SMART PARKING SYSTEM USING WIRELESS CONNECTIVITY

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This report is submitted in particular fulfillment of the requirements for the award of Bachelor of Electronic Engineering (Wireless Communication) with Honours

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I declare that this project report entitled "Smart Parking System Using Wireless Connectivity" is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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"I hereby declare that I have read this project report and in my opinion this project report is sufficient in terms of scope and quality for the award of Bachelor of Electronic Engineering (Wireless Communication) With Honours."

Signature : .....

Name of Supervisor : HAMZAH ASYRANI BIN SULAIMAN

Date : 17 JUNE 2013

Specially Dedicates
To my beloved parents, family and all my friends
Not forgetting the supervisor who has the support,
assistance and suggestions
in completing this project.

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ABSTRACT

With the increase in vehicle production and world population, more and more parking spaces and facilities are required. In this paper a new parking system called Smart Parking System is proposed to assist drivers to find vacant spaces in a car park in a shorter time. IR sensors are used to detect either car park occupy or not. Different detection technologies are reviewed and compared to determine the best technology for developing smart parking system. Features of Smart Parking System include vacant parking detection, display of available parking spaces, and directional indicators toward vacant parking spaces through the use of specific LEDs. The technologies for communication system that used in the Smart Parking System also have been discussed in this paper.

ABSTRAK

Dengan peningkatan dalam pengeluaran kenderaan dan penduduk dunia, tempat letak kereta dan kemudahan yang lebih diperlukan. Dalam kertas kerja ini sistem letak kereta baru yang dipanggil "Smart Parking System" dicadangkan untuk membantu pemandu untuk mencari ruang kosong di tempat letak kereta dalam masa yang singkat. Sensor Infrared digunakan untuk mengesan sama ada tempat letak kereta menduduki atau tidak. Teknologi pengesanan yang berbeza dikaji dan dibandingkan untuk menentukan teknologi yang terbaik untuk membangunkan sistem letak kereta pintar. Ciri-ciri Sistem Parking Pintar termasuk pengesanan kosong tempat letak kereta, paparan tempat letak kereta yang ada, dan penunjuk arah ke arah tempat letak kereta yang kosong melalui penggunaan LED tertentu. Teknologi untuk sistem komunikasi yang digunakan dalam Sistem Parking Pintar juga telah dibincangkan dalam kertas ini.

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GUI	-	Graphical User Interface
PIC	-	Programmable Interface Controller
IC	-	Integrated Circuit
LED	-	Light Emitting Diode
MCLR	-	Master Clear Reset
IR	-	Infrared
LCD	-	Liquid Crystal Display
PCB	-	Printed Circuit Board
UART	-	Universal Asynchronous Receiver Transmitter
USART	-	Universal Synchronous Asynchronous Receiver Transmitter
USB	-	Universal Serial Bus
VB	-	Visual Basic

CHAPTER I

INTRODUCTION

1.1 Introduction

Attractive place for locals and tourists to shop is in the shopping mall, it became the focal point of a town that has a modern shopping center and also provides a variety of services, where it became the attracted place to come. Many shop owners prefer to locate their business in the shopping mall to increase revenue and get more customers. They are two important factors of human life which is time and cost, either to individuals or businesses. As the quality of life is increases, many people inhabiting cities and urban life requires centralized utilities [1].

Recently, shopping mall has started providing a lot of services not just a place that only has pure selling and buying. Customers can use cinemas, food court, post offices, banking services, children play areas and much more. For example, window-shopping or visiting to shopping mall in Malaysia just to find and not to buy, is a common activity. Development of shopping malls has influenced shopping culture and behavior [2].

The main issue in developing shopping mall is providing sufficient parking for a customer. A sufficient number of parking spaces and paying attention to handicapped driver with offering safe and secure parking lots are a few of the factors which can attract and increase customer loyalty to visit a shopping mall frequently. There are various types of parking lots such as roadside, roadside with ticket, barrier gate and multilevel parking. The most preferred by patrons is the multilevel parking lot [3]. The main factors that customer choose a specific parking lot is weather conditions, safety, proximity and car park fees respectively.

The objectives of this purpose are to identify the difficulty drivers to parking their vehicles at shopping mall, propose a solution to solve the problems and outline a Smart Parking System architecture design.

1.2 Problem Background

On weekend or public holidays, finding a vacant space in parking lot in shorten time is difficult. 86% of drivers have a problem in finding a vacant parking lot [3], 66% of visitors facing a problem to finding spaces during weekends or public holidays can take more than 10 minutes. At peak hour shopping mall becomes crowded, and difficulty in finding parking lot is a major problem for customers [4]. Insufficient parking spaces lead to traffic congestion and driver frustration [5].

The selection of detection technology is by referring the objective and scope of the purpose. There are various types of detection discussed in this study, infra red, ultrasonic, inductive loop detector, magnetometer, piezoelectric sensor, weigh in motion sensor, microwave radar, image processing and vehicle license plate recognition. Also the communication system between sensor modules and monitoring system is how to transmit the data of sensor module to monitoring system.

1.3 Objective

The objectives of this project are listed below:

i. To design a parking system that will guide the drivers to vacant parking lots.
ii. To design graphic user interface (GUI) for monitoring system.
iii. To design a parking system that capable to determine parking availability.

1.4 Scope of Work

The scope of this project will focus on the following areas:

i. To understand and learn the suitable sensor that will be use in the parking system.

ii. To understand and apply to transfer data by using wireless communication system using Zigbee.

iii. To design the graphic user interface (GUI) by using Visual Basic Studio for monitoring system of the parking system.

1.5 Chapter Structure

This report have a 5 chapters consists of the introduction, literature review, methodology, result, and discussion and the last chapter is conclusion and recommendation.

The first chapter of this thesis is about an introduction of the project. It explains the objectives and problem statement of this project in detail. The scope of work for this project also discusses in this chapter.

The second chapter will discussed about the literature review of this project. Gaining a knowledge and learn a method how to develop a smart parking system.

The third chapter focuses on the project methodologies. It explains the method for develop this project such as designing a circuit, selecting a component and workflow of this project.

The forth chapter discusses about the result of this project. It explains all the results obtained, system operation, implementation of hardware and software for this project.

The last chapter for this thesis is about conclusion and future work for this project. This project was fully functional and tested as expected. The new ideas for improving this system already explain in the future work part.

CHAPTER II

LITERATURE REVIEW

2.1 Introduction

This chapter reviews some information from previous project, journals, articles, books and datasheets. In order to develop a Smart Parking System that will demonstrate the objectives of the project, from the different sources such as library, internet, product manual and etc these information were collected to overcome the objective of this project.

2.2 Type of Sensor Technologies

There are a various detection technologies that being used in a parking system. Each sensor determines the function to detect an object and have advantage and disadvantage for using the technology to apply in parking system.

2.2.1 Passive Infrared Sensor

Passive infrared sensors measured the changes in the energy emitted by vehicle and the roads for identify the occupancy status of a parking space [6]. The sensitivity of the sensor is reduced in snow, heavy rain and fog, the sensors are able to be implemented in a multilane environment to measure vehicle speed. And also certain models are not recommended for presence detection.

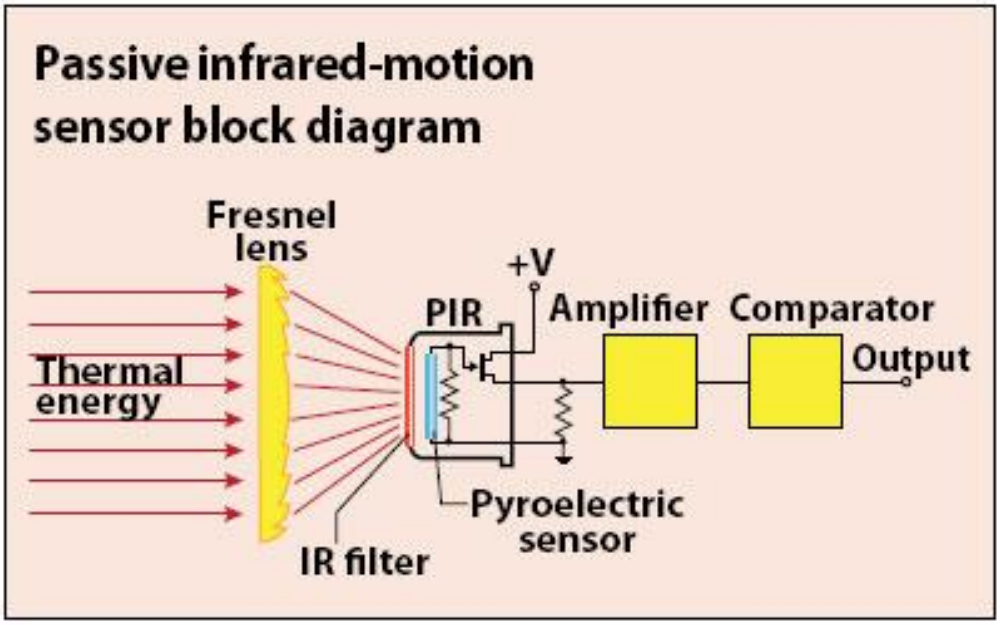

Figure 2.1: Passive Infrared Sensor

2.2.2 Active Infrared Sensor

The emitting infrared energy and detecting the amount of energy reflected an active infrared sensor will detects the vehicles [6]. The active infrared sensors are used to measure of vehicle position, class and speed, multiple beams are measured and transmitted from the sensor. This sensor is sensitive about environmental conditions.

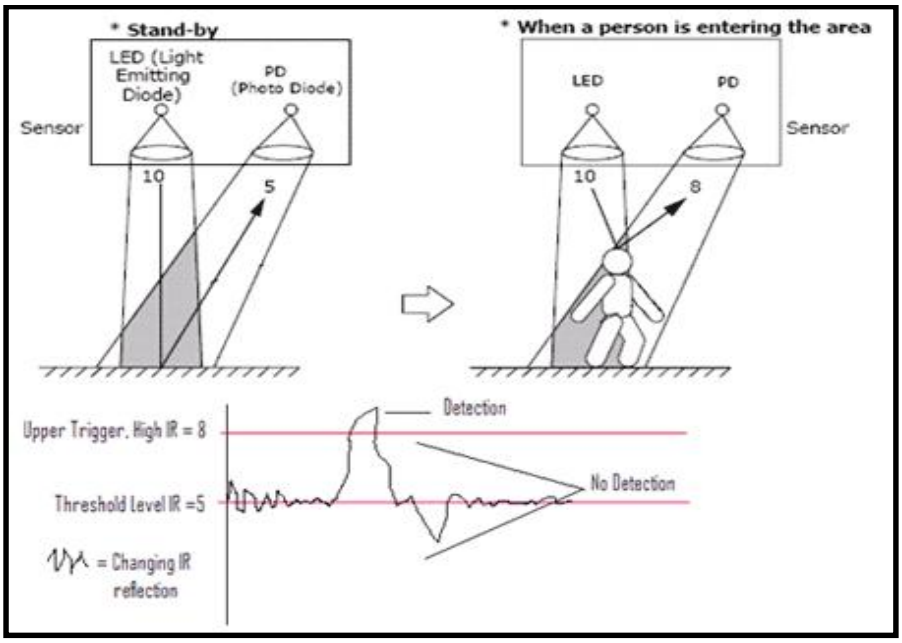

Figure 2.2: Active Infrared Sensor

2.2.3 Inductive Loop Detectors

A wire loop of various sizes is called an Inductive Loop Detectors, this sensor using frequencies range from 10 to 50 kHz to send a signal [6]. The oscillation frequency of the inductive loop is directly controlled by the inductance of the loop which changes with vehicle presence.

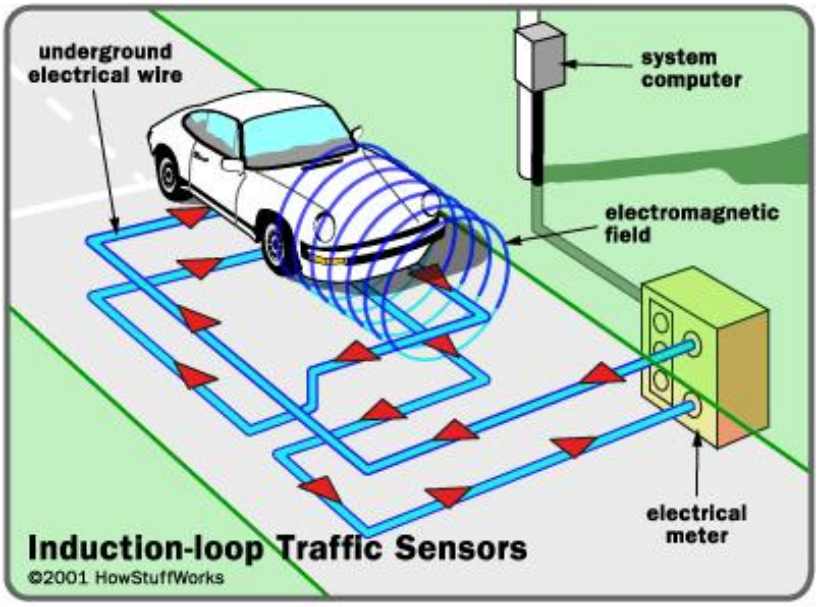

Figure 2.3: Inductive Loop Detectors

2.2.4 Magnetometer

There are two type of magnetometer which is flux gate magnetometer and search coil magnetometer [6]. The search coil magnetometer are insensitive and are intrusive sensors, meanwhile the flux gate magnetometers are insensitive to weather conditions, proximity is required for accurate detection.

2.2.5 Anistropic Magnetoresistance Sensors

These sensors are simply energized by providing a constant current: Anistropic Magnetoresistance Sensors (AMR), Giant Magnetoresistance Sensors (GMR), magnetic Tunnel Junction Sensors, Extraordinary Magnetoresistance and Ballistic Magnetoresistance. In their research the AMR sensor is for detect a vehicle and its sensitivity to position and orientation has noted.

2.2.6 Piezoelectric Sensor

When the specially processed material is subjected to vibration or mechanical impact this sensor will convert kinetic energy to electrical energy [6]. It gives more accurate and it needs multiple detectors. It is very sensitive to high temperature and stress.

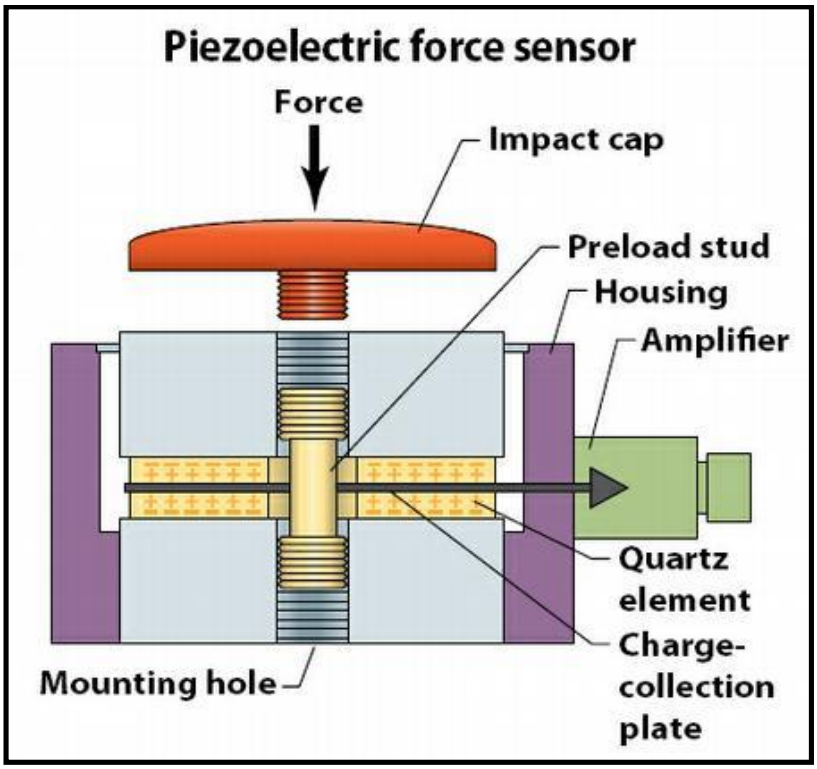

Figure 2.4: Piezoelectric Sensor.

2.2.7 Pneumatic Road Tube

When air pressure created, and closes a switch, and then produces the signal when the vehicles pass over the vehicle will be detected [6]. It is temperature sensitive and sometimes in accuracy, and it is easy to maintain and implement.

2.2.8 Weight-in-motion Sensor

This sensor is useful to highway planner, designers and law enforcement agencies that will detect with their weight of the vehicle [6]. Piezoelectric, load cell, bending plate and capacitance mat are the four technologies are used in this sensor.