

UTEM BUS SYSTEM (UBS) USING ZIGBEE

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DEDICATION

Dedicate to beloved mother, father, supervisor, families and friends.

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Alhamdulillah, praise to Allah S.W.T for the guidance and blessing upon me, for without it I would not have been able to come this far.

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ABSTRACT

Wireless technology is becoming one of important applications in the era of globalization. It provides facilities and more users friendly. In addition, now almost all electronic devices are equipped with wireless technology. ZigBee is a wireless technology that is popular nowadays. The implementation of Intelligent Transportation (IT'S) at the moment are becoming a trend. This system is proved to be very useful not only in the sense of the safety of the vehicles, but also easy to use. The aim of this study is the implementation of ITS in UTeM Campus Bus. The main problem is that the campus buses are not consistent and not follow the schedule. This problem causing students will be late to class. Also, students they do not know when and where the bus will arrive and their destination. In this research, a prototype of bus system using ZigBee is to be developed. ZigBee is a low cost, low power consumption and short distance wireless communication technology. The signal sent out from the Bus as a transmitter to the Bus Stop as a Receiver. At the Bus Stop LCD display can display the destination bus will arrive. Buzzer will sound as a reminder for the user. This system enables to UTeM Campus Bus more systematic, thus solving the current problem faced.

ABSTRAK

Teknologi tanpa wayar adalah menjadi salah satu aplikasi penting dalam era globalisasi. Ia menyediakan kemudahan dan lebih mesra pengguna. Di samping itu, kini hampir semua peranti elektronik dilengkapi dengan teknologi tanpa wayar. ZigBee adalah satu teknologi tanpa wayar yang popular pada masa kini. Pelaksanaan Pengangkutan Pintar (IT'S) pada masa ini adalah menjadi satu gaya pada masa kini. Sistem ini terbukti sangat berguna bukan sahaja dari segi keselamatan kenderaan, tetapi juga mudah untuk digunakan. Tujuan kajian ini adalah pelaksanaan ITS di UTeM Kampus Bas. Masalah utama adalah bahawa bas kampus tidak konsisten dan tidak mengikut jadual. Masalah ini menyebabkan pelajar akan lewat ke kelas. Selain itu, pelajar mereka tidak tahu bila dan di mana bas akan tiba dan destinasi mereka. Di samping itu juga, pelajar-pelajar mereka tidak tahu bila dan di mana bas akan tiba dan destinasi mereka. Dalam kajian ini, prototaip sistem bas dengan menggunakan ZigBee akan dibangunkan. ZigBee adalah kos rendah, penggunaan tenaga yang rendah dan jauh teknologi komunikasi tanpa wayar. Isyarat dihantar dari Bus sebagai pemancar ke Hentian Bas sebagai Penerima. Di Hentian Bas paparan LCD akan memaparkan destinasi bas yang akan tiba. Buzzer juga akan berbunyi sebagai peringatan kepada pengguna. Sistem ini membolehkan Bas Kampus UTeM lebih sistematik, sekaligus dapat menyelesaikan masalah yang dihadapi.

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LIST OF ABBREVIATIONS

UBS	-	UTeM Bus System
PIC	-	Peripheral Interface Controller
LCD	-	Liquid-Crystal Display
GPS	-	Global Positioning System
SPICE	-	Simulation Program with Integrated Circuit Emphasis
PCB	-	Printed Circuit Board
BASIC	-	Beginner's All-purpose Symbolic Instruction Code
RFID	-	Radio-Frequency Identification
LED	-	Light-Emitting Diode
GPRS	-	General Packet Radio Service
PC	-	Personal Computer
IEEE	-	Institute of Electrical and Electronic Engineers
WSN	-	Wireless Sensor Network
WLAN	-	Wireless Local Area Network
Tx	-	Transmitter
Rx	-	Receiver
IC	-	Integrated Circuit
V	-	Voltage
IDE	-	Integrated Development Environment
RF	-	Radio Frequency

CHAPTER 1

INTRODUCTION

1.1 Overview of Project

This project is to implement of UTeM Bus System using ZigBee. ZigBee suite on high-level communication protocols using small, low-power digital radios based on the IEEE 802 standard are used for personal area networks. ZigBee devices often used in the form of mesh network to transmit data at greater distance, passing data through and intermediate device to reach people even further. It allows ZigBee network ad hoc, where there is no centralized control or a high-powered transmitter or receiver and can reach all devices. Any ZigBee devices can be used to make a network. ZigBee is used for applications that require low data rate, the long battery life and secure networking. ZigBee has a rate 250 kbit/s, suitable for periodic data, intermittent and single signal transmission from a sensor or input device. The example applications of ZigBee such as wireless light switches, electric meters in homes, systems for traffic management, user equipment, industrial uses in close

proximity wireless transfer of data and the relatively low rate. ZigBee is intended to be easier and cheaper than other WPANs, such as Bluetooth [3].

The implementation of UTeM Bus Station (UBS) has nowadays has developed to incredible extent. This system is used to facilitate users. The aim of this study is to implement of UBS in UTeM campus bus. The main problem is that the campus buses are not consistent and not follow the schedule. This problem causing students will be late to class. In this research, a prototype of bus identification and monitoring system using Zigbee technology is to be developed. The objectives of this project are to design and develop UBS. It can detect a bus arrive at a distance of approximately 120 meters. It also makes it easier for users to prepare before the bus arrive the destination.

1.2 Objective Project

The aim of this project is to design and develop UTeM Bus System (UBS) using ZigBee. In order to make this project successful, the objectives have been declared and must be achieved. The specific objectives of this project are:

- i. To design and develop the prototype of the UTeM Bus System (UBS) using ZigBee.
- ii. To implement the bus system more systematic.

1.3 Problem Statement

In the UTeM, 60% of the UTeM's student uses the bus facilities to go to the campus. The problems often experienced by students they do not know when and where the bus will arrive and their destination. With UBS, students can know in advance that the bus will arrive at a distance of approximately 120 meters and know where the destination will be addressed. This system is easy to users and also it proved to be very useful not only in the sense of the safety of the vehicles. UBS can solve the main problems faced by the students of the campus who take the bus as their primary transportation to get to class.

1.4 Scope of Project

The scope of this project focuses into two parts in order to accomplish one complete system wireless networking, which is hardware and software. Figure 1.1 shows the scope of the project. For hardware parts it contains the circuit such as Microcontroller (PIC16F877A), Clock Oscillator, Power Supply, LCD display and Switch. The Microcontroller circuit PIC16F77A operate in 2.2V-5V, so the circuit is connected to a 5V power supply. PIC16F77A have Port A, Port B, Port C, Port D and Port E to use input and output. Then, the Clock Oscillator circuit it is important to give pulse to microcontroller circuit. LCD is in use is measuring 16x2. The purpose of the use is to display the bus destination to be reached and this makes it easier for students to know.

The software part is also divided into parts, which are Multisim, Proteus and MPLAB. Multisim is to construct the circuit and to testing the circuit whether it functioning or not. The Proteus software is the circuit design and PCB making. This software usually used for circuit design and fabrication. The MPLAB is the programming language and environment was developing by Microsoft. It is to develop applications for Microchip microcontrollers and digital signal controller. Figure 1.1 shows the scope of the project.

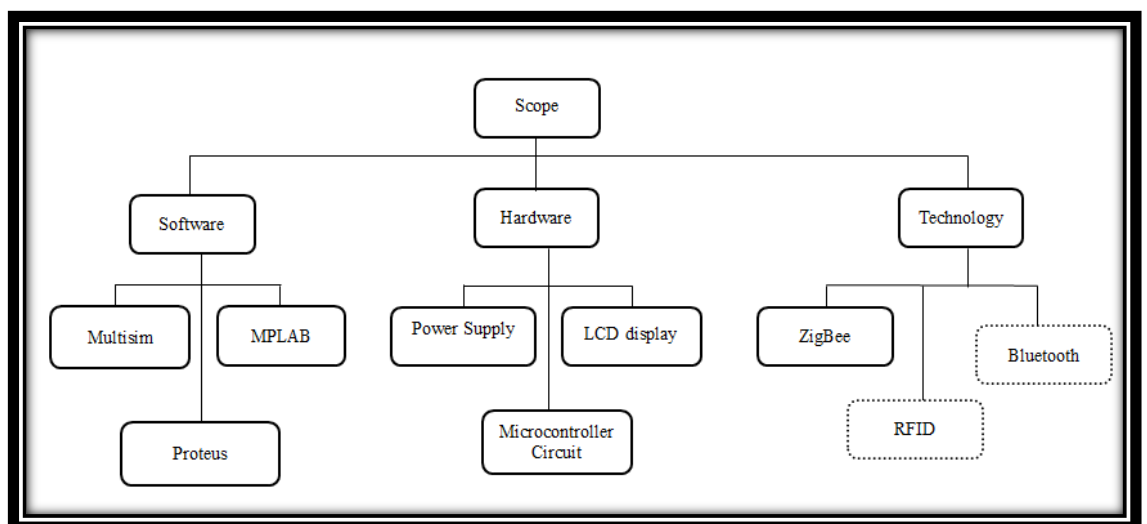


Figure 1.1: Scope of Project

1.5 Project Methodology

This project focuses on wireless transmission data and the project development based on ZigBee technology. The Figure 1.2 shows the block diagram of UBS. The system will function properly when the ZigBee transmitter from the bus will send data to receiver at the bus stop will be detected at a wide ranged as far as 120 meters. The project methodology shows that the step will be taken to complete the project. Figure 1.2 shows the block diagram of UBS. This method covers the management, development design and project planning. Another method is used in this project is interview the users.

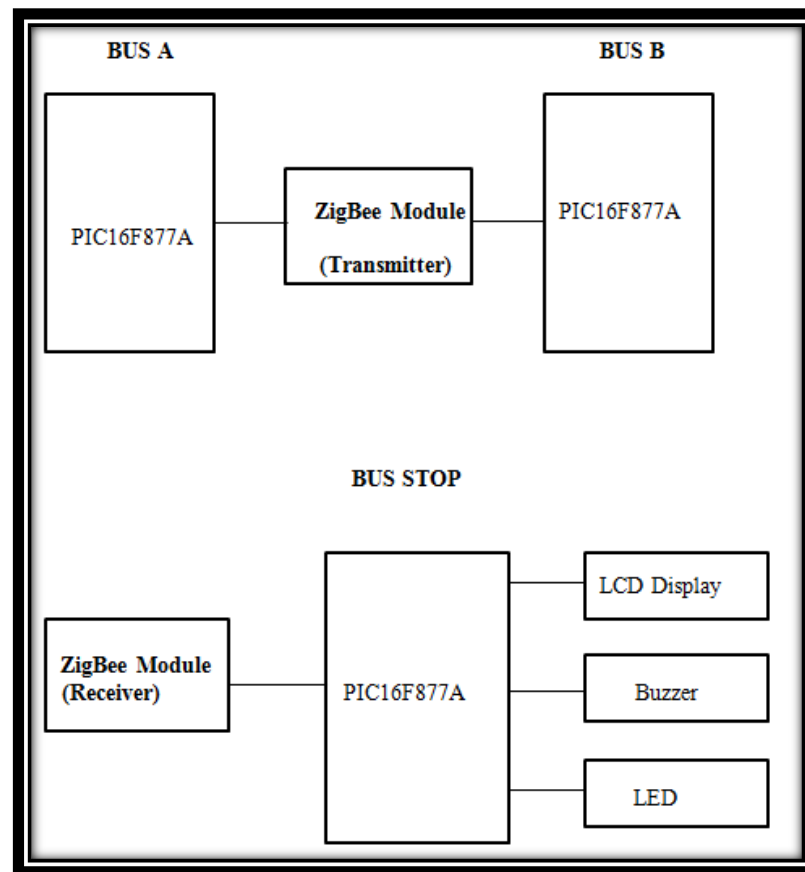


Figure 1.2: UBS Block Diagram

1.6 Report Structure

This report is covered by five chapters. The first Chapter starts with the background, introduction, problem statement, objective and the scope of work. The literature review is discussed in Chapter 2 and project methodology in Chapter 3. Chapter 4 covers software and hardware implementation and then the conclusions and suggestions are respectively covers in Chapter 5. For the projects that have been successfully implemented, there are some places to look into. Here are the main chapters:

- ✓ **Chapter 1:** Study the objectives and scope of work project.
- ✓ **Chapter 2:** Literature review about wireless ZigBee system.
- ✓ **Chapter3:** Project methodology covers the planning, design and management of development project.
- ✓ **Chapter 4:** Software and Hardware and implementation.
- ✓ **Chapter 5:** Conclusion and suggestion on the project.

The project is divided into several chapters is to facilitate the project to run in a systematic way, and structured as the project can be implemented smoothly.

Chapter 1 is study about objectives and scope of work of the project. The aim of this project is to design and develop a wireless ZigBee system consists of UTeM Bus System.

Chapter 2 is about Literature review for wireless ZigBee system and PIC. Research, find and read relevant topics from the sources such as journal, conference paper, reference book and internet let's get deeper knowledge and information for the project. Research on the same system or even less in the market and know what are the characteristics and capabilities of the product will also provide more information and understanding in this project.

Chapter 3 is about project methodology covers the planning, design and management of development projects. This chapter explains more about the project methodology used in this project. This section will explain more about the way it projects from start to finish. Every single thing has been implemented in the project should be describes step by step.

Chapter 4 is discussing about Software and Hardware implementation. The fourth chapter focus on software and hardware development. In this chapter also

shows the testing process. Testing will be performed on each module in both software and hardware systems.

Chapter 5 is a last chapter that discuss about Conclusion and suggestions on the project. In the final chapter will examine and review the project, whether the solution is done to achieve the project objectives. Discuss problems, conclusions and recommendations will be discussed for future improvements in this project.

CHAPTER 2

LITERATURE REVIEW

2.1 Chapter Overview

In this chapter will discuss the project and paper work associated with this project. Related work carefully in advanced to produce the quality and reliability of the project. By analysing the projects the projects done before by other researchers, are likely to find out there are a few features about the projects done. They also recommend some future work that can be undertaken to improve the project. In addition, there are a few ideas that are used to implement this project from other projects similar. An extended literature review process from beginning to end of the project. By reviewing previous work, the right of action for the project can be undertaken and the features that must be enhance to make this project reliable and marketable. Furthermore, there are a few findings from the internet and books used in this project. Along analysis at the beginning of the project, special features

specified in this project and the components used in the project is determined. Therefore, it is functional and well understood concept.

2.2 Previous Projects

2.2.1 Title: UKM Campus Bus Identification and Monitoring Using RFID and GIS by AishahMahani Mustapha, MA Hannan, Aini Hussain and Hassan Basri, [2009] [3].

This paper discuss about the implementation of Intelligent Transportation System (ITS) nowadays has developed to incredible extent. This system is proved to be very useful not only in sense of the safety of the vehicles, but ease the users. This paper research the aim of this study is the implementation of ITS in UKM campus bus. The main problem is that the campus buses are not consistent and do not follow the schedule. It is causing the students to be late to class. Also, in this research a prototype of bus identification and monitoring system using Radio-frequency Identification (RFID) and Geographical Information System (GIS) is to be developed. RFID is the technique used to monitor and identify the location of a certain bus, presented in the form of map aided by GIS software. The tag and the reader of the RFID devices are wirelessly connected. The signal sent out by the tag sent out by the tag will be read by the reader when the both the devices are in the fixed proximity. The read signal is then sent for data utilization.

In vehicle management, RFID is one of the technologies used to plan and schedule vehicles optimum routings using real-time information in logistics or distribution services. RFID mainly consists of a tag and a reader and these two devices are wirelessly connected. RFID is an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders. It can be applied to or incorporated into product, animal, vehicle or person for the purpose of identification and tracking using radio waves. Most RFID tags contain at least two parts. One is an integrated circuit for storing and processing information, modulating and demodulating a radio-frequency (RF) signal and other specialized functions. The second is an antenna for receiving and transmitting the

signal. The operational principle of RFID systems such that when the readers enter the reader work field of RFID label, they will send out radio frequency signals through the antenna; inducing current powers that enable the tag to send out encoded message. The message sent is then received by the readers and interpreted by a system connected to them.



Figure 2.1: RFID Reader and RFID Tag

2.2.2 Title: Bus Management System Using RFID in WSN by Ben AmmarHatem and Hamam Habib, [2009] [2].

This paper discuss about to integrated RFID (Radio Frequency Identification) in WSN (Wireless Sensor Network). WSN is used to support RFID identification process by extending the read range of an RFID system. The WSN can monitor the environment of an object and optimize RFID reader's performance and energy. Then, methodology to integrate RFID technology, wireless sensor network to form an intelligent bus tracking application is studied. The proposed system can monitor bus traffic inside spacious bus stations, and can inform administrators whether the bus is arriving on time, early or late. This information is then displayed on the different wireless displays inside and outside the bus station. New technology can help the administrator to monitor the buses traffic while increasing the satisfaction of transit users and reducing cost through efficient operations asset utilization. Well-known examples of identification technologies include Closed-Circuit Television (CCTV) and Global Positioning System (GPS).

The main idea of this paper is to integrate RFID technology and WSN to build an intelligent bus tracking system. Two scenarios of integration have been