Faculty of Computer Science and Information Technology

KID PICKUP NOTIFICATION SYSTEM USING MOBILE APPLICATION AND ARDUINO

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DESMOND LIM SIEH WEI

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requirement for the degree of
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SISTEM NOTIFIKASI AMBIL KANAK-KANAK MENGGUNAKAN APLIKASI MOBILE DAN ARDUINO

DESMOND LIM SIEH WEI

Projek ini merupakan salah satu keperluan untuk
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8/8/2020

Date submitted

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Abstract

The final year project is to develop a Kid Pickup Notification System using Mobile Application and Arduino. The problem of the current scenario is that when the school is over, the kid needs to wait at the school gate and constantly look for the parent's vehicle and sometimes overlook it. A system is developed that the kid carries a notification device that will alert and notify the kid when the parent almost reaches the school. So, the kid can wait inside the school first. The parent needs to use the app to set the geofence around the school.

Abstrak

Projek tahun akhir ini adalah untuk membangunkan Sistem Notifikasi Ambil Kanak-kanak menggunakan Aplikasi Mobile dan Arduino. Masalah senario sekarang adalah apabila sesi persekolahan berakhir, kanak-kanak perlu menunggu di pintu sekolah serta sentiasa mencari kenderaan ibu bapanya dan kadang-kadang akan terlepas pandang. Sebuah sistem dibangunkan untuk kanak-kanak yang membawa peranti notifikasi yang akan memaklumkan dan memberitahu kanak-kanak bahawa ibu bapa mereka hampir sampai ke sekolah. Jadi, kanak-kanak boleh menunggu di dalam sekolah terlebih dahulu. Ibu bapa perlu menggunakan aplikasi ini untuk menetapkan geofensi di sekeliling sekolah.

Table of Content

List of Tables

List of Figures

CHAPTER 1: INTRODUCTION

1.1 Background

Nowadays, many people are using their smartphone in their daily life. According to the Malaysian Communications and Multimedia Commission (2018), the survey shows that the ownership of smartphone in Malaysia in 2017 is about 74%. Smartphone helps people to solve their daily life problems such as communication, entertainment, business and more.

Hardware platforms are also gaining popularity in the worldwide. Arduino and Raspberry Pi are such platforms that have many applications from simple do-it-yourself project to industry project, including Internet of Things. Those platforms enable the developers and hobbyists to prototype their idea and concept quickly, then end up with a working prototype to solve the problems.

The public schools in Malaysia have the single and double session. The single session school has a morning session, while the double session school has morning and afternoon session. School start time and end time are varying for each school. According to the Ministry of Education Malaysia (2013), the morning session starts typically from 7:30 am to 1:00 pm while the afternoon session starts from 1:15 pm to 6:45 pm. Usually, the school kids inform their parent that when is the time of the school is over and their parent drives the vehicle to go pick up them at that time.

1.2 Problem Statement

When the school is over in the afternoon, the school kids are eager to go back home. So, they go outside the school, waiting for their parents to pickup them. However, their parents may late to pickup them because of busy or encounter traffic congestion, and their kids might

need to wait for a long time. Besides, sometimes school kids are not alerted and realized when their parent is arrived to fetch them. Parents might need to spend time to look for their kids. Both situations can cause traffic congestion in the school area, besides wasting time waiting and searching for their kids.

1.3 Scope

The mobile application is an Android app built using Java programming with Android Studio. The notification device is built based on Arduino using the Arduino programming language with Arduino IDE. Firebase Database is used as the database to have communication between notification device and mobile application over the Internet.

The targeted user of the system is the parent who has a kid. The parent needs to have a Google account to login to the mobile application due to the mobile application relies on Google Sign-In as the only login method.

1.4 Objectives

The objectives of this project are:

- To design and develop an android based notification app that sends pickup notification to the notification device using geofencing.
- To assemble an Arduino notification device that alert and show the notification to the user.
- To evaluate the usability of the proposed notification system.

1.5 Brief Methodology

Waterfall model with feedback is chosen to develop the system as it is easy to understand. The model has 5 phases which are divided into requirement, design, coding, testing and maintenance, as shown in figure below. Each phase needs to be done before moving to the next phase. There is a feedback path between the current phase and the earlier phase. When we find out an issue in the current phase, this model provides us with the ability to transit from the current phase to the earlier phase (Raza, 2017).

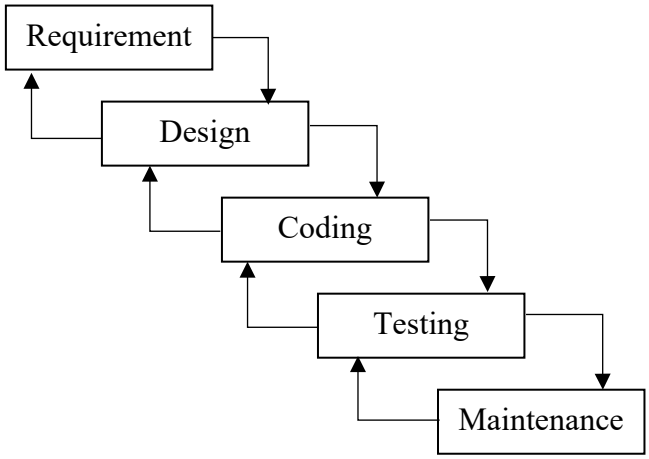

Figure 1.1 Waterfall model with feedback (Xiong, 2011)

The first phase is requirement. The developer asks for a project title from FYP supervisor. The developer identifies the requirements for the proposed system. Three existing systems which are Quick Pickup App, Nearby Friends android app and ESP8266 Friend Detector are reviewed and compared to find the strength and weaknesses of each system. The software development tools, and technology used are also reviewed to get a better understanding of them. Other requirements include the functional requirements, hardware requirements and software requirements are also determined.

The second phase is design. The developer thinks about how to design the system based on the requirements. The design of the system is supported by a few diagrams like architecture diagram, hardware schematics diagram, UML diagrams, and wireframe diagrams.

The third phase is coding. The developer starts coding the system based on the design. The developer also assembly the notification device based on Arduino. The report highlights the important parts of the code and the implementation the system.

The fourth phase is testing. The developer writes the test cases and executes them. The developer tests the system to ensure the system is functioning correctly. If the developer finds any bugs in the system, then the developer fixes the bugs. The system will be demonstrated through pre-recorded video to at least 10 evaluators, and they will evaluate the usability of the system by fill in the evaluation form.

The final phase is maintenance. Once the system has been tested, the developer publishes the system to the public. The user will use the system. If the user discovers any bugs, an updated version of the system will be published to fix the bugs. Maintenance is an ongoing process which is not in the scope of the final year project. Thus, it is not carried out in this project.

1.6 Significance of Project

With this proposed system, the notification device will notify and alert the kid as his/her parent almost reaches the school. Thus, the kid does not need to be in a hurry to go outside the school and spend time to wait for his/her parent there. Instead, the kid can stay inside the school first before their parent has almost reached the school.

Other than that, this proposed system should help to ease the traffic congestion at the school area after the school ended as the kid knows that their parent almost reaches the school. The parent does not need to wait and search for their kid outside the school which can cause traffic to stall. Once the parent reaches the school, the kid right away enters the parent's vehicle, and the parent can straight drive his/her kid to the home.

1.7 Project Schedule

Microsoft Project is used to create the project schedule of final year project. The Gantt Chart lists the tasks that need to be done to complete the final year project. Each task has a starting date and due date to guide the developer to finish the task on time.

	Task Name	Duration	Start	Finish
1	Brief Proposal	26 days	Tue 10/9/19	Sat 5/10/19
2	Full Proposal	14 days	Sun 6/10/19	Sat 19/10/19
3	Chapter 1: Introduction	7 days	Sun 20/10/19	Sat 26/10/19
4	Chapter 2: Literature Review	21 days	Sun 27/10/19	Sat 16/11/19
5	Chapter 3: Requirements Analysis and Design	19 days	Sun 17/11/19	Thu 5/12/19
6	FYP 1 Report	7 days	Fri 6/12/19	Thu 12/12/19
7	FYP 1 Symposium	6 days	Fri 13/12/19	Wed 18/12/19
8	FYP 1 Amended Report	24 days	Thu 19/12/19	Sat 11/1/20

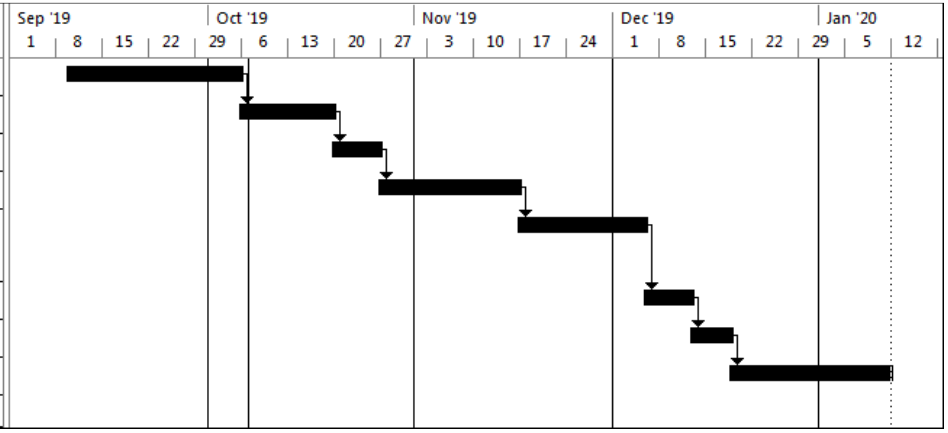

Figure 1.2 Gantt chart of Final Year Project 1

	Task Name	Duration	Start	Finish
1	Revised Structure of FYP Report, Title, Gantt Chart	7 days	Tue 11/2/20	Mon 17/2/20
2	Chapter 4: Implementation and Testing	35 days	Tue 18/2/20	Mon 23/3/20
3	Chapter 5: Conclusion and Future Work	14 days	Tue 24/3/20	Mon 6/4/20
4	FYP2 Draft Report and Paper	9 days	Tue 7/4/20	Wed 15/4/20
5	FYP2 Final Report, Paper, Source Code, Installation Kits and User Manual	14 days	Thu 16/4/20	Wed 29/4/20
6	FYP2 Symposium	7 days	Thu 30/4/20	Wed 6/5/20
7	FYP2 Amended Report, Paper, Source Code, Installation Kits and User Manual	23 days	Thu 7/5/20	Fri 29/5/20

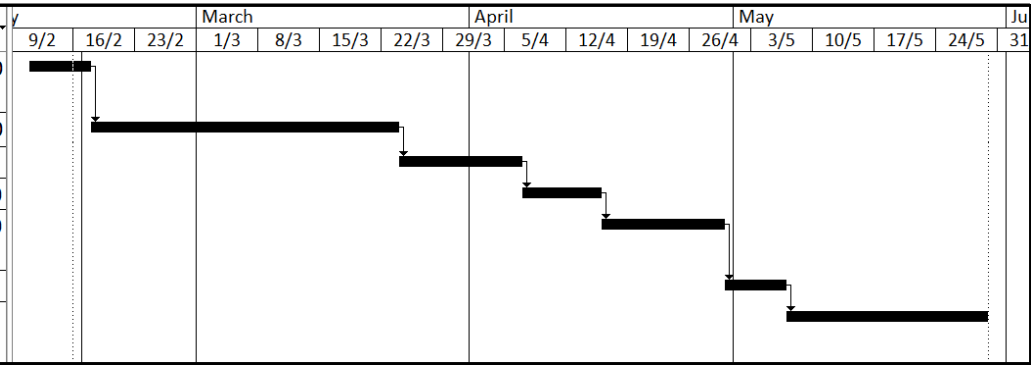

Figure 1.3 Gantt chart of Final Year Project 2

1.8 Expected Outcome

The expected outcome of this project is that a prototype of the proposed system will be created. The proposed system consists of two parts which are an Android based notification app and Arduino based notification device. Android based notification app enables the parent to send pickup notification to the kid using geofencing. Arduino based notification device enables the kid to receive pickup notification from the parent. The notification device will alert and notify the kid when his/her parent almost reaches the school.

1.9 Project Outline

The project outline describes what to be done starting from chapter 2 to chapter 5.

Chapter 2 is the literature review which is about reviewing the existing system. Compare and contrast are done to three existing systems, as well as describing the proposed system. This chapter also includes reviewing software development tools and technology used to develop the proposed system.

Chapter 3 is the requirements analysis and design. This chapter discusses the requirement of the proposed system. The designs of the system are based on the Unified Modeling Language diagrams and the design of the user interface is based on the wireframe.

Chapter 4 explains the implementation of the proposed system. The implementation is explained and shown through screenshots.

Chapter 5 describes about testing. Functionality testing and usability testing of the proposed system are carried out and the results are documented in this chapter.

Chapter 6 describes the conclusion and future work of this project. This chapter summaries the works that are done in this project. This chapter also discusses the project limitation and future work that can be done to improve further and enhance the system.

1.10 Summary

The proposed system will help the parent smoothen the kid pickup process and the kid does not need to wait for his/her parent at the school gate.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Notification is common in our daily life such as phone ringing sound, traffic light blinking, new email alert and more. Notification alerts the users to know that something has happened and tries to catch the users' attention even when they are not using an app (Cohen, n.d.). Notification is particularly important in this project as it is used to alert and notify the kid that his or her parent is almost reaching the school.

In this chapter, three existing systems are reviewed to determine how they work and find the strength and weaknesses of each system. After that, a system has proposed to solve the problem better. Next, these existing systems are compared with the proposed system to get a better understanding of these existing systems. The comparison criteria are the features of the system. By doing the comparison, some features of the existing system may be adapted to the proposed system with improvement. The software development tools and technology used are also discussed in this chapter.

2.2 Review on Existing System

The existing systems that are reviewed are Quick Pickup App, Nearby Friends and ESP8266 Friend Detector. They are chosen because they show the notification to the user when the other user is nearby.

2.2.1 Quick Pickup App

Quick Pickup App helps the school to streamlines the pickup process for the parent. Gmeiner (2017) states that it helps to solve the problem of the school car line where the parent