UNIVERSITI TEKNIKAL MALAYSIA MELAKA

FACULTY OF ELECTRICAL ENGINEERING

FINAL YEAR PROJECT REPORT

IMPLEMENTATION OF THE SECURITY MAIN GATE

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DECLARATION

"I hereby declared that I have read through this report entitle "Implementation of the Security Main Gate Entrance" and found that it has comply the partial fulfillment for awarding the degree of Bachelor of Mechatronic Engineering"

Signature : …….

Supervisor's Name : Encik Hairol Nizam b. Mohd Shah

Date : ……

DECLARATION

"I hereby declared that this report entitle "Implementation of the Security Main Gate Entrance" is the result of my own work except as cited in the references. The report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree."

Signature : ……

Name : Mohd Khairery b Abdul Rahman

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IMPLEMENTATION OF THE SECURITY MAIN GATE ENTRANCE

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A Report submitted in Partial Fulfillment of requirements for the award of the Degree of Bachelor in Mechatronic Engineering

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To my beloved Father and Mother

May their soul rest in peace

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ABSTRACT

The project is about a smart and intelligence security main gate entrance. The gate is mainly to be used in main entrance to calculate and verify the amount of vehicle entered and exit from the location. The function of the security gate are basically to count the vehicle enters and exit from the location, it also has the ability to verify the vehicle in load setting; which is to verify the load of the vehicle when they enters and exit through the location or premises. Basically, this system are able to calculate the amount of vehicle enters and exit and are able to classify the class of the vehicle, whether it is car, motorcycle, lorry or bus. The previous system that are use are basically using human as the main counter and to verify the load in the vehicle. This system are able to helps the problem faced by the security guard which is the missing of items in premises. This system are able to help the in survey if there is any needed. Basically, this project will be using the proximity sensor and the IR sensor. Thus, this project is able to be settling some of the problems faced nowadays.

ABSTRAK

Projek ini adalah berkenaan satu sistem cerdik dan bijak yang akan diimplementasikan di pagar utama. Fungsi sistem pagar utama ini adalah untuk mengira dan mengenal pasti jumlah kenderaan yang memasuki dan keluar sesebuah premis. Fungsi utama sistem pagar utama ini adalah untuk mengira bilangan kenderaan yang keluar masuk sesebuah premis; selain itu, sistem ini juga mempunyai keupayaan untuk mengenalpasti sama ada kenderaan yang keluar dari premis mempunyai muatan ataupun tidak. Secara amnya, pagar utama ini berfungsi mengelaskan kenderaan kepada beberapa bahagian iaitu kereta, motorsikal, lori dan bas. Sistem yang digunapakai sebelum ini adalah berdasarkan kecekapan manusia untuk mengira dan mengenal pasti sama ada kenderaan itu bermuatan atau tidak. Sistem ini mampu untuk membantu masalah yang dihadapi oleh pengawal keselamatan iaitu untuk mengelakkan pencurian dari dalam premis. Sistem ini juga mampu membantu jikalau terdapat bancian yang ingin diadakan. Secara amnya, projek ini akan menggunakan sensor proximiti dan sensor infra-Merah. Oleh itu, projek ini diharap mampu untuk menyelesaikan masalah yang dihadapi pada masa kini.

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CHAPTER 1

INTRODUCTION

Security gate can be defined as a gate that is supposed to be safe and full with guards all the time. Currently main gates are usually guards by numbers of security guards taking turns in day and night shift. It is a basic knowledge that guards sometimes works at night may fall asleep and left their post unattended. In order to solve this kind of problems, a system is created so it can help the security guard in improving their efficiency in their job.

The main motive in inventing this system is to solve the current problems face nowadays and to enhance the current security gate to ensure safety for all premises. It is also to fill the imperfections of the current security gate which is quite a lot.

1.1 Background of the Project

Implementation of the Security Main Gate Entrance is the title of this project where as the main idea is to implement a system on the security guard entrance in order to solve the problem faced by current state of security gate. This future implemented system is supposed to be a smart and intelligence system that is able to solve and minimize the problems faced by the current state of security guard entrance. This system is able to count the numbers of

vehicle that enters and exits the premises, verifying the class of vehicle whether it is car, motorcycle, bus or lorry. Basically, this system will be using sensor as detectors and counters. PIC board will be used in order to control these sensors. A driver for the sensors will be created on board to have the sensors functions and accomplish the mission of this project. These sensors are supposed to acts as a switch when the vehicle pass through the sensors, allowing the sensors to become a detector whether there is vehicle in place or not. C languages are programmed so that I can be burn into the PIC in order to control this system. The entire objective, scope and other will be discussed in the next chapter.

1.2 Problem Statement

There are several problems based on recent way of gate. First of all, the problems face by the guards to calculate the numbers of vehicle that enters and exit a premise. In current way, eye-sighting is the most efficient way; however this may be tiring for most of the security guards; thus making it less effective.

Theft robberies in premises are often undetectable even with security guards all over the place. Ensuring the premise safe is one of the problems to be study about. Ensuring the premises safe is the problem face by the current security gate entrance where as the security guard needs to tend all of the vehicle enters and exits the premises.

Classifying the classes of vehicle are problems that are going to be studied as current way of identifying classes of vehicle is true sight-seeing by guards. This current way of classifying class of vehicle could be very tiring since that security guard need to be cautious all time.

1.3 Objective

The main objective of this project is to build a smart and intelligence system to be implemented on main security guard entrance. In order to make this project successful, the objectives have been declared these objectives must be achieved in completing this project. Objectives are a guidance of any project, so the objectives have been listed below.

1) To calculate the numbers of vehicle enters and exit a premise.

2) To classify the vehicle into several classes.

3) To build a Smart gate that helps the security guard in keeping the premise safe.

1.4 Scope

The scope of this project is to build a system that will function properly based on the objective and to solve problem faced as much as it can. The scope of this project is to build a system using sensors as detectors. PIC will be used in controlling the device. The programming of the system will be using the C language based on the C file using the MicroC software.

The project scope is to identify and verify the class of vehicle which is car, motorcycle, bus and lorry. The type of each class of vehicle is not specific. Each of the class of vehicle will be taken into measurement.

Keeping the premises safe in the objective is to alert the security guard whenever a vehicle enters the premises, thus keeping the premises safe from any trespassing. The

identifying of the load of vehicle is also limited to the vehicles that are able to maintain heavy load such as lorry or buses.

Lastly, perform an experiment that is including testing and commissioning the product to make sure the product well function as stated in the objective.

1.5 Organization of the Project

This report will be conducted in few chapters and each stated as below:

Chapter 1: Introduction

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

Chapter 2: Literature Reviews

This chapter shows about the studies and research that relevant to the project.

Chapter 3: Methodology

This part will show the canvass about the project methodology used in this project.

Chapter 4: Preliminary result

This part will state out the result that be obtained.

Chapter 5: Discussion of results

This chapter will talk about the discussion of the result of the project.

Chapter 6: Summary and Conclusion

This chapter will discuss about the summarization of the project and the major conclusion of the project.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

In this chapter, reviews of the previous researches project that are related with this project will be discussed. The information will be become additional source for the project in becoming more successful. To have a brief understanding of the researches related to the project, a few literature reviews had been done. This chapter will describe the related literature reviews.

2.1 PIC Microcontroller

Microcontroller is an integrated chip that is often part of an embedded system. The microcontroller includes a CPU, RAM, ROM, I/O (input/output) ports, and a timer like a standard computer. Examples of popular microcontrollers are Intel's 8052 Motorola's 68HC11, Zilog's Z8 and PIC (that focus on this project). In choosing the microcontroller; the

aspects that are important are speed of microcontroller, packaging, size of RAM and ROM, numbers of input/output ports, timer, and cost per unit.

PIC is a family of Harvard architecture microcontrollers made by Microchip Technology. The name PIC initially referred to “Programmable Interface Controller”, but shortly thereafter was renamed “Programmable Intelligent Computer”. The main function of a microcontroller is to receive information and give order to other devices to do a job that has been programmed into the microcontroller. A microcontroller is a single integrated circuit with the following key features:

1. Central processing unit – ranging from small and simple 8-bit processor to sophisticated 32 or 64-bit processor.
2. Input/output interfaces such as serial port
3. Peripheral such as timer and watchdog circuit
4. RAM for data storage
5. ROM,EEPROM or Flash memory for program storage
6. Clock generator – often an oscillator for a quartz timing crystal, resonator or RC circuit

To program the PIC microcontroller usually C language will be use. This is because C language will produce hex file and PIC reads the hex file. For this project the PIC controller that is used is PIC18F877a. PIC18F is a 8-bit PIC family that mean all of the data transfer are in 8-bit, it has 40 pins around it. It also has 4 ports that are available for 33 input and output. The maximum clock frequency supported for this PIC is 20 MHz. ADC in this PIC is 10 bits which means it has 1024 resolution and it has 8 channels. Flash program memory provided by this PIC is 8 KB while RAM 368 bytes. EEPROM provided is 256 bytes.

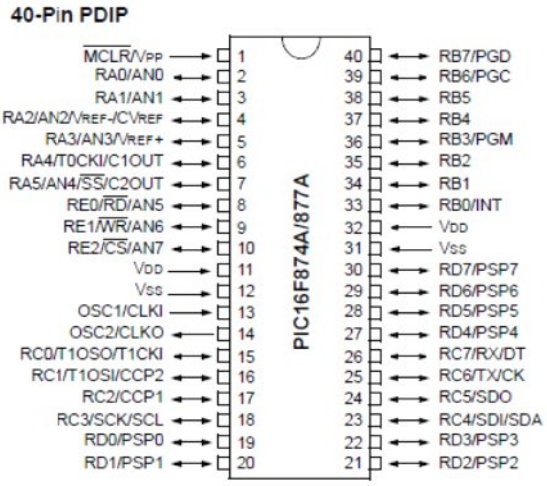

Figure 2.1 PIC16f877A pin diagram

2.2 Sensor

The navigator for obstacle tracking there are several method that been used.

a) IR sensor

b) Inductive sensor

c) Ultrasonic sensor

2.2.1 Infra-Red Proximity Sensor

This infra – red proximity sensor is easy to build, easy to calibrate and still, it provides a detection range of 35 cm (range can change depending on the ambient light intensity).

1. Can be used for most indoor applications
2. Can be measure the speed of object moving at a very high speed
    i) industry

ii) tachometers

Infrared radiation (IR) is electromagnetic radiation whose wavelength is longer than that of visible light (400-700 nm), but shorter than that of terahertz radiation (100 μm - 1 mm) and microwaves (~30,000 μm). Infrared radiation spans roughly three orders of magnitude (750 nm to 100 μm). Direct sunlight has a luminous efficacy of about 93 lumens per watt of radiant flux, which includes infrared (47% share of the spectrum), visible (46%), and ultra-violet (only 6%) light. Bright sunlight provides luminance of approximately 100,000 candela per square meter at the Earth's surface. Infrared imaging is used extensively for military and civilian purposes. Military applications include target acquisition, surveillance, night vision, homing and tracking. Non-military uses include thermal efficiency analysis, remote temperature sensing, short-ranged wireless communication, spectroscopy, and weather forecasting. Infrared astronomy uses sensor-equipped telescopes to penetrate dusty regions of space, such as molecular clouds; detect cool objects such as planets, and to view highly red-shifted objects from the early days of the universe Humans at normal body temperature radiate chiefly at wavelengths around 10μm (micrometers). At the atomic level, infrared energy elicits vibrational modes in a molecule through a change in the dipole moment, making it a useful frequency range for study of these energy states for molecules of the proper symmetry. Infrared spectroscopy examines absorption and transmission of photons in the infrared energy range, based on their frequency and intensity.

Figure 2.2: Infra-Red Proximity Sensor

2.2.2 Inductive Sensor

An inductive sensor is an electronic proximity sensor, which detects metallic objects without touching them. The sensor consists of an induction loop. Electric current generates a magnetic field, which collapses generating a current that falls asymptotically toward zero from its initial level when the input electricity ceases. The inductance of the loop changes according to the material inside it and since metals are much more effective inductors than other materials the presence of metal increases the current flowing through the loop. This change can be detected by sensing circuitry, which can signal to some other device whenever metal is detected.

Common applications of inductive sensors include metal detectors, traffic lights, car washes, and a host of automated industrial processes. Because the sensor does not require physical contact it is particularly useful for applications where access presents challenges or where dirt is prevalent. The sensing range is rarely greater than 6 cm, however, and it has no directionality.

Figure 2.3: Infra-Red Proximity Sensor

2.2.3 Ultrasonic Sensor

Ultrasonic sensors (also known as transceivers when they both send and receive) work on a principle similar to radar or sonar which evaluate attributes of a target by interpreting the echoes from radio or sound waves respectively. Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor. Sensors calculate the time interval between sending the signal and receiving the echo to determine the distance to an object.

This technology can be used for measuring: wind speed and direction (anemometer), fullness of a tank, and speed through air or water. For measuring speed or direction a device uses multiple detectors and calculates the speed from the relative distances to particulates in the air or water. To measure the amount of liquid in a tank, the sensor measures the distance to the surface of the fluid. Further applications include: humidifiers, sonar, medical ultrasonography, burglar alarms, and non-destructive testing.

Systems typically use a transducer which generates sound waves in the ultrasonic range, above 20,000 hertz, by turning electrical energy into sound, then upon receiving the echo turn the sound waves into electrical energy which can be measured and displayed. The technology is limited by the shapes of surfaces and the density or consistency of the material. For example foam on the surface of a fluid in a tank could distort a read

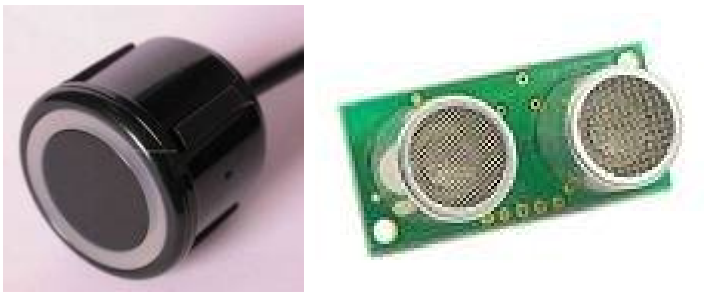

Figure 2.4: Ultrasonic Sensor

2.3 Studies on Usage of Proximity Sensor

2.3.1 Reactive Grasping Using Optical Proximity Sensors

Based on the journal, there are certain points that can take into measurement, such as the Grasping Experiment done in the journal. The purpose of the experiment is to focus on the final approach of grasping using proximity sensor. Here, can be seen that proximity sensor can be use in order to get a vivid measure of a certain objects.

Based on the experiment, using a gripper which is uploaded with a proximity sensor, the proximity sensor are able to identify certain things such as ski-boot. However, the proximity sensor senses are facing with disturbances when the objects are extreme type of surface such as highly reflective aluminum and a transparent glass.

This is the picture of failures of the proximity sensor in order to detect and calculate the distance of gripper and objects. Figure 2.5 shows the effect of grasping proximity sensor gripper on shiny object. Figure 2.6 shows the effect of grasping proximity sensor gripper on transparent glass.

Figure 2.5 shows the effect of grasping proximity sensor gripper on shiny object.

Figure 2.6 shows the effect of grasping proximity sensor gripper on transparent glass.

2.3.2 Dynamic Object Localization via a Proximity Sensor

Based on the experiment done in this journal, the object localization using a proximity sensor is proven to be effective whereas the result are such where most of the objects are able to detect using proximity sensor. In this paper itself, it is describe that a Proximity Sensor consisting solely of inexpensive intensity-based electro-optical proximity sensors embedded in a robotic end-effector. This paper also talks about the degree of sensor reflectivity and how the sensors accept the transmitted wave.

Based on this paper, the sensors were characterized by experiment: sensor output voltage was recorded while a flat plane covered with white paper was placed at distance intervals of 1mm and orientation intervals of 1.5^{o} over a range of 0-75mm and -50^{o} to 50^{o} respectively. The sensor saturated at distances less than 5mm when the orientation was less than $\pm 30^{o}$ .This region was avoided for the rest of the characterization.

This framework permits the simultaneous estimation of the object's reflectance properties, allows for angle dependent sensor models, all while tracking an unknown object trajectory. Figure 2.7 shows the trajectory of the proximity sensor.

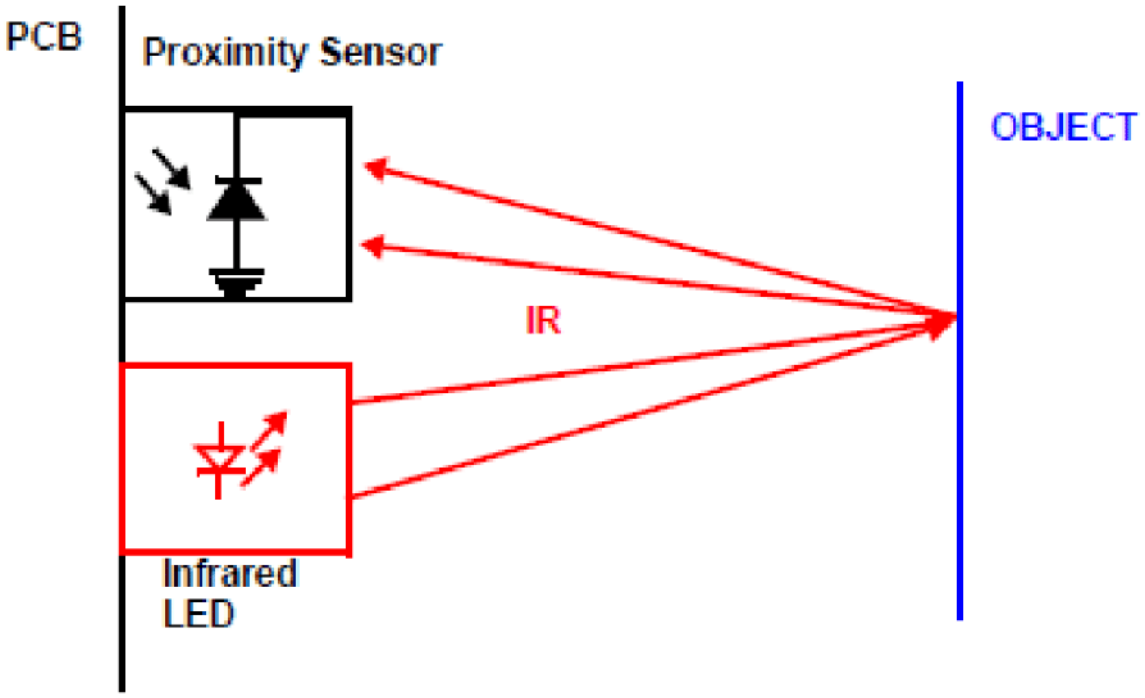

Figure 2.7 Trajectory of the proximity sensor

2.4 Sonar Sensor on PIC PIC16F628

Based on the research of using sonar sensor on PIC16F628, the principle of Echo Location stated that a short pulse is sent in a specific direction. By specific angle to trigger, the specific angle of wave receive by the receiver can be determine. When the pulse hits an object, which does not absorb the pulse, it bounces back, after which the echo can be picked up by a detector circuit. By measuring the time between sending the pulse and detecting the echo, the distance to the object can be determined.