Masters Project Research Log

Masters in Electronic and Computer Engineering 2021/2022

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Project Title: The design and development of a discreet building access management system using wireless Indoor location tracking

Please read before making entries in this log

The purpose of this Project Research Log is to capture concise, focused summaries of research materials you read, as you progress through your project. The emphasis is to record (i) how the material you have read will determine or influence your project solution approach and (ii) your assessment of the key strengths and weaknesses of the solutions, methods, technologies, etc. proposed in the material you have read.

In the first stage of your project, the literature review, use the Log to capture this information for the key papers you have read (for example, the three most important papers of your 10 literature review references). As your project progresses into the design and implementation phases, you will need to continue to search the literature so you can review, revise and refine your initial thinking and the details of your approach to a project solution. Use this Research Log to capture your continued research reading and its influence on your project design and implementation.

Be selective about what you record in this log. Do not use it as an informal notebook while you are reading a new paper. Only make an entry after you have read a paper that you consider important to the development of your project solution. It is expected that, by the end of the project, you will have made **between 10 and 20 entries (20 maximum)**.

Share your log with your supervisor for viewing throughout the project. You will submit the final version of the log for grading, at the end of the project implementation period. It will be assessed on the basis of how well you have used your analysis of the literature to inform your project design, implementation and the evaluation of your project results. The Research Log contributes **5%** to the overall project mark.

Note: All entries you make in this log must use the prescribed format shown on the next page. You will maintain other notes as you progress through your project but they should not be recorded here. Fill in the details where the *** signs are.

Statement of project problem / research question (maximum 200 words) *This statement should be periodically reviewed and updated, as necessary, as your project progresses and you gain further insight into the detailed project challenges, requirements and objectives as your project work moves from background reading, literature review, initial project design planning and detailed design and implementation. Initially, start by stating your current understanding of the project objectives. After each meeting with your supervisor, review and refine your project problem statement, as required.*
Utilising off the shelf wireless devices to establish a passive real-time indoor location system for the purpose of access control. Questions to answer are: 1. Wireless protocols available 2. Measurement Methods 3. Architecture design

1.

A complete reference for the paper
X. Zhao, Z. Xiao, A. Markham, N. Trigoni and Y. Ren, "Does BTLE measure up against WiFi? A comparison of indoor location performance," European Wireless 2014, 2014
Summary of paper (maximum 100 words)
A comparative review of using Bluetooth low energy and Wifi to accurately determine the location of a user within a given space
How is this paper relevant to solving your project problem or addressing your research question? (maximum 100 words)
This paper draws a direct comparison of the accuracy of 2 of the wireless protocols within this projects scope and looks at implementation and issues presented by both under similar conditions (excludes access management/decisions based on location)
What are the strengths and weaknesses of the solutions/methods/technologies proposed in this paper? (maximum 100 words)
This paper outlines that Wi-Fi's inaccuracy needs to be accompanied by either rigorous data processing or combined with another method to determine indoor location. It also shows while more accurate Bluetooth also has issues to the degree of accuracy it can achieve. Combining results for both Wi-Fi and Bluetooth produce a better image but it is still not accurate enough (often showers users in rooms when in corridors etc)

2.

A complete reference for the paper
A. Martinelli, M. Dolfi, S. Morosi, L. Mucchi, M. Paoli and A. Agili, "Ultra wide Band Positioning in Sport: How the Relative Height Between the Transmitting and the Receiving Antenna Affects the System Performance," International Journal of Wireless Information Networks (2020) 27:18–29, 2019
Summary of paper (maximum 100 words)
This paper reviews the accuracy and configuration of an outdoor UWB network for location tracking within a given outdoor space.
How is this paper relevant to solving your project problem or addressing your research question? (maximum 100 words)
While this is conduced outdoor and in full line of sight of all device in network (no walls/objects blocking LoS) this does show the accuracy achievable to a significantly greater details over a large area as well as reviewing some issues the investigators had to overcome
What are the strengths and weaknesses of the solutions/methods/technologies proposed in this paper? (maximum 100 words)
The data collection done onf the UWB devices is very strong however the fact that it is done in an open air out door space does still leave some questions regarding guaranteed obstructions in indoor spaces

3.

A complete reference for the paper
M. Terán, J. Aranda, H. Carrillo, D. Mendez and C. Parra, "IoT-based System for Indoor Location using Bluetooth Low Energy," IEEE, 2017.
Summary of paper (maximum 100 words)
Using Bluetooth low energy to devise indoor location based off of relative strength index (RSSI) measurements
How is this paper relevant to solving your project problem or addressing your research question? (maximum 100 words)
This paper showed implementation of an IoT architecture as part of an indoor location tracking system utilising one of the wireless protocols in scope
What are the strengths and weaknesses of the solutions/methods/technologies proposed in this paper? (maximum 100 words)
The architecture used re-enforced my initial design concept however the data analysis based off of RSSI meant they could only achieve accuracy up to a $2m2$ area

4.

A complete reference for the paper
J. F. E. a. M. S. Reynolds, “Every smart phone is a backscatter reader: Modulated backscatter compatibility with Bluetooth 4.0 Low Energy (BLE) devices,” IEEE International Conference on RFID (RFID), 2015.
Summary of paper (maximum 100 words)
This paper analyses and optimises processing for packets on the Bluetooth network
How is this paper relevant to solving your project problem or addressing your research question? (maximum 100 words)
This paper provided technical details regarding Bluetooth protocol metrics needed as part of the selection matrix analysis that were missing from other papers used
What are the strengths and weaknesses of the solutions/methods/technologies proposed in this paper? (maximum 100 words)
NA used as a reference to back up data

5.

A complete reference for the paper
E. H. Reich, B. Ghita, M. Wagner and J. Schäfer, "Performance Evaluation of Bluetooth in a Wireless Body Area Network for Practical Applications," 2020 IEEE 11th Sensor Array and Multichannel Signal Processing Workshop (SAM), 2020
Summary of paper (maximum 100 words)
This paper looks at the abilities of a Bluetooth WBAN through performance testing
How is this paper relevant to solving your project problem or addressing your research question? (maximum 100 words)
This paper identified the device number limitations on a Bluetooth network required as part of the selection matrix analysis
What are the strengths and weaknesses of the solutions/methods/technologies proposed in this paper? (maximum 100 words)
NA