UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF UTEM BUS TRACKING SYSTEM USING GSM AND GPS MODULES

This report is submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electronic Engineering Technology (Telecommunication) with Honours

by

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TAJUK: **Development Of UTeM Bus Tracking System Using GSM And GPS Modules**

SESI PENGAJIAN: **2017/18 Semester 1**

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I, hereby, declared this report entitled "Development Of UTeM Bus Tracking System Using GSM And GPS Moludes" is the results of my own research except as cited in references.

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfilment of the requirements for the degree of Bachelor of Electronic Engineering Technology (Telecommunications) with Honours. The member of the supervisory is as follow:

....
Mr. Mohd Faizal Bin Zulkifli
(Project Supervisor)

ABSTRAK

Pada masa kini, perkhidmatan pengangkutan bas UTeM mempunyai sistem maklumat pengangkutan yang tidak lengkap. Di UTeM, kebanyakan pengguna bas perlu menunggu di perhentian bas dengan waktu yang lama kerana mereka hanya mengetahui jadual waktu ketibaan bas dan biasanya bas tidak akan tiba pada masa yang tepat seperti masa yang dinyatakan. Matlamat saya adalah untuk membangunkan sistem pengesanan bas dengan menggunakan modul GPS dan GSM untuk memudahkan pelajar di UTeM. Jadi pelaksanaan sistem pengesanan bas UTeM telah dibangunkan. Sistem pengesanan bas UTeM adalah sistem yang digunakan untuk mendapatkan koordinat bas UTeM dan pelokasi sumber seragam peta google dalam bentuk SMS apabila pelajar meminta lokasi bas UTeM melalui menghantar SMS ke sistem. Pelajar boleh mengklik pada pelokasi sumber seragam peta google yang dibalaskan oleh sistem dengan berhubung dengan internet untuk mendapat lokasi bas UTeM di peta google. Dalam projek ini, modul GSM digunakan untuk menerima SMS dari pelajar dan menghantar semula SMS kepada pelajar. Modul GPS digunakan untuk mendapatkan koordinat bas UTeM. Sementara itu, Arduino Uno digunakan sebagai pengawal mikro dalam projek ini kerana ia kos rendah dan fakta mesra pengguna. Pada masa akan datang, aplikasi android juga boleh dilaksanakan untuk memperbaiki sistem ini dengan menyediakan lokasi dinamik bas UTeM dalam peta google kepada pelajar.

ABSTRACT

Nowadays, the UTeM bus transportation service has very poor transportation information system. In UTeM, most of bus user needs to wait at bus stop with a long time because they only know the scheduled of the bus arrival time but usually the bus did not arrive on time as the time stated. My aim is to develop the bus tracking system using GPS and GSM modules to bring convenient to the student in UTeM. So the implementation of UTeM bus tracking system was developed. The UTeM bus tracking system is a system used to obtains the coordinates of the UTeM bus and the google maps link in the form of SMS when the students requests for the location of the UTeM bus through sends SMS to the system. The student can clicks on the google maps link that reply by system with internet excess to show the location of the UTeM bus in the google maps. In this project, the GSM module was used to receive the SMS from the student and send back the SMS to the student. The GPS module was used to obtain the coordinates of the UTeM bus. The Arduino Uno was used as the microcontroller in this project due to low cost and user friendly fact. In the future, the android application also can be implemented to improve this system by providing the dynamic location of the UTeM bus to the student in the google maps.

DEDICATION

To my beloved parents,

Chew Chin Nam and Tan Bee Ee

All my lectures, especially Mohd Faizal Bin Zulkifli and my friends

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First and foremost, I would like to take this opportunity to express my appreciation to those who helped me to complete my project. I would like to thank my supervisor Mohd Faizal Bin Zulkifli and co-supervisor Ahmad Sayuthi Bin Mohammad Shokri who are from Electronic and Computer Engineering Technology Derpartment in UTeM for the significant guidance, patience and suggestion to make sure that my project achievable. I have gain a lot of information and knowledge from both of my lectures along this project.

Furthermore, I would like to thank my beloved parents for their motivation and financial support along this project. Lastly but not least, I would to like to thank my friends and everyone that had been supporting and helping me during the progress of my project.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

USB   -   Universal Series Bus

GSM   -   Global System Mobile

GPS   -   Global Positioning System

SMS   -   Short Message System

QR   -   Quick Response

UART   -   Universal Asynchronous Receiver

AVR   -   Advanced Virtual RISC

GLCD   -   Graphical Liquid Screen Display

ARM   -   Advanced RISC Machines

SPI   -   Serial Peripheral Interfaces

DC   -   Direct Current

PCB   -   Printed Circuit Board

GND   -   Ground

VCC   -   Power Supply

RXD   -   Receive Data

TXD   -   Transmit Data

PCS   -   Personal Communication Services

HDTV   -   High-Definition TV

PDA   -   Personal Digital Assistant

TDMA   -   Time Division Multiple Access

FDMA   -   Frequency Division Multiple Access

CHAPTER 1

INTRODUCTION

1.0   Background

Since from the last past century, transportation becomes a necessary object that needed by humans. Among all public transportation service, bus service is the most easy, convenient and low price transportation in the busy town. This service is the major transportation used by the public. Nowadays some bus transportation service has very poor transportation information system. Most of bus user needs to wait at bus stop with a long time because they only know the scheduled of the bus arrival time but usually the bus did not arrive on time as the time stated. In addition, most of bus transportation system does not have a proper system that can show the position of the bus and calculate the bus arrival time compare to flight and train transportation system.

In order to understand more about current bus transportation system nowadays, I choose University Teknikal Malaysia Melaka (UTeM) bus transportation system as my final year project environment. I will analyze the problem that faces by student when using current bus transportation system that provide by UTeM. Bus service is the major service that used by UTeM's students because the student hostel is mainly located far from their faculty. Students who do not possess their own transports are highly depending on the bus service to commute between hostel and the faculty.

However, the current bus services in UTeM still need to be improved because the student cannot track the location of the bus. When student want to take bus, they need to wait at the bus stop before the time stated in the manual bus schedule. Sometimes, the bus may be delay or arrived late. Student may miss their class because they cannot estimate the bus arrival time. In comparison to university WEST CHESTER in United State, UTeM do not used any system or application to track all their buses position in every bus stop.

In order to solve the current problem of bus service system, bus tracking system must be develop and implement to help UTeM's student to have better bus service. With this bus tracking system the UTeM's students just need send a message to the GSM module, then the GPS module will send the data related to tracking position in real time, and it will send the data to the GSM module. After that, the GSM module will reply a message with coordinate and a google maps link to the mobile phone. Lastly, the student just need click the link with internet access, the mobile phone will show the location of the bus in google maps and the student can further estimate the bus arrival time.

The main components that used in the bus tracking system are GPS module, which is used to obtain the coordinates of the bus and the GSM module is used to receive the message from the user and transmit the coordinate of the bus to the user's phone through mobile network. A microcontroller is used to control the GPS module and GSM module.

1.1   Problem Statement

One of the problem that occur in current UTeM bus service is the student only know the bus schedule but do not know the exact time for bus arrival. According to the survey was made to 30 responses at bus stop UTeM about the bus services, 73.33% of student said that the bus normally not arrives at the expected time. The students need to wait at bus stop without knowing the location of the bus and what time the bus will arrive. In this situation the student waste a lot of time waiting at the bus stop. Most of the times students felt anxious and impatient when they rush for class but the bus does not arrive on time.

Furthermore, the safety of the student will be at risk while waiting at the bus stop for a long time. According to survey has been made, 63.33% of students said that waiting at bus stop for a long time will increase the chance of getting robbed. Based on the BORNEO POST online posted 6 October 2016, a 15-year-old boy was waiting at a bus stop near his school along Jalan Tun Jugah around 1.50pm when two men threatened him with a pair of scissors into surrendering his wallet and mobile phone.

1.2   Objective

Based on the problem statement discussed above, the objectives of this study are:

i.   To understand about the GPS and GSM tracking technology and bus transportation system in UTeM.

ii.   To develop the bus tracking system using GPS and GSM modules.

iii.   To analyze the performance of the bus tracking system.

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1.3   Scope

In this project, the GPS module, GSM module and microcontroller will be used. GPS is a space-based satellite navigation system that can provides location and time information in all weather conditions, anywhere on or near the earth where there is an unobstructed line of sight to four or more GPS satellites (Mistary and Chile, 2016).The GPS module is the main component in this bus tracking system and used to receive the coordinates of the bus. The GSM module is used to receive message and send the coordinates and link to the user by SMS. The user just need to send SMS to the system that placed in the vehicle. The GSM module of the system will receive the message and send message data to microcontroller. Microcontroller will read it and receives the coordinates from the GPS module. The message contains the coordinate of the bus and link will send to the user by using GSM module.

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CHAPTER 2

LITERATURE REVIEW

2.0   Introduction

In this chapter, the purpose is to reviews on some of the various significant works that had been done by other researcher and relevant to the bus tracking system and conclude all the information that found in the literature. Based on the literature, the research and fact finding that obtain can be used to support this projects. Therefore, literature review plays an important role when this project is carried out.

2.1   Overview of tracking system

Nowadays, a lot of vehicle tracking system was developed and implemented using various platforms. The tracking system can use in security of personal vehicles, public transportation system, fleet management and others (Janarthanan and Santhanakrishnan, 2014). Bus tracking system is the system that allow user to track the current position of the bus. This will save the user time and reduce the anxiety of the user because the user can plan when to go to bus stop and no need waiting bus with long time. Recently GPS, GSM, Quick Response (QR) code, android app and several of technologies are used to improve the bus tracking system.

2.2 Previous Related Work

2.2.1 "Real Time Metroplitan Bus Positioning System design using GPS and GSM" by B.Janarthanan & T.Santhanakrishhan

B.Janarthanan and T.Santhanakrishhan have proposed the real time metropolitan bus position system design using GPS and GSM. The real time bus monitoring and passenger information bus tracking device is a system that will displayed the GPS data of the bus locations in the GLCD screen at the bus stop when the user request. The equipment that used in this system consists of backup battery, GSM module, ARM7 microcontroller, AVR microcontroller, GPS module and GLCD screen. Three major part are consists in this bus positioning system those are inside bus unit, bus stop unit and central control.

The GPS module, GSM module and the ARM microcontroller are installed over every bus. The data received from the GPS module then will be processed by the ARM7 microprocessor using a UART serial link. Then the data will transmitted to the control unit through the GSM. When the user request the AVR microcontroller will receive the data through the GSM at the receiver unit. The SPI protocols are used to transfer the data from the control unit to the microcontroller. The processing platform will send the data to the GLCD displays after data processing. The limitation of this project is the user cannot get the bus position when the user is not around in the bus stop and the user cannot know the time of bus arrival. Then, the receiver unit must implement in all bus stop for user to get the position of the bus and costly expensive.
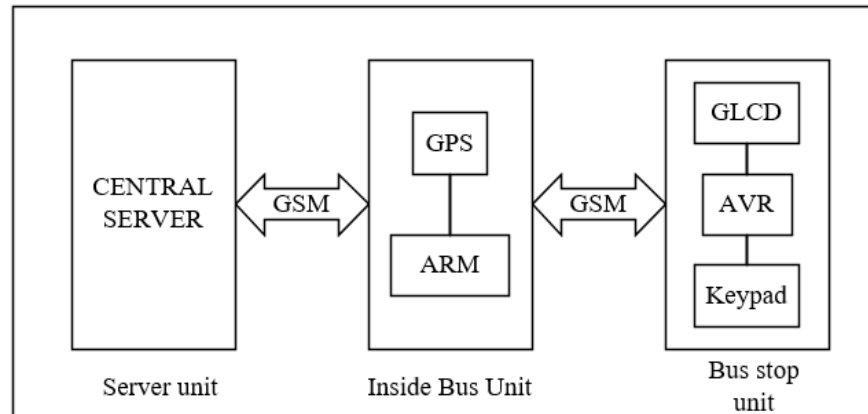
Figure 2.1: Functional block diagram (Janarthanan and Santhanakrishnan, 2014)

2.2.2 "Development of Vehicle Tracking system using GPS and GSM modem" by Pham Hoang Dat, Micheal Drieberg and Nguyen Chi Cuong

This paper is written by Pham Hoang Dat, Micheal Drieberg and Nguyen Chi Cuong in December 2013. In this paper, bus tracking system is being proposed with use of u-blox NEO-6Q GPS module, u-blox LEON-G100 GSM module and Arduino Uno microcontroller. As results, the system will use GPS module to obtain a vehicle's coordinate and using GSM modem to transmit the coordinate to the user's phone through the mobile network. The vehicle tracking system block diagram is as shown in figure 2.2.
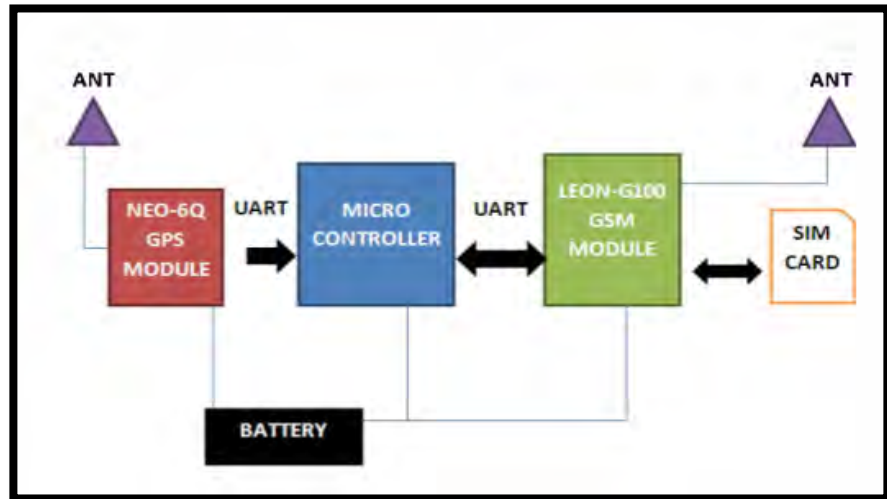
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Figure 2.2: Vehicle tracking system block diagram (Pham, Drieberg and Nguyen, 2013)

The u-blox NEO-6Q GPS module is the heart in the proposed system which used to obtains the vehicle's coordinates. The coordinates that received from the GPS module will send to Arduino Uno microcontroller. Then the Arduino Uno microcontroller will send the coordinate to the LEON-G100 GSM to be transmitted through the mobile network to the user when user requested.

The Universal Asynchronous Receiver/Transmitter (UART) interface is used to communicate between u-blox NEO-6Q GPS module, u-blox LEON-G100 GSM module and microcontroller. The limitation of this project is the user only can know the coordinates of the vehicle and cannot know where the vehicle is. Then, the user need copied the coordinates to mapping application such as Google Maps to identity the location of the vehicle in a graphical map display.

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