

FTMK NAVIGATOR



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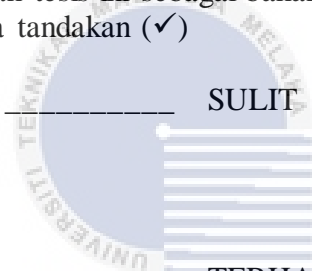
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FTMK Navigator

KOH KOK SHENG



This report is submitted in partial fulfillment of the requirements for the Bachelor of Computer Science (Software Development) with Honours.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2021

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ABSTRACT

This project is developed based on the idea of navigation in an indoor environment. Sometimes it is difficult to find a venue in a building like a shopping mall or faculty because of its complex structure or familiarity of user. So it is a good idea to have a mobile application that can guide user inside a building. FTMK in UTeM is one of the good example of complex building. It is hard to search a venue or route in FTMK especially for new students, hence that's the reason why FTMK Navigator is built in this project. FTMK Navigator is an android mobile application, it shows the floor plans of FTMK, user can use it to search a venue or route between two venues. It calculate the estimated distance when a route is being searched and gives some more information to user for them to search their destination more easily. FTMK Navigator is useful to students and guests that visit FTMK since they can find destination on their fingertip.

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ABSTRAK

Projek ini dibangunkan berdasarkan idea pelayaran di persekitaran dalaman. Kadang-kadang sukar untuk mencari tempat di bangunan seperti pusat membeli-belah atau fakulti kerana strukturnya yang kompleks atau keakraban pengguna. Oleh itu, adalah idea yang baik untuk mempunyai aplikasi mudah alih yang dapat membimbing pengguna di dalam bangunan. FTMK di UTeM adalah salah satu contoh bangunan kompleks yang baik. Sukar untuk mencari tempat atau laluan di FTMK terutamanya untuk pelajar baru, oleh itu itulah sebabnya FTMK Navigator dibina dalam projek ini. FTMK Navigator adalah aplikasi mudah alih android, ia menunjukkan denah lantai FTMK, pengguna dapat menggunakannya untuk mencari tempat atau laluan antara dua tempat. Ia mengira anggaran jarak ketika laluan sedang dicari dan memberikan lebih banyak maklumat kepada pengguna agar mereka dapat mencari destinasi dengan lebih mudah. FTMK Navigator berguna untuk pelajar dan tetamu yang mengunjungi FTMK kerana mereka dapat mencari destinasi di hujung jari mereka.

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LIST OF ABBREVIATIONS

| | | |
|--------------|---|--|
| FTMK | - | Fakulti Teknologi Maklumat & Komunikasi |
| UTeM | - | Universiti Teknikal Malaysia Melaka |
| Wi-Fi | - | Wireless Fidelity |
| RSS | - | Receive Signal Strength |
| AP | - | Access Point |
| IMU | - | Inertial Measurement Unit |
| SDLC | - | System Development Life Cycle |
| DBLC | - | Database Life Cycle |
| ERD | - | Entity Relationship Diagram |
| SQL | - | Structured Query Language |
| RDBMS | - | Relational Database Management System |
| IDE | - | Integrated Development Environment |
| UML | - | Unified Modelling Language |

CHAPTER 1: INTRODUCTION

1.1 Introduction

FTMK Navigator is an android mobile application that helps students mainly in searching venues and directing students to their destination in FTMK. FTMK is large and complex in structure, students always can't find their destination and get lost in FTMK. Hence, FTMK navigator is designed to solve the problems faced by students. This project is built using the Navigine, it is a global provider of integrated mobile indoor positioning technologies that enable advanced indoor and outdoor navigation. At the end of this project, FTMK Navigine will be useful to the students and guests in the FTMK.

1.2 Problem Statement

- The structure of FTMK is complex that students always get lost in there.
- Students always can't find destination in FTMK.
- Students always wasting time on searching destination in FTMK.

1.3 Objective

This project embarks on the following objectives:

- To design a solution to facilitate students, guests in indoor navigation.

- To develop an android-based mobile application as a platform for students and guests to navigate them to their destination in FTMK.
- To test the system for efficiency and user satisfaction in terms of usability by the students and guests.

1.4 Scope

a) Target User

This project is target for students in FTMK and guests that visit FTMK.

b) Operating System

Android is the operating system used for FTMK Navigator in this project. Android is a software stack for mobile devices that includes an operating system, middleware and key application (Kharisma and Nurhasan, no date). It is used because it provides a rich application framework that allows developer to build innovative application.

c) Modules to be developed

- Display Floor Plan

FTMK Navigator will display floor plan for a specific floor when user click on up and down button to switch floor number. The ground floor's floor plan will be displayed as default after user enter FTMK Navigator.

- Search Venue by Venue's Name

FTMK Navigator will search a specific venue and draw a pinpoint on the venue after user enter correct venue's name.

- Draw Route from Source to Destination

FTMK Navigator will draw a route on the floor plan once it receives two valid venues name. The route drawn by FTMK Navigator will be the shortest one.

- Search Venues by Filter

It is a feature that allow user to search multiple venues by selecting one of the filters provided by FTMK Navigator. Examples of filters are lecture room, lab, rest room and so on.

- Estimate Distance From Source to Destination

The distance from source to destination will be estimated once user enter two valid venues name.

d) Deliverable

The deliverables of this project are the literature review, project methodology, analysis, design, implementation, testing and finally the complete FTMK Navigator application.

1.5 Project Significance

This project is built especially for students in FTMK and guests that visit FTMK, they are the one who will get benefits from this project. By using navigation technique, this will definitely decrease the time consume on searching their destination. As a result, it reduce the probability of students and guests getting late to lecture or lab session and important meeting respectively.

1.6 Expected Output

There are some of the expected output in this project. Firstly, FTMK Navigator is built as expected at the end of this project, all of the modules stated above are built accurately. Secondly, the application is widely accepted by students and guests, it is

easy to use and learn to use. Thirdly, the application helps students and guests in term of reducing time consume in searching the destination. Lastly, the developer of this application grasp all the knowledge about indoor navigation.

1.7 Conclusion

In conclusion, this chapter does the introduction of this project which include problem statements, objectives, scope and so on. In next chapter, it will preview to the literature review of this project.



CHAPTER 2: LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1 Introduction

This chapter aims to discuss on the related works regarding indoor navigation. The literature will describe in details on the types of indoor navigation. It will act as the summary of the related topic of published researched. This will give the clear explanation on what has just been done, what is commonly acknowledged, what is emerging and what is the present state of thinking on the topic.

2.2 Facts and findings

In software engineering, facts and findings are the truth and information collected based on techniques which contain sampling of existing documents, research, observation and so on (*Definition Of Fact Finding Techniques Information Technology Essay*, no date). Facts and findings are important, they helps software development team to design a tailor-made solution, identify objections before they come up and so on (*10 benefits of fact-finding / ThinkAdvisor*, no date). Section below describes the facts and findings related to this project.

2.2.1 Domain

Indoor navigation is a function that used to lead people to reach their destination in an indoor environment. There are many different types of technology that can be used to build indoor navigation system. One of the most popular technology used to build indoor navigation is the Wi-Fi technology. Indoor navigation based on Wi-Fi are used in many projects, it is because a wide range of different types of existing Wi-Fi hotspots can be used for this and it is easy to implement. This technique uses

already existing infrastructure and Wi-Fi access points (APs) to calculate where a device is located. The device needs to be able to listen for the Wi-Fi AP but does not need to connect to it. By analyzing the signal strength of multiple Wi-Fi signals and knowing the location of those APs, the approximate location of the device can be determined. There are still many other technologies used to build indoor navigation system, which will be discuss later.

2.2.2 Existing System

Till date, there are many applications that provide indoor navigation functionality. One of the example is the mobile application offered by Sunway Pyramid shopping mall (*Sunway Pyramid launches real-time in-mall navigation mobile app*, no date). The Sunway Pyramid mobile application was created in partnership with Google Maps and uses indoor map technology to provide customers an easier way to navigate the mall. Wi-Fi fingerprinting is the technique used by Sunway Pyramid application to achieve indoor positioning and navigation (Zulkiflie, Kamaruddin and Wahab, 2020). This technique collects the signal strength of the Wi-Fi access point (AP) in the local surrounding at various points in a covered area. With this technique, Sunway Pyramid application locate customer's position accurately and navigate customer throughout the whole shopping mall. Figure 2.1 shows the user interface of Sunway Pyramid for user to enter source and destination while figure 2.2 shows the route drawn from source to destination.

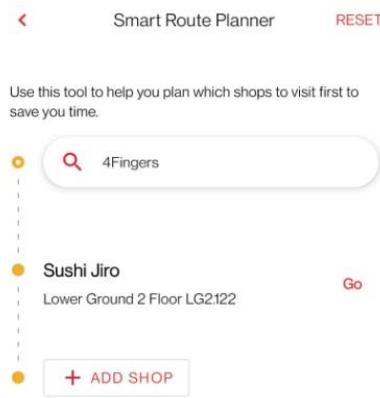


Figure 2.1 Smart Route Planner User Interface

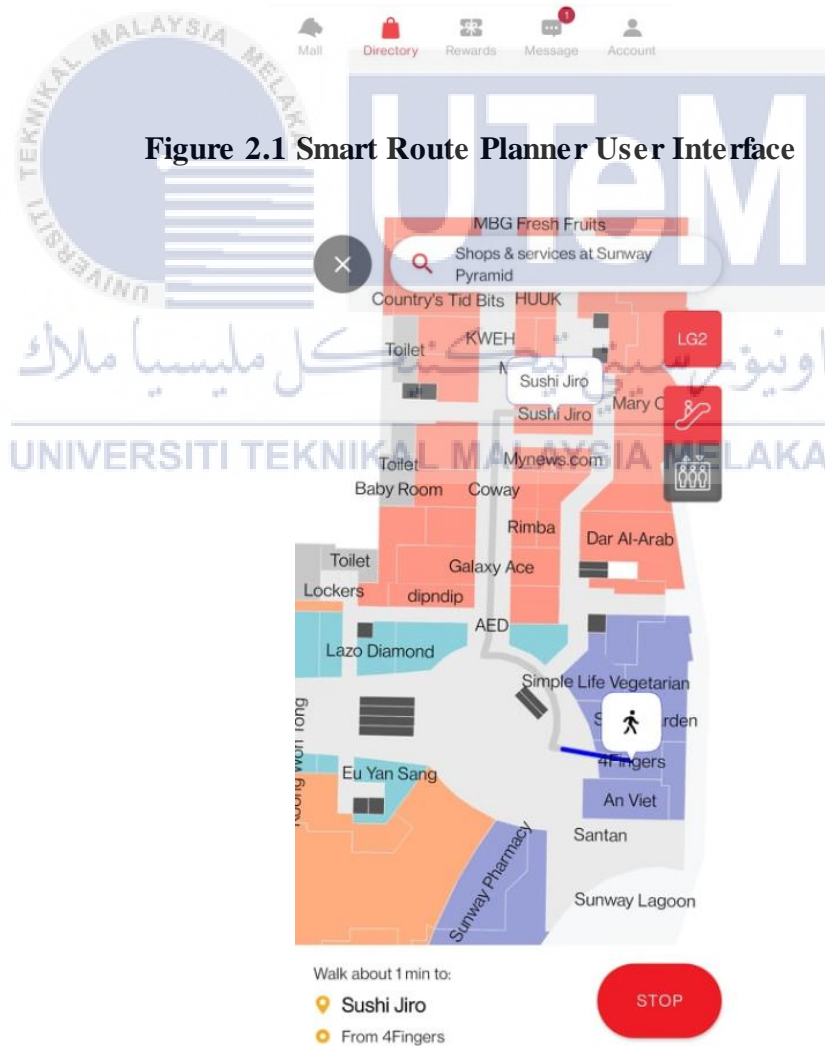


Figure 2.2 Route Drawn on Sunway Pyramid Floor Plan

2.2.3 Technique

Other than using Wi-Fi fingerprinting that used by Sunway Pyramid, there are many other techniques can be used to achieve indoor navigation which is describe in section below.

- IMU (Inertial Measurement Unit)

Inertial Systems inform about the relative movement of the tag with the integration of several sensors such as accelerometer, magnetometer, and gyroscope, in a tiny module. These sensors are useful in determining the direction and orientation of movement. Combined, they can provide an estimate of the relative motion with regards to the previous position.

- Infrared Light

This type of system can be used as a very reliable room detector. Since light cannot traverse walls, it is not possible for a tag to detect light from an anchor without being in the same room. For precise localization, they require installing many anchors and can struggle due to the low quality of the signal strength measurements required to compute the position from multiple anchors.

- Ultrasound System

Ultrasound systems use sound instead of light. It does not interfere with electromagnetic waves and does not require line of sight. The system requires a set of anchors and a tag. It uses Time of Flight, that is, the time required by sound to travel from an anchor to a tag or vice versa, to estimate the distance between them.

2.3 Project Methodology

Project methodology including system development life cycle (SDLC) and database life cycle (DBLC) is important because they help to transform the idea of a