

**A SIMPLE ID DETECTION USING INFRARED SENSORS**

**NOOR FARHANA HALIL BT ABDUL RAZAK**

**This report is submitted in partial fulfillment of the requirements for the award of  
Bachelor of Electronic Engineering ( Electronic Industry ) With Honours**

**Faculty of Electronic and Computer Engineering  
Universiti Teknikal Malaysia Melaka**

**April 2010**



UNIVERSITI TEKNIKAL MALAYSIA MELAKA  
FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

BORANG PENGESAHAN STATUS LAPORAN  
PROJEK SARJANA MUDA II

Tajuk Projek : A SIMPLE ID DETECTION USING INFRARED SENSORS

Sesi Pengajian : 

2	2	0	1	0
---	---	---	---	---

Saya NOOR FARHANA HALIL BINTI ABDUL RAZAK  
(HURUF BESAR)

mengaku membenarkan Laporan Projek Sarjana Muda ini disimpan di Perpustakaan dengan syarat-syarat kegunaan seperti berikut:

1. Laporan adalah hakmilik Universiti Teknikal Malaysia Melaka.
2. Perpustakaan dibenarkan membuat salinan untuk tujuan pengajian sahaja.
3. Perpustakaan dibenarkan membuat salinan laporan ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. Sila tandakan (  ) :

SULIT\*

\*(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia seperti yang termaktub di dalam AKTA RAHSIA RASMI 1972)

TERHAD\*\*

\*\*\*(Mengandungi maklumat terhad yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)

TIDAK TERHAD

Disahkan oleh:

  
(TANDATANGAN PENULIS)

  
(COP DAN TANDATANGAN PENYELIA)

**FARID ARAFAT BIN AZIDIN**  
Pensyarah

Fakulti Kejuruteraan Elektronik Dan Kejuruteraan Komputer  
Universiti Teknikal Malaysia Melaka (UTeM)  
Karung Berkunci No 1752  
Pejabat Pos Durian Tunggal  
76109 Durian Tunggal, Melaka

Alamat Tetap: 62, JALAN PISANG RAJA,  
KAMPUNG MELAYU, AYER ITAM,  
11500, PULAU PINANG

Tarikh: 30 APRIL 2010

Tarikh: 30 APRIL 2010

“I hereby declare that this report is result of my own effort except for works that have been cited clearly in the references.”

Signature : .....  
Author : Noor Farhana Halil Binti Abdul Razak  
Date : .....

“I hereby declare that I have read this report and in my opinion this report is sufficient in terms of the scope and quality for the award of Bachelor of Electronic Engineering (Electronic Industry) With Honours”

Signature : .....  
Supervisor’s Name : Mr. Farid Arafat B Azidin  
Date : .....

To my beloved Parents, Family and Friends

## ACKNOWLEDGEMENT

I would like to take this opportunity to express my gratitude to all the parties that have been assisting me throughout the duration of my final year project report.

First and foremost, I would like to shower a million thanks to my supervisor, Mr. Farid Arafat Bin Azidin who has been of outmost help and patience. From the first I started my project design until the end of my PSM II, he has been my source of motivation, inspiration, and my guiding light. All the input towards the practical has tremendously benefited me in various aspects.

I would also like to take this opportunity to show my appreciation to Dr. Lim Kim Chuan and Pn. Yusmarnita Bt Yusop the assessor. Thanks for always being receptive towards any new ideas and suggestion that was brought forward during our meeting on 8 April 2010. All your comments during Presentation PSM II was taken seriously and kept in a corner of my mind at all times while developing this report successfully.

I would like to take this chance to express my thanks to the management of Faculty Electronics and Computer Engineering (FKEKK), UTeM, for give me the opportunity to use all the facilities in FKEKK especially all the equipment in the laboratory in order to complete my project work. Without the kind cooperation from all the people, this project would not be able to be completed in such as smooth manner.

Special thanks are also directed to some of UTeM lecturer for freeing up their busy schedule and spend time with me in order to help me figure out my project.

Last but not least I would like to thank all my family members and friends who have been extremely supportive throughout the duration of the entire practical and helping me to complete my final year project report.

## ABSTRACT

The ID detection is design for used in unlocking outdoor gate system. This project is to develop an electronic sensor for ID detection using 4x2 matrix infrared sensors where it can detect self-implemented blocking code. The card is set up for easy usage. The sensor used in this project is the infrared sensor. The main objective of this project is to design an ID Detector by using IR sensors and PIC microcontroller. It is also to develop and implement a system which uses infrared sensors, PIC 16F877A, LCD display, LED display and buzzer alarm. Moreover, this project is to design a low cost ID detector for simple application. The ID Detector is implementing to avoid animal or intruders to enter into the court easily. It is for the reason of environmental protection and to avoid any damage to the courts. Moreover, this ID Detector can be used for reservation system which happened to make the owner of the court easy maintaining the courts privacy. When the card is inserted in the ID detector, the sensors will detect the code and send the information to the PIC microcontroller which then activates the green LED. A valid ID detection will be display on the LCD. An invalid ID detection will be display on the LCD and follows by red LED and buzzer.



## ABSTRAK

Pengesan ID direka untuk menghasilkan sistem membuka kunci gerbang luar. Projek ini adalah untuk menghasilkan sebuah sensor elektronik untuk mengesan ID dengan menggunakan sensor inframerah 4x2 matrix dimana ia diimplementasikan untuk mengesan kod. Kad sudah ditetapkan untuk kegunaan mudah. Sensor yang digunakan dalam projek ini adalah sensor inframerah. Tujuan utama projek ini adalah untuk menghasilkan sebuah pengesan ID dengan menggunakan sensor inframerah dan mikrokontroler PIC. Selain itu, pengesan ID dihasilkan untuk melaksanakan sistem yang menggunakan sensor inframerah, PIC 16F877A, layar LCD, LED dan penggera buzzer. Selain itu, projek ini direka untuk pengesan ID kos rendah. Pengesan ID ini dihasilkan adalah untuk mengelak haiwan atau penceroboh dari masuk ke gelanggang dengan mudah. Penghasilan ID ini adalah untuk sebab perlindungan alam sekitar dan untuk mengelakkan kerosakan pada gelanggang. Selain itu, pengesan ID boleh digunakan untuk sistem tempahan oleh pemilik gelanggang untuk menjaga privasi gelanggang miliknya. Saat kad dimasukkan ke dalam pengesan ID, sensor akan mengesan kod dan menghantar maklumat tersebut kepada PIC mikrokontroler yang kemudian mengaktifkan LED hijau. Sebuah pengesanan ID yang sah akan dipaparkan pada LCD. Sebuah pengesanan ID tidak sah akan dipaparkan pada LCD dan diikuti dengan LED merah dan buzzer.

## TABLE OF CONTENTS

<b>CHAPTER</b>	<b>ITEM</b>	<b>PAGE</b>
	DECLARATION	i-ii
	DEDICATION	iii
	ACKNOWLEDGMENT	iv-v
	ABSTRACT	vi
	ABSTRAK	vii
	TABLE OF CONTENTS	viii-x
	LIST OF TABLES	xi
	LIST OF FIGURES	xii-xiii
	LIST OF APPENDIX	xiv
<b>1</b>	<b>INTRODUCTION</b>	<b>1</b>
	1.1 Introduction	1-2
	1.2 Objective	2
	1.3 Problem Statement	3
	1.4 Scope of work	4
	1.5 Methodology	5
	1.6 Thesis Structure	6
<b>2</b>	<b>LITERATURE REVIEW</b>	<b>7</b>
	2.1 Introduction	7
	2.2 ID Detector	8
	2.3 Comparison with Existing Project	9
	2.4 PIC Microcontroller	10

2.4.1	Introduction	10-15
2.4.2	Power Supply	15
2.5	Display Unit	16
2.5.1	Introduction	16
2.5.2	Liquid Crystal Display (LCD)	16-19
2.6	Sensors	19-21
2.6.1	Infrared (IR) Sensors	21-22
<b>3</b>	<b>METHODOLOGY</b>	<b>23</b>
3.1	Introduction	23-24
3.2	Hardware	25
3.2.1	System Block Diagram	25
3.2.2	Power Supply Circuit	26-27
3.2.3	Main Controller Circuit	27-28
3.2.4	Infrared Sensor Circuit	28-29
3.2.5	LCD Display Module	29-30
3.3	Software	31
3.3.1	MPLab C Compiler	31
3.3.2	C Language	31-32
3.3.2.1	The Structure of C Program	32-33
3.3.3	Programming	33
3.3.3.1	Initialize	33-34
3.3.3.2	Main Program	35
3.3.3.3	Verifying ID	36-37
3.3.3.4	Invalid ID	37-38
<b>4</b>	<b>RESULT AND DISCUSSION</b>	<b>39</b>
4.1	Introduction	39
4.2	Power Supply Circuit Analysis	40
4.3	Main Controller Circuit Analysis	40-42
4.4	Sensors Circuit Analysis	43
4.5	Display Circuit Analysis	44-46
<b>5</b>	<b>CONCLUSION AND SUGGESTIONS</b>	<b>47</b>
5.1	Introduction	47
5.2	Conclusion	48

5.3 Suggestions	49
<b>REFERENCES</b>	50
<b>APPENDIX A</b>	51-70
<b>APPENDIX B</b>	71-74
<b>APPENDIX C</b>	75-76

## LIST OF TABLES

Table 2.1: Comparison between my projects with the previous projects	9
Table 2.2: LCD differences	17-18
Table 2.3: Comparison between LCD and personal computer	18
Table 2.4: Sensor characteristic that need to be consider.	20-21
Table 2.5: Comparison of sensors	22
Table 3.1: Connection Port of LCD display	30

## LIST OF FIGURE

Figure 2.1: Existing Project 1	9
Figure 2.2: Existing Project 2	9
Figure 2.3: Clock/instruction Cycle	13
Figure 2.4: Pin diagram	14
Figure 2.5: Liquid Crystal Display (LCD).	19
Figure 2.6: IR sensor	22
Figure 3.1: Block Diagram for the whole system.	25
Figure 3.2: LM7805 regulator.	26
Figure 3.3: Schematic circuit of +5V power supply.	27
Figure 3.4: Main controller circuit	28
Figure 3.5: Infrared Sensor Circuit	29
Figure 3.6: LCD display circuit	30
Figure 3.7: Initialize Ports	34
Figure 3.8: Main Program	35
Figure 3.9: Verifying ID	36
Figure 4.0: CARD1 Verification	36
Figure 4.1: Invalid ID detection	38
Figure 4.2: Final Project	40
Figure 4.3: Valid ID detected	41
Figure 4.4: Invalid ID detected	42
Figure 4.5: Infrared Sensors Circuit & Card Slot	43
Figure 4.6: Displaying Project Title	44

Figure 4.7: Displaying System Activated	44
Figure 4.8: Verifying ID display	45
Figure 4.9: Valid ID display	45
Figure 4.10: Invalid ID display	46

**LIST OF APPENDIX**

APPENDIX A	SOFTWARE DEVELOPMENT	51-70
APPENDIX B	MICROCHIP 16F877A DATA SHEET	71-74
APPENDIX C	LM7805 DATA SHEET	75-76



## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Introduction**

The ID detection is design for used in unlocking outdoor gate system. This project is to develop an electronic sensor for ID detection using 4x2 matrix IR sensors where it can detect self-implemented blocking code. The card is set up for easy usage. An additional advantage of it safety is the fact that sensors is set up on the internal part, whereas the code is set up on the card. In this case the unlocking gate system is ensured only if the codes on the card make contact with the sensor in the ID detector.

The sensor used in this project is the infrared sensor. Infrared sensor is use to detect the code that on the card. The infrared sensor is then connected to the PIC microcontroller which is programmed to identify the code that is on the card.

The ID detection is a small database system programmed in PIC microcontroller. The PIC microcontroller used in this project is PIC16F877A. When the card is inserted in the ID detector, the sensors will detect the code and send the information to the PIC microcontroller which then activates the green LED. A valid ID detection will be display on the LCD. An invalid ID detection will be display on the LCD and follows by red LED and buzzer.

## 1.2 Objectives

There are several objectives that are to be achieved at the end of the project which includes:

- i. To design an ID Detector by using IR sensors and PIC microcontroller.
- ii. To develop and implement a system, which uses; Infrared Sensors, PIC 16F877A, LCD display, LED (green and red) and buzzer alarm.
- iii. To design a low cost ID detector for simple application.
- iv. To learn about the art of programming in C language.

### 1.3 Problem Statement

Nowadays, the outdoor gates such as courts gate is unlocked and widely open whenever no one is using it. So when the gate is unlocked, there are many possibilities can happened such as animals or intruders can enter the courts without any reason anytime. Furthermore, the carpet used in tennis courts, basketball courts and many other courts is expensive. The ID Detector is implementing to avoid animal or intruders to enter into the court easily. It is for the reason of environmental protection and to avoid any damage to the courts.

Moreover, this ID Detector can be used for reservation system which happened to make the owner of the court easy maintaining the courts privacy. It is also to avoid any intruders which are not registered entering the courts.

ID Detector is implementing for easy usage and a user friendly type. It is not necessary to use an expensive type of ID detector for a simple gate system. So for this type of gate system, a low cost ID Detector can be used.

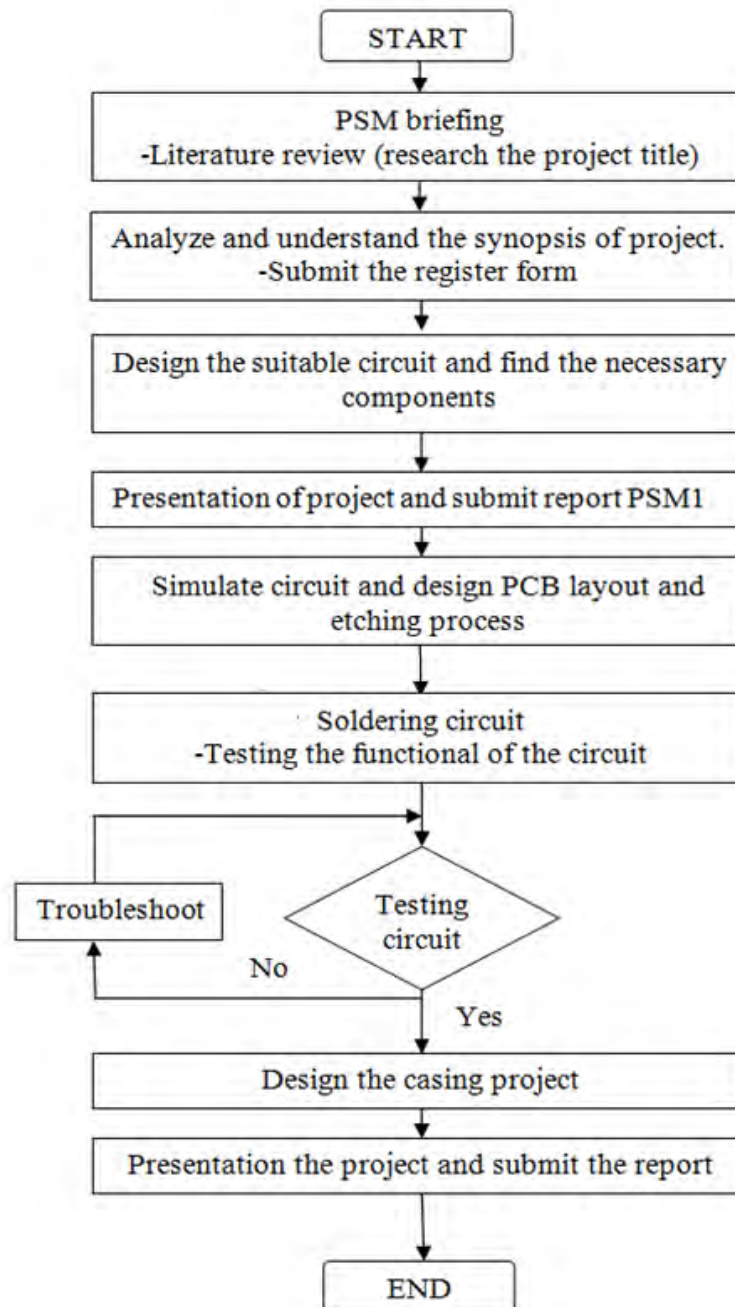
## 1.4 Scope of Work

As to ensure the completion of project achieves the stated objectives, the project shall be completed within these scopes:

- i. To built an ID detector using 4X2 matrix IR sensor in the field of outside gate system.
- ii. To construct a compact design capable for gate system.
- iii. To study the operation of;
  - Microcontroller.
  - Infrared Sensor
- iv. To identify;
  - The accurate and stable circuit.
  - Suitable programming and its implementation

## 1.5 Methodology

To achieve the goal that has been set in the objectives of this project, certain methods shall be used.



## 1.6 Thesis Structure

**Chapter 1** will be discussed about an introduction of the project. The main idea is about the background and objectives of the project will be discussed.

**Chapter 2** is about literature review of the project. This project discusses the concept of the research and how it related with the theory.

**Chapter 3** is explanation about the methodology and process that taken to complete the project. It consist the detail development of this project.

**Chapter 4** is about the result obtaining based on the methodology used. The obtained result will be analyze and based on the objectives and problem statement.

**Chapter 5** is about the discussion and summary of project achievement. It also includes the conclusion and recommendation that can be taken for future improvement of the project.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter is upon the study on PIC microcontroller, LCD display, Infrared sensors, LED display and Buzzer Alarm. The PIC microcontroller discussed more towards the capability of it and thorough detail on the functions and the operations of it.

## 2.2 ID Detector

In designing this project, the requirement is as below:

- i) Requires Proximity Card
  - For different card code used.
- ii) The ID can be detected by using Infrared Sensor controlled by a programmable microcontroller;
  - Features an alphanumeric LCD display - interacts with the user.
- iii) Requires LED display
  - To shows valid ID display Green LED and invalid ID display Red LED.
- iv) Requires Buzzer
  - It will turned on when ID card fully slotted in, valid ID detected and also when detected invalid ID. When it detected invalid ID card, buzzer will turned on the alarm continuously until the card is removed.