UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF SMART PARKING LOT SYSTEM USING LASER COMMUNICATION

This report is submitted in accordance with the requirement of Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electronic Engineering Technology (Telecommunications) with Honours.

by

MUHAMMAD AZRUL SYAFIQ BIN SUHAIZAM
B071310661
940515-10-6155

FACULTY OF ENGINEERING TECHNOLOGY

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DECLARATION

I hereby, declared this report entitled "DEVELOPMENT OF SMART PARKING LOT SYSTEM USING LASER COMMUNICATION" is the results of my own research except as cited in references.

Signature   :   …………………………………………

Author's Name   :   Muhammad Azrul Syafiq bin Suhaizam

Date   :   …………………………………………

APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfilment of the requirements for the degree of Bachelor of Engineering Technology (Telecommunications) with Honours. The member of the supervisory is as follow:

…………………………

(Win Adiyansyah Indra)

ABSTRAK

Dengan peningkatan dalam pengeluaran kenderaan dan penduduk dunia, semakin banyak tempat letak kereta dan kemudahan yang diperlukan. Dalam projek ini, sistem tempat letak kereta baru yang dikenali sebagai Sistem Parkir Pintar dicadangkan untuk membantu pemandu untuk memeriksa ruang yang terdapat di tempat letak kereta. Sistem baru ini menggunakan pengesan laser untuk mengesan kereta yang masuk sebelum masuk ke tempat letak kereta. Teknologi pengesanan yang berbeza telah dikaji dan dibandingkan untuk menentukan teknologi yang terbaik dalam pembangunan Sistem Parkir Pintar. Ciri-ciri sistem ini adalah untuk memaparkan tempat letak kereta yang kosong melalui penggunaan sensor laser dan Arduino Uno. Projek ini juga menerangkan penggunaan sistem Smart Parking dari pintu masuk ke tempat letak kereta. Sistem ini direka untuk tempat letak kereta dengan beberapa bilangan tempat letak kereta. Perekaan sistem mentakrifkan ciri-ciri reka bentuk penting seperti lokasi sensor, bilangan yang diperlukan sensor dan papan paparan. Projek ini boleh mengurangkan masa untuk pemandu untuk mencari ruang yang kosong dan mengelakkan dari berlakunya kesesakan lalulintas.

ABSTRACT

With the increase in vehicle production and world population, more and more parking spaces and facilities are required. In this project, a new parking system called Smart Parking System is proposed to assist drivers to check available spaces in a car park. The new system uses Laser (Light Amplified Stimulated Emission Radiation) sensors to detect the incoming car before enter to the parking lot. Different detection technologies are reviewed and compared to determine the best technology for developing Smart Parking System. Feature of Smart Parking System is to display of available parking spaces through the use of laser sensor and Arduino Uno. This project also describes the use of Smart Parking system from the entrance into a parking lot. The system is designed for a parking lot with several parking spaces. The system architecture defines the essential design features such as location of sensors, required number of sensors and outdoor display board. This project can reduce the time for the driver to find vacant empty space and almost reduce the chances of entering into the unusual space which might lead into the traffic jam

DEDICATION

Special dedication for:

To my beloved parents, Mr. Suhaizam Sujak and Mrs. Roslinah Mohd Aribi who always motivating me along the process of completing the project.

To my beloved supervisor, Mr. Win Adiyansyah Indra, thanks for all the guidance in this project.

Sincerely from my heart, thank you for the support.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

LASER	-	Light Amplified Stimulated Emission Radiation
SPS	-	Smart Parking System
IR	-	Infrared
RFID	-	Radio Frequency Identification
USB	-	Universal Serial
IDE	-	Integrated Development Environment
PWM	-	Pulse Width Modulation
AC	-	Alternative Current
DC	-	Direct Current
LED	-	Light Emitting Diode
CC	-	Common Cathode
CA	-	Common Anode

CHAPTER 1
INTRODUCTION

1.0   Introduction

This section basically explains about what the project happened and the project background. This section will also focus on the problem statement, objective, scope, importance of the project and report organization.

1.1   Project Background

In the late time individuals can't picture their existence without technology. Encompassing us different technologies are peopling to carry on with their existence with more extravagance. The innovation area has changed and created numerous items or gadgets. The innovation is giving many points of interest additionally it has a few inconveniences. Telecommunication is one of the advancements that have been created into numerous sorts of innovation.

Given the current parking problem in our country and the new solutions like multilevel systems, it is not helping much. The idea of this project is that it will be an effort to save time and useful associated with parking. The check in and parking slot assignment are all done through a single system, which primarily uses laser to communicate with the car. The gates of parking lots are fitted with the laser sensor only just before the entry of the parking. The sensor shall detect the car from the laser and the available of the remaining parking slot will be determined by the laser which

is it will do the count for the remaining parking slot. The number of parking slot will be shown in front of the gate. This project is also using Arduino that can run the system.

The idea of this project is also to use communication with the help of Arduino and laser sensor for developing smart parking system. Arduino is an open-source microcontroller used in electronic prototyping. There are many types of Arduino and each types of Arduino have different control system, microcontroller type and speed of processing. It makes things simpler because of the streamlined variant of C++ and the officially made Arduino microcontroller.

Laser products are currently available over an extremely broad range of operating regimes and output characteristics. Laser sensor can be used in various ways. For example, there are laser sources all the way from the deep ultraviolet to the far infrared, lasers with constant output and those with pulsed output of only a few femtoseconds in duration, and lasers having just a few milliwatts of power to those that bring tens of kilowatts. Because of this diversity, together with the disparate measurements needs of various applications, a number of different technologies are currently employed for laser power and energy measurements.

Combining Arduino and Laser communication in this project can develop a device that can do all the check-in and parking lot assignment so that it will check whether the parking slots are still available or not.

1.2   Problem Statement

Through the fast increment of vehicle accessibility and use as of late, finding an accessible auto parking spot is turning out to be more troublesome, bringing about various ordinary clashes. In each real city, parking has turned out to be real issue and it is developing quickly. Part of innovative work is being readied everywhere throughout the world to improve and more astute parking lot car systems. Regular utilization of remote advances consolidated with the cutting edge improvements in remote applications for parking, uncovers that computerized information dissemination could be the way to take care of creating stopping issues. As of late, with the sensational increment of vehicles in urban areas, parking issues are not

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kidding and even compound in numerous urban communities. Given the present parking emergency in our nation has turned into a weight for everybody. By and large, they locate the indoor parking spots adjacent are constantly full, and they need to drive around to look accessible parking spot in the city. At that point a congested road may happen. This project can individuals to let them know whether the parking spaces are still accessible and not accessible. In the case of parking is accessible, the entryway is open for few moments and that specific space is set apart as inaccessible. Parking status can be known by the driver at the passageway of the parking area as it were. That implies an auto driver can know whether the auto parking spot is accessible in the parking lot or not without going into the parking area.

1.3   Objective

The objectives of this project are:

1.   To develop parking lot system with sensor communication.

2.   To study about laser communication as the sensor system.

3.   To investigate the performance of the equipment used.

1.4   Work Scope

This project is using laser sensor (laser diode) and Arduino (Arduino UNO) as the main equipment. This project's work scope is focus on to parking lot. The laser sensor is attached at the parking gate and it will detect the coming car before the entry of the parking. Thus, the system of Arduino will do the counting of the remaining available parking lot. By this project, it will help them to check the available parking by looking at the parking board.

1.5   Importance of the Project

This section will be focused on the importance of the project. With the current parking lot system in this country, there are lots of things that need to improvise. Even this smart parking system has been developed at several places, this project use different sensor compare with the others such as ultrasonic and infra-red. This project can prove that laser communication is also the way to use in this system. This project can change whole situation for this parking problem. It makes it easier for all the people to check the current available of parking car. This system will save most of the time of the driver for observing the parking space and also headache of drive the car inside the parking lot and see the parking space.

1.6   Report Organization

a) Chapter 1: Introduction

This chapter provides project background, problem statement, and objectives of project, project's scope and the importance of this project.

b) Chapter 2: Literature Review

This chapter covered the literature review and citation about any information that related to this project from any references. In this chapter, the citation about analysis of equipment also is included.

c) Chapter 3: Methodology

This chapter covered more detailed explanation of this project. In addition, this chapter gives information of process flow in this project. Flow chart and table of data is included in this chapter.

d) Chapter 4: Result and Discussion

This chapter discuss about the result and discussion about Smart Parking Lot using Laser Communication.

e) Chapter 5: Conclusion

This chapter covered the conclusion based on overall process that happened in this project from start until end of this project.

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CHAPTER 2
LITERATURE REVIEW

2.0   Introduction

This chapter will focus to the literature review which is about the understanding of this project. This chapter will be listed out all details that have been studied about smart parking system. As mention before in chapter 1, this project uses two main equipment; Arduino and laser communication. Arduino acts as a microcontroller of the project while laser uses as a sensor. All the equipment are the important things that will make this project work well. Hence, it is very important to do the research about the basic concept of the Arduino and laser working out for the project.

In genuine time parking car, parking has been accomplished in numerous situations with a few elements. The smart parking system will find the openings for parking car in parking zones. The parking zones can be produced in city zones and regular parking zone, for example, schools, colleges and shopping range. An imperative element which prompts to a parking issue is human conduct. Because of time deviation in coming rate, run of the mill parking lots cannot be worried with the user. Along these lines, the users by and large park the car in a parking spot, and some don't have space, and they park outside of parking spot.

2.1 Smart Parking Car System

2.1.1 Smart Parking Car using Ultrasonic Sensor

With the development in vehicle creation and total populace, many parking spots and offices are turned out to be basic. Another parking system called Smart Parking System (SPS) that found by the scientist is anticipated to help drivers to discover empty spaces in a car park in a shorter time. The ultrasonic (ultrasound) sensors was utilized to the new system to recognize either car park occupancy or unseemly parking activities.

The ultrasonic transmitted sound waves between 25 kHz and 50 kHz. The ultrasonic utilize the reflected vitality to detect and break down the status of a parking spot. Ultrasonic waves are delivered from the head of an ultrasonic vehicle detection sensor for each 60 milliseconds, and the assurance of the nearness or presence of vehicles are set aside a few minute contrasts between the received and transmitted signs. The numbering vehicles and assessing the occupancy status of every parking spot can be overseen frame the ultrasonic sensor. Rather than the minimal effort and simple establishment of ultrasonic sensors, they do have a few downsides, especially the ultrasonic sensor is touchy to temperature changes and extraordinary air turbulence (Kianpisheh et al. 2012).
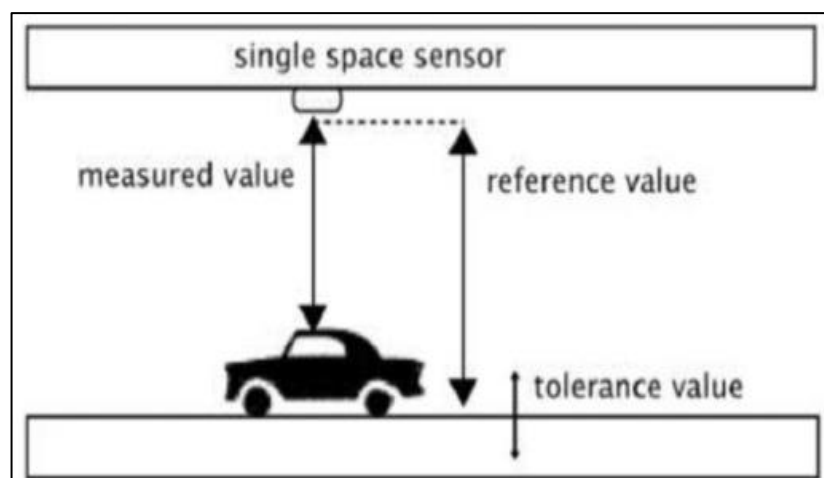

Figure 2.1: The Ultrasonic Sensor's Works (Kianpisheh et al. 2012)

For each and every car park, one sensor was required to situate on the roof over every parking spot. The operation of ultrasonic sensors depends on echo area. The sensor transmit the sound wave, which is the sound will hit a solid object (auto or ground) and reflect back to the sensor. The distance is computed by time between the sent heartbeat and the reflected echo. In accessible spaces, the time between transmitted sound and reflection is longer than in an inaccessible space, consequently the detection can be made by the sensor when a space is involved (Kianpisheh et al. 2012).

Figure 2.2: Ultrasonic Detection Area (Kianpisheh et al. 2012)

2.1.2   Smart Parking Car using Infrared (IR) Sensor

A parking system called administration of parking car system that found from the inquires about is proposed to a change answer for overseeing and checking free parking spot and computerized direction for client to park the car. In this system, the status of car space is detected by the Infrared sensor modules (IR sensor) and it assign the data to the AVR controller. As needs be, the status of car parking spot is detected by the AVR sensor and it demonstrates the data on the LED screen for the user.

An infrared sensor is an electronic gadget that produces as well as distinguishes infrared radiation keeping in mind the end goal to detect some part of its surroundings. The estimation of the temperature of an object can be made by the IR sensor, and also sense movement. A hefty portion of these sorts

of sensors are just measured infrared radiation, as opposed to transmitting it, and in this manner are known as passive infrared sensors (PIR).
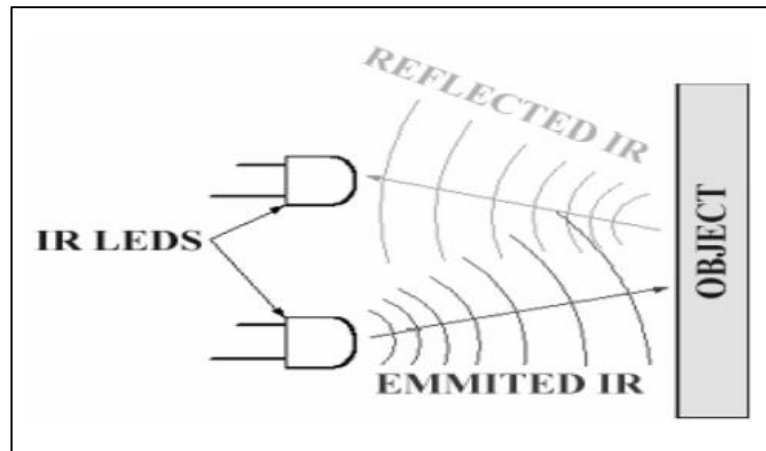

Figure 2.3: Object Detection using IR Sensor (Reve and Choudhri 2012)

All Infra-Red proximity sensors utilize a similar principal. The fundamental thought is infrared light is transmitted through IR-LEDs, which is then reflected back by any protest before the sensor (Reve and Choudhri 2012).

2.1.3   Smart Parking Car using RFID

This research recognized the useful of this simple invention which is to monitor and manage vehicles in a parking garage. The notification of drivers about the number of available parking spaces and in which area should they be directed to can be shown by this system. This research defined the work to use of RFID and zigbee technology and its result are acquired when the parking garage be the example of this application.

RFID is Radio Frequency Identification that helps to recognize the animate or inanimate through radio waves. Wireless data transmission is enabled by RFID. RFID technology rises company efficiency and provides benefits on both company and client-wise. The protection by the RFID is much better compared to other networks. RFID technology is used for the system to identify the vehicles identification and no personnel is required in this process.

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Automatically the identification of vehicles and parking-lot payments are managed through this system. RFID system helps the vehicles to do the check-in and check-out within fewer time in convenient and protect circumstances. Most of the system in parking lot has barriers at the gate. These allow the system for the one by one parking, is time consuming and thus the multiple check-ins or check-outs can be avoided at a time (Patil and Bhonge 2013).

2.1.4 Smart Parking Car using Image Processing

This research is about the image processing idea for the number plate recognizable proof. The image processing is an arrangement of signal processing, where the information is a photo or picture, and the picture of the output or qualities of picture or related parameters of picture. The image processing is additionally helpful for various applications. It is typically expressed as advanced flag preparing. In a framework arrangement, the picture is a variety of pixel kept in and the pixels are at first in grayscale, and it is prepared. The image processing techniques are utilized for vehicles distinguishing proof. In this paper, this idea was utilized by the specialist for the car number plate recognizable proof (Revathi et al. 2012).

A preview from the camera of the number plate is taken through an image processing. The number plate is distinguished and the data is circulated to ZigBee convention in the parking zone from ZigBee convention in the passageway door. The ready message will demonstrate the quantity of car that has been checked to the client. At that point the cautions will be given to a car on the off chance that they were attempting or unwittingly, parking in a space other than what they have being designated when the car arrives a parking zone. The user will get the ready message by means of the speakers.