UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF SMART MONITORING PARKING SYSTEM USING ARDUINO

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor"s Degree in Electronic Engineering Technology (Electronic Industry) (Hons.)

by

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APPROVAL

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

.....

(Encik Ahmad Sayuthi Bin Mohamad Shokri)

ABSTRAK

Projek ini bertujuan untuk mengkaji dan memperbaharui sistem tempat letak kereta yang sedia ada dengan sistem yang baru. Hal ini kerana, sistem tempat letak kereta yang sedia ada tidak sistematik dan kurang efisien kerana masih tidak dapat mengatasi masalah yang sering berlaku kepada pengguna kereta. Masalah yang sering dihadapi oleh pengguna kereta adalah mereka tidak dapat mengagak posisi sebenar untuk meletakkan kereta mereka dengan betul di dalam kawasan tempat letak kereta yang disediakan. Hal ini menyebabkan ruang tempat letak kereta tidak mencukupi disebabkan faktor kereta yang diparkir tidak diletakkan dengan betul dan mengambil ruang kawasan tempat letak kereta yang lain lalu mengakibatkan pengguna kereta yang lain tidak dapat tempat untuk meletakkan kereta mereka. Dengan sistem yang baru ini, penambahbaikan telah dilaksanakan untuk memudahkan pengguna kereta meletakkan kenderaan mereka dengan posisi yang betul di dalam ruang tempat letak kereta yang disediakan. Hal ini dapat menjimatkan ruang tempat letak kereta malahan menoptimumkan penggunaan ruang tempat letak kereta yang disediakan. Sistem ini menggunakan Arduino UNO microcontroller untuk memproses pemprograman yang menghubungkan pengesan ultrasonic untuk mengesan kereta di ruang tempat letak kereta.

ABSTRACT

The project aims to study and renew the parking system available with the new system. This is because, parking system existing nowadays unsystematic and less efficient because they do not resolve the problem that often happens to car users. Problems faced by consumers is their cannot figure out the actual position to park their cars right in the parking area provided. This leads to an insufficient parking space because the car parked not placed properly and take up space parking area and lead to other car users cannot park their cars. With this new system, improvements have been made to facilitate car user to park their cars in the correct position in the parking space provided. This can save car park space and also optimizes the uses of parking space available. This system uses the Arduino UNO microcontroller programming to process the ultrasonic sensors to detect cars in the parking space.

DEDICATION

To my beloved parents, family members, coursemates and housemates.

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ITS	-	Internet Time Service
PIR	-	Passive Infrared Sensor
IR	-	Infrared
IDE	-	Integrated Development Environment
USB	-	Universal Serial Bus
PWM	-	Pulse Width Modulation
ICSP	-	In-Circuit Serial Programming
AVR	-	Aboriginal Voices Radio
LED	-	Light-Emitting Diode
IDE	-	Integrated Development Environment
VCC	-	Voltage at the common collector

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter includes the background of the project, problem statement, objectives, scope and outline of the project in order to give an overall view of the project.

1.2 Background

This project is to develop advanced monitoring parking system in order to save space and systematically using the Arduino microcontroller. The system is used for the upgrading of parking system in the shopping center building with paid parking. Specific control sensor is used in every box area of car park spaces. If the car is not properly placed in the parking lot of the car park, the alarm will sound to warn the driver as a signal for correcting the position of the car, so that the car will be back properly in the parking lot. Furthermore, the car driver also will be alert with the red lamp placed on the left and the right wall align with the line of parking lot to indicate where the car moves on to whether on the left or the right of the parking lot line. Addition of lights on each rooftop parking spaces are also used to display either one of the parking lot is full or empty. It's easier for the car driver to look for empty parking space.

1.3 Problem Statement

This project is about to create advanced system at the parking area especially in the building of shopping center for the convenience of car user. First of all, due to car user problem which cannot assume the distance between the car and object at the parking lot, so an intelligence system is design to overcome the problem. Besides that, irresponsible attitude of drivers who parking outside the parking lot have lead to insufficient parking space for car user. Moreover, the car driver also has to take a longer time to find the empty parking because there are no indication signals which shows the car parking.

1.4 Objectives

The main objective of the project can be outlined as follows:

1) To study the Arduino Microcontroller application used in the project.
2) To design a smart monitoring parking system circuit.
3) To develop and simulate prototype device that combine hardware and software.

1.5 Scope of Project

This system is build based on the Arduino microcontroller. This project will be divided into four modules which are the microcontroller, sensors, hardware and the software. Firstly, few sensors will be set up around the parking line box and one main sensor is installed in the middle of the roof top parking lot. In the operation, the few sensors will identify the position of the car and automatically gives alert to the car user so that they will fit in the parking box without interferes with other parking box. When the car exceeds the parking line box, an alarm will sound and red lamp will turns on to notify that the car is not park properly. While the main alarm is used to detect the presence of the car, and light will display as the output when there is a car in that parking lot. This system will be a prototype of the project. The

programming use in this project will be compile using Arduino software and then been upload into the Arduino microcontroller to implement the process. The main target of this project is to develop a monitoring parking system to accomplish car user needs that can control and monitor the car at parking spaces specifically in shopping center building. This system is focus in the building which has limited parking spaces.

1.6 Outline of Project Report

The outline project of this report is divided into five sections to make clearly view about this project. For the first section of this project, it is about the introduction of system operation and hardware development of the project that requires in this final year project. For the section two, it is about the review and explanation of previous research and past paper that have related with this final year project. While for the section three, it is more explained the details about the method and process to made implementation of this project. Meanwhile for the section four, it is more to discuss all the findings, results, discussion, and analysis about this project. Lastly, the conclusion and recommendation for future work to improves this project is been explained in the section five.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter, the literature evaluation contains the information and ideas in completing the project which need to discussed. There are some sources that had been used as the resources such as books, thesis, journal and website. It was included the process of the circuit, the hardware and software implementation which is useful in the project. Besides that, in this chapter we also make a study about several projects that related to make some improvement or take some idea from the other project. It is advantages to complete a project that has been created and make the comparison between the previous project and this project in order to make this project more efficient and systematic.

2.2 Research from Previous Project

Based on the previous project, it was used as the references to complete this project successfully. It was useful to upgrade and modified the system that has been done before. Furthermore, according to current developments, the latest technology need to be used in this project to solve the problems faced at present.

2.2.1 Park-A-Lot: An Automated Parking Management System (Kuo-Pao Yang 2013).

In this thesis, by using ultrasonic sensors, Arduino board, Ethernet shield and motor shield the parking system is developed. The status of the parking lot is able to send to the web interface by development of this prototype system after the information is process in the Arduino board using Ethernet shield [1]. Moreover, a parking gate is also implemented in this project with the help of motor shield and a sample gate arm. This system is competent to reading the ultrasonic sensor echo distances values, their average, and the average is able to manipulate to decide whether the parking spot represented sensor is free or taken. The research project is more complex compare to this project. Therefore, from the research some ideas is taken to implement it into this project and design advanced system by using Arduino.

2.2.2 Sensor fusion-Based Vacant Parking Slot Detection and Tracking (Jae Kyu Suhr & Ho Gi Jung 2014).

This paper proposes a tracking and a vacant parking slot detection system that fuses the sensors of an Around View Monitor (AVM) system and an ultrasonic sensor based automatic parking system [2]. The proposed system consists of three stages that are parking slot marking recognition, parking slot occupancy arrangement, and parking slot marking tracking. Using AVM image sequences, the parking slot marking recognition can be known by various types of parking slot. It detects parking slots in individual AVM images by exploiting a hierarchical tree structure of parking slot markings and combines sequential detection results. The parking slot occupancy arrangement stage identifies vacancies of detected parking slots using ultrasonic sensor data. Parking slot occupancy is automatically calculated by treating each parking slot region as a single cell of the

occupancy grid. The parking slot marking tracking stage will continuously estimates the position of the selected parking slot.

2.2.3 Sensor Fusion based Energy Efficient and Sustainable Smart Parking System (Gul Shahzad 2015).

In this article, a smart energy efficient parking system is develop, which the image detection techniques is integrates for license plate recognition. Moreover, the infrared sensor also used for group control while wireless sensor network (WSN) for intelligent light emitting diode (LED) lighting [3]. The system offers better assistance to parking position and controls LED lights based on traffic distribution for maximum energy efficiency. Furthermore, compared to its complement conventional system it also offers enhanced security. The system is developing by using ZigBee based Wireless Mesh network (WMN) nodes equipped with RF module and image sensor. In the operation, when the vehicles in the parking lot are detected it automatically prominent using the grid based algorithm and license plate image identification.

2.2.4 A Vision-Based Parking Lot Management System (Sheng-Fuu Lin 2006).

In this research paper, the system is design by using vision based parking management system to supervise an outdoor parking lot by four cameras set up at loft of buildings around it which sending information that includes real time display to the database of Internet Time Service (ITS) center via internet [4]. This system let the drivers to find available parking spaces or monitoring the parking lot where they parked their cars easily by the help of wireless communication device. Different with this project, where

the driver are indicate with led display at every parking lot to shows that the parking lot is empty or full.

2.2.5 Design and Implementation of a Digital Parking Lot Management System by (Xiaolong Li 2009).

This journal is about development of a digital vehicle management system via radio frequency identification (RFID) technology [5]. The parking system is enhancing by the digital vehicle organization system and the availability of the parking space can be check by the user remotely since the system is connected to the Internet. The advantage of the research project is, it used RFID which it does not require direct contact or line of sight scanning. Therefore, user can fast enter the parking lot without manually scanning the parking permit. Furthermore, user also can view the availability of the parking space easier because the system connected online. This help user reduce the wasting time of search parking lot and also improve the parking lot utilization. While the disadvantages is the RFID component is expensive and used costly materials.