

AUTOMATIC RAILWAY GATE CONTROLLER USING ZIGBEE

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BORANG PENGESAHAN STATUS LAPORAN  
PROJEK SARJANA MUDA II

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## **DEDICATION**

*Dedicated to my beloved supervisor, lecturer, my family and all my friends*

## ACKNOWLEDGMENT

Alhamdulillah thanks to Allah S.W.T the final project is complete. I hereby would like to take this opportunity to thank all persons who has involved generously in helping me and assisting me while I was completing the PSM which is a compulsory to all UniversitiTeknikal Malaysia Melaka (UTeM) students in order to complete our degree.

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## ABSTRACT

This project is about ZigBee technology. The concept of ZigBee is applied to an Automatic system. Wireless sensor network has good function of data collection, transmission and processing. The principle objective of this project was to design an Automatic Railway Gate Controller using ZigBee. This project deals to develop a prototype of railway gate that function automatically by using ZigBee. Besides that, the interfacing program also had been developing for the integration part. The operation using ZigBee that integrated with other circuits involved such as microcontroller (PIC16F877A), power supply, IR sensor, light and buzzer, gate motor and LCD display. All the circuits will be combining to demonstrate the operation of ZigBee. This system will make improvement towards the manually operation before this. Human supervision will be considered if there are problems occurred while this system was operated.

## ABSTRAK

Projek ini adalah mengenai teknologi ZigBee. Konsep ZigBee digunakan untuk sistem Autogate. Rangkaian sensor tanpa wayar mempunyai fungsi yang baik pengumpulan data, penghantaran dan pemprosesan. Prinsip tujuan projek ini adalah untuk membina sistem pengendalian pagar lintasan kereta api secara automatik dengan menggunakan ZigBee. Ia termasuk juga untuk membangunkan sebuah prototaip sistem pagar lintasan kereta api yang berfungsi secara automatik. Selain itu, sebuah program juga dibentuk bagi menggabungkan bahagian-bahagian tertentu di dalam sistem ini. Operasi ZigBee ini juga melibatkan litar-litar lain seperti mikropengawal (PIC16F877A), litar bekalan kuasa, infrared, lampu dan buzzer, motor dan paparan LCD. Kesemua litar-litar ini digabungkan bagi menambah baikkan sistem yang sedia ada sekarang yang masih menggunakan sistem manual. Khidmat pekerja hanya diperlukan apabila situasi berdepan masalah seperti sistem gagal beroperasi.



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## LIST OF ABBREVIATIONS

IEEE	Institute of Electrical and Electronic Engineering
WLAN	Wireless Local Area Network
LED	Light Emitting Diode
LCD	Liquid Crystal Display
PCB	Printed Circuit Board
V	Volt
PIC	Peripheral Interface Controller
Tx	Transmitter
Rx	Receiver
Xbee	ZigBee

## CHAPTER 1

### INTRODUCTION

#### 1.0 Project Background

In general, this project utilizes the importance of ZigBee Technology as a main design. It used to provide improvement into manual system that exist nowadays. This project is designed using ZigBee to prevent train accident occurred in the train door unattended. This project utilized microcontroller (PIC16F877A), two powerful IR transmitter and two receivers, one pair of transmitter and receiver is fixed up side (from where the train comes) and the other pair is fixed at down side of the train direction.

This Automatic Railway Gate Controller system was operated after signal received from the ZigBee Transmitter then the ZigBee Receiver will remain train is coming at LCD. When IR sensor detect the train, then it will send to trigger the PIC16F877A for operating the gate motor, alarm indicator and LCD display by instruction programmed.

Electronic application used to enable this system operated in automatic mode. The computer usage to building up a system that encourage implementing of the technology.

## 1.1 Problem Statement

Nowadays, the railway gate is operating by manual operation. The railway gate management has to employ workers to be on duty for control the operation. Due to this, the worker will manually open and close the gate when the train arrived.

This project will improve the system by the automatic railway gate operation. This system will make improvements to the previous manual operation. Human supervision will be considered if there are problems occurred while this system was operated.

This is an idea to perform computer integration with mechanical structure to simulate what the system can do. Control system with computer applications will make the management or consumer become more effective. Therefore, this is the best example in develop railway gate management system become more efficient.

## 1.2 Objective

The aim of this project is to design and develop the Automatic Railway Gate Controller using ZigBee. In order to make this project successful, the objectives have been declared must be achieved in completing this project. The objectives are:

- ❖ To design an Automatic Railway Gate Control by using ZigBee.
- ❖ To develop a prototype of Automatic Railway Gate by using ZigBee.
- ❖ To design an interfacing program for the integration part of microcontroller operation.



### 1.3 Scope of Project

This project covered the operation of Automatic Railway Gate Controller by using ZigBee. The circuits involved such as microcontroller (PIC16F877A), power supply, IR sensor, light and buzzer, gate motor and LCD display. All of these operations will be combining to demonstrate the operation of ZigBee technology.

The operations of ZigBee works follow the instruction when ZigBee Transmitter receives the signal data from ZigBee Receiver. The combining circuits were constructed on Proteus software to seen whether that circuits was right or not. After that, the hardware part was constructed after all the simulation being done. IR sensor circuit is providing signal to triggered the PIC16F877A. The sensed signal wills active the gate motor and LCD display. The buzzer and indication light circuit was provided as additional part of this system.

Additional elements can be added without affecting the remaining elements. This allows the flexibility of the developed system.

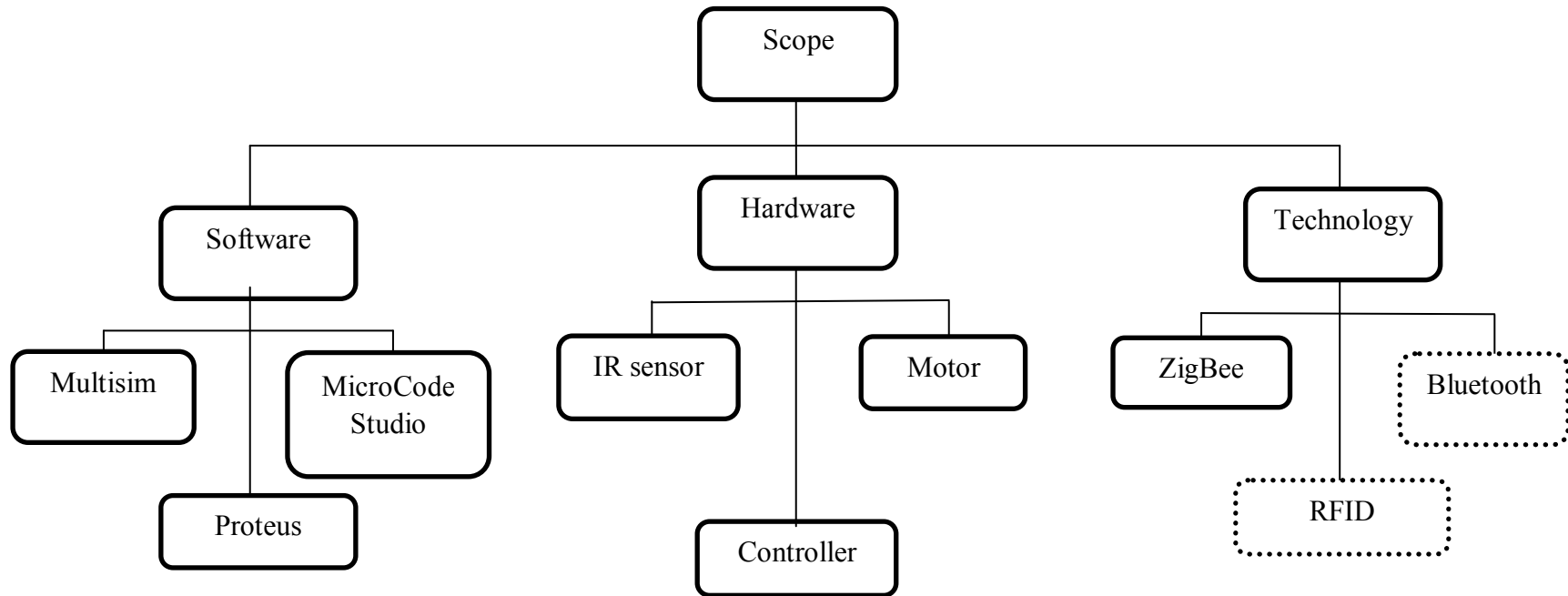


Figure 1.1: Scope of Project

## 1.4 Project Methodology

The methodologies of project regarding the project title are divided into two parts which is Hardware and Software. For the Hardware part, the design of the infrared and motor system for the Automatic Railway Gate Controller using ZigBee and need to understand how the system will be functioning. As far as hardware is concerned, open hardware designs will be created for various railway gate automation components. These could then be assembled by users. For the Software part, design the Automatic Railway Gate Controller system, on the software side, a stack of software would run on a single server. This software stack would include software for interfacing with devices, software for aggregating, analyzing, and acting upon these data.

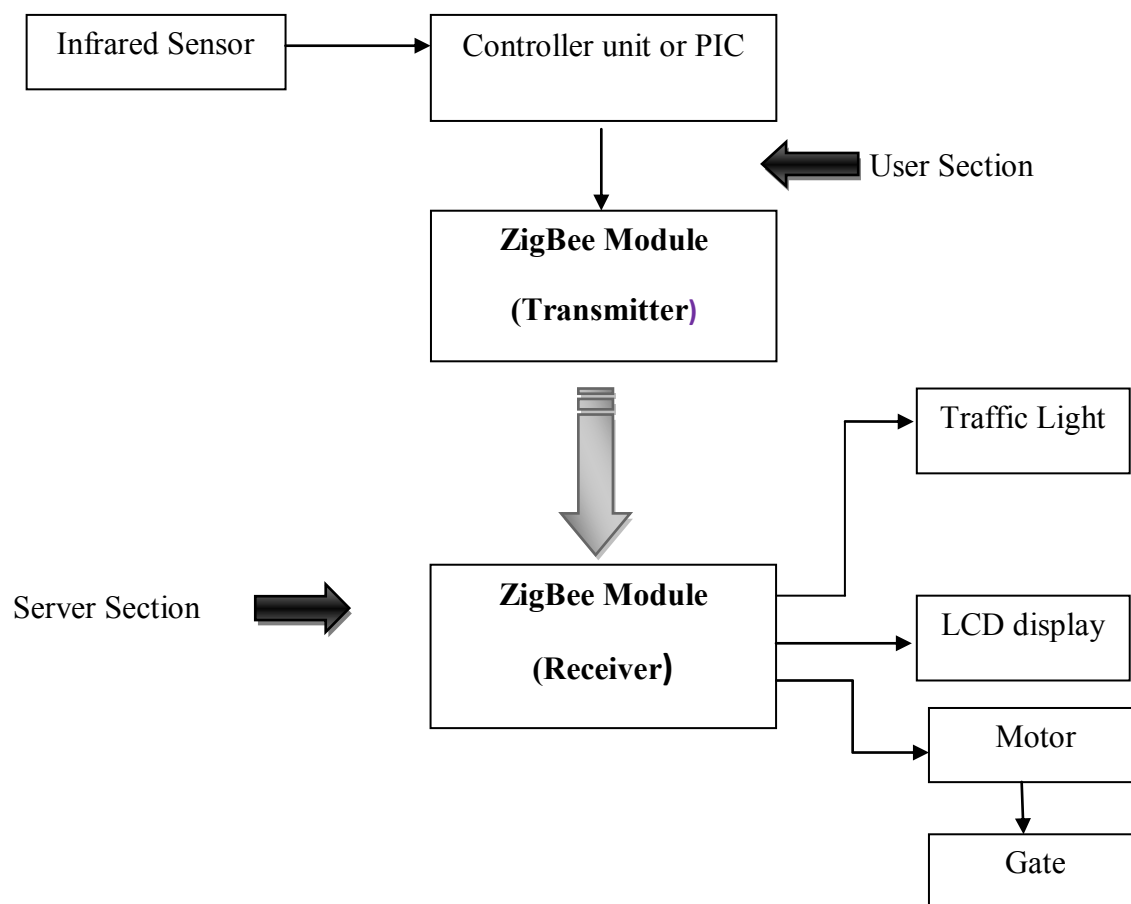


Figure 1.2: Block Diagram of Project

The Figure 1.2 shows the block diagram of the project. The operations of ZigBee works follow the instruction when ZigBee Transmitter receives the signal data from ZigBee Receiver. The IR sensor circuit is providing signal to triggered the PIC16F877A. The sensed signal wills active the gate motor and LCD display. The buzzer and indication light circuit also active when their get the signal.

## 1.5 Report Structure

This report is covered by five chapters. The Chapter 1 starts with Background of the project, problem statement, objective and scope of project. The literature review is discussed in Chapter 2 and project methodology in Chapter 3. The Chapter 4 cover on hardware and software implementation. The conclusions and suggestion are respectively cover on Chapter 5.

### *Chapter 1: Introduction*

This chapter will simply introduce about the project. This chapter contains background of project, problem statement, objective and scope of project.

### *Chapter 2: Literature Reviews*

It will discuss about the literature review. It had review some references from previous project, journal, article, books and datasheet. All the materials were useful to ensure the success of this project.

### *Chapter 3: Project Methodology*

This chapter will discuss the flow of this project started and how it will be functional. There are several block in flow chart to explain the process of the circuit within combining hardware and software. It also includes the analysis design, material, and method for the prototype.

### *Chapter 4: Result and Discussion*

It will show the details of the result from testing the Automatic Railway Gate Controller Using ZigBee.

### *Chapter 5: Conclusion and Future Works*

It will conclude the project, about the conclusion from the project. It also includes the summary from the project and recommendation for future project.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.0 Introduction

At present scenario, in the level crossing line the railway gate is operated usually by a gate keeper. This happen when the railway line is cross over the road and there are a gate that have to be controlled. The gate keeper work after receiving the information about the train arrival from the nearer station. When the train starts to leave the station, the particular station delivers the information to give the signal for gate keeper to get ready. This is the operation are followed for operating the railway gates [1].

In addition, this automatic railway gate system can contribute a lot of benefit either to the road user or to the railway management. This type of gate can be implementing in the level crossing where the chances of accidents are higher. The computer integration will be use to provide addition in the latest technology.



In sequences, the gate motor will move forward direction to close the gate. It will stay closed at certain time until that has crossed the gate and reached the second sensor active the motor in backward direction so the gate will open.

Lighting signal also provided at the certain distance as pre cautionary step for driver. Meanwhile, the near station also will provide an indication alarm to remind them about the crossing train. If anything happened at the gate, this alarm will alert the station. LCD display will show the arrival of the train to cross the gate as additional features of this system.

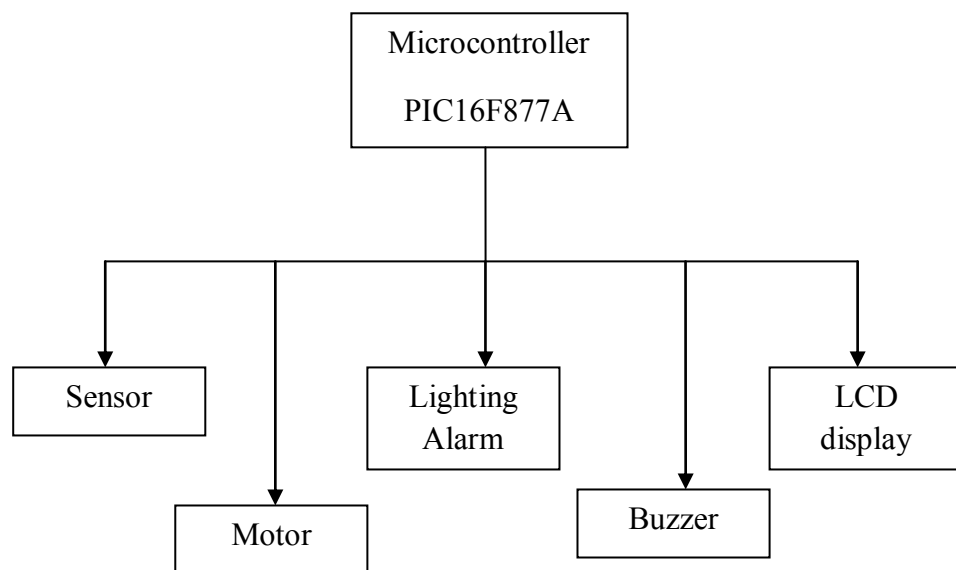


Figure 2.2: The Functionality between Microcontrollers