of security. It used for more complicated applications such as E-tickets, electronic ID, membership cards, etc. It is very widely used in Asia, because it is Japanese innovation.

Type 4 has the same capacity, but speed is up to 424 Kbit/s and offers most of the flexibility and memory, but has high price for it. Also, it provides a good security.

Type 5 is used for library books, products and ticketing applications.

It’s a quick and efficient way to push any information to your phone. Also, they are very cheap to make, maintain and can be used for wide range of apps.

# QR Code Technology & Software for generating

<https://www.qr-code-generator.com/qr-code-marketing/qr-codes-basics/>

QR Code for Windows 10 – free, didn’t test it though or <https://www.qrcode-monkey.com/> looks free as well.

# Conclusion

The research we have undertaken for this project has been immense and extremely enlightening before we began we did not comprehend the magnitude of the different research we would have to undertake such as the differences between different hosting companies, the difference between the beacon technology’s and how each will work together, this research has truly helped us understand how vital it is to research each factor of these technology’s so that we are sure that we can and should implement them into our project.

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