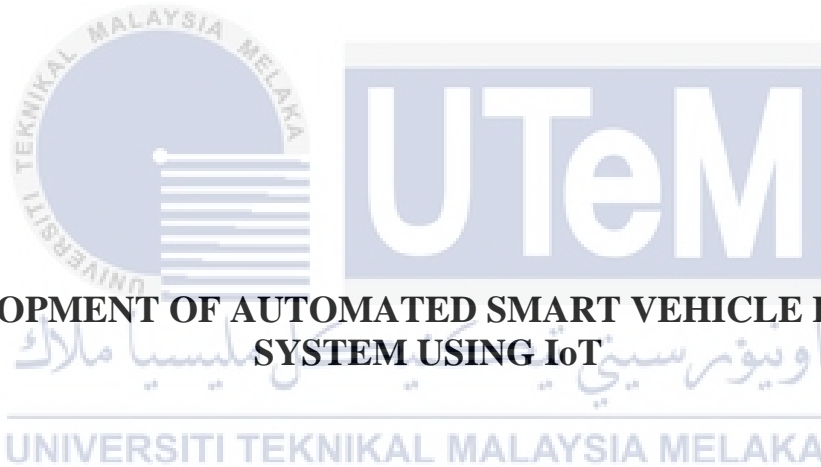




Faculty of Electrical and Electronic Engineering Technology



**DEVELOPMENT OF AUTOMATED SMART VEHICLE PARKING
SYSTEM USING IoT**

MUHAMMAD HISHAM BIN MAT PAUZI

**Bachelor of Electronics Engineering Technology (Industrial Electronics) with
Honours**

2021

**DEVELOPMENT OF AUTOMATED SMART VEHICLE PARKING SYSTEM
USING IoT**

MUHAMMAD HISHAM BIN MAT PAUZI

**A project report submitted
in partial fulfillment of the requirements for the degree of
Bachelor of Electronics Engineering Technology with Honours**



Faculty of Electrical and Electronic Engineering Technology

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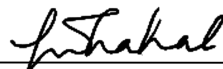
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DECLARATION

I declare that this project report entitled “DEVELOPMENT OF AUTOMATED SMART VEHICLE PARKING SYSTEM USING IoT” 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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APPROVAL

I hereby declare that I have checked this project report and in my opinion, this project report is adequate in terms of scope and quality for the award of the degree of Bachelor of Electronics Engineering Technology (Industrial Electronics) with Honours.

Signature



Supervisor Name : FAUZI BIN HJ. ABDUL WAHAB

Date : 11 JANUARY 2022

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Co-Supervisor

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DEDICATION

*To my mother, ZAWIYAH BINTI MOHD YUNUS, and father, PAUZI BIN,
and*

*To dearest project supervisor, FAUZI BIN HJ.ABDUL WAHAB and
My friends, MUHAMMAD HAZMAN BIN MOHD HIDIR and SYAMSUL HILMI BIN JORI*



ABSTRACT

Insufficient parking spots, along with a rise in the amount of vehicles has become a major source of concern for drivers. Because the current parking system needs the motorist to actively locate a parking place, this is ineffective for the driver. This is a problem that drivers in metropolitan regions confront, such as the Mid Valley Megamall in Kuala Lumpur. The parking space is always full during busy hours, ignoring the fact that parking is paid by the hour. This has an influence on the driver's search for a parking spot since by the time they get at their destination, all of the available parking places have already been taken. As a consequence, the driver has move around again and wait for an available parking spot, wasted precious time and fuel. As a result, the driver is forced to drive around and wait for a parking space, wasting time and fuel. To address the issue, a smart parking system based on IoT is being developed. Thanks to the Internet of Things, the driver was able to reserve a parking spot on their smartphone. This is due to the system's ability to be accessible via a website link to the booking system, which allows consumers to check available parking spots at the megamall and make reservations that prevent another automobile from parking there. An ultrasonic sensor, an infrared sensor, a microcontroller named NodeMCU(ESP32), and a Firebase application are used in the Automated Smart Vehicle Parking System. The technology also enables the LED to assist the driver identify whether one parking space is reserved or available. The smart parking system was built using the Arduino IDE software and Visual Studio Code tools. The web application was utilised as the interface for this project, and the NodeMCU received the user's input data. It is possible to improve and develop the project in order to make it more effective.

ABSTRAK

Tempat letak kereta yang tidak mencukupi, bersama-sama dengan peningkatan jumlah kenderaan telah menjadi punca kebimbangan utama bagi pemandu. Oleh kerana sistem parkir semasa memerlukan pemandu untuk mencari tempat letak kereta secara aktif, ini tidak berkesan untuk pemandu. Ini adalah masalah yang dihadapi oleh pemandu di wilayah metropolitan, seperti Mid Valley Megamall di Kuala Lumpur. Tempat letak kereta sentiasa penuh semasa waktu sibuk, mengabaikan hakikat bahawa tempat letak kereta dibayar mengikut jam. Ini memberi pengaruh kepada pemandu mencari tempat letak kereta kerana pada masa mereka tiba di destinasi mereka, semua tempat letak kereta yang ada telah diambil. Akibatnya, pemandu telah bergerak semula dan menunggu tempat letak kereta yang tersedia, membuang masa dan minyak yang berharga. Akibatnya, pemandu terpaksa memandu dan menunggu tempat letak kereta, membuang masa dan minyak. Untuk menangani isu tersebut, sistem letak kereta pintar berdasarkan IoT sedang dibangunkan. Terima kasih kepada Internet Perkara, pemandu dapat menempah tempat letak kereta pada telefon pintar mereka. Ini berikutan keupayaan sistem untuk diakses melalui pautan laman web ke sistem tempahan, yang membolehkan pengguna menyemak tempat letak kereta yang tersedia di megamall dan membuat tempahan yang menghalang kereta lain daripada meletak kenderaan di situ. Penderia ultrasonik, penderia inframerah, mikropengawal bernama NodeMCU(ESP32) dan aplikasi Firebase digunakan dalam Sistem Tempat Letak Kenderaan Pintar Automatik. Teknologi ini juga membolehkan LED membantu pemandu mengenal pasti sama ada satu tempat letak kereta ditempah atau tersedia. Sistem parkir pintar telah dibina menggunakan perisian Arduino IDE dan alatan Visual Studio Code. Aplikasi web

telah digunakan sebagai antara muka untuk projek ini, dan NodeMCU menerima data input pengguna. Ia adalah mungkin untuk menambah baik dan membangunkan projek untuk menjadikannya lebih berkesan..



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LIST OF SYMBOLS



LIST OF ABBREVIATIONS

V - Voltage



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CHAPTER 1

INTRODUCTION

1.1 Background

As the world's technology advances, so do the world's economy. However, many countries, the majority of which have established car parks, lack a systematic system. The majority of them, like the parking system at the Mid Valley Megamall, is manually operated and inefficient. Finding a parking slot can be difficult, especially during peak periods such as the weekend and holidays, when families spend time together going out. The driver must circle the parking area until they find an empty space, which is always the case in densely populated areas. Some locations include several allocated parking spaces for the megamall's staff, making it more difficult for a car to get a free parking slot. Particularly for families with elderly members or OKUs (disabled people) who wish to park closer to the entrance because there are few dedicated parking spaces for OKUs near the entrance. The more vehicles and persons that have to circle the parking lot looking for a parking slot, the more greenhouse emissions lead to a significant increase in surface temperature [10]. It helps to lessen the greenhouse effect by resolving the parking issue. The driver can then reserve a free parking slot before ever arriving at the location.

1.2 Problem Statement

Drivers in the region of their chosen mall destination are having difficulty finding a free parking spot. Due to the problem, the vehicle must drive in a circle within the destination location several times to obtain an available parking space. By using a booking parking system that will be used for such a long time and under variable circumstances that may occur in the parking area, the gadget used to indicate the presence of a car must be put in the best possible condition.

1.3 Project Objective

These are the purpose of this study is to introduce a systematic and effective system-wide methodology that goals are :

- a) To design and build a webpage that will allow users to register and log in to the booking website using data from the Microcontroller.
- b) To design and construct a system that detects the presence of a car and displays the status of a parking slot, utilizing the Firebase application like the Internet of Things (IoT) as the medium to assist a driver in booking a parking slot.
- c) To analyze the performance of the data collected by the Microcontroller under the various condition that occurs in the parking area.

1.4 The Scope of Project

- d) This project has a scope that is as follows:
 - a) The NodeMCU (ESP32) serves as the Microcontroller that sends data from the input device to the Firebase application and receives data from it.
 - b) The Arduino IDE is used to write code and send it to the NodeMCU (ESP32).
 - c) Visual Studio Code is used to create a webpage that serves as the user's sign-up, sign-in, and sign-out interface.
 - d) The data from the NodeMCU is shown on a booking parking webpage using a Firebase app or set of tools.
 - e) An infrared sensor detects the presence of a car in a parking place and sends data to the NodeMCU(ESP32) for display.
 - f) An ultrasonic sensor is used to measure the distance between an arriving vehicle and the sensor device, as well as to indicate the distance via the LED.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Despite the technological technology that has an impact on our everyday lives, the parking system in today's modern society is still archaic. Every year, the number of people who own a smartphone grows, as does the number of people who use the internet. It has become a requirement for today's society. The current parking system uses radio-frequency identification (RFID) as its Internet of Things (IoT), but it is only used in the subterranean mall parking lot [7]. The system, which is based on a mall parking system, will use the Wi-Fi network in its specific location, depending on the Wi-Fi module's coverage. This will be the link between the booking system and the Firebase application, which will operate as an IoT. The ultrasonic sensor and infrared sensor are also used as input devices in the system to detect the status of a car in a parking place. This will assist drivers in reserving a parking slot before arriving at their location.

2.2 Hardware

2.2.1 NodeMCU(ESP32)



Figure 2.1 ESP32

The NodeMCU in Figure 2.1 is the ESP32 DEVKIT V1 - DOIT module is known as the Microcontroller. A NodeMCU is a device that helps the system monitor the status of the vehicle parking space [5]. Also, it is used to enable the system with an IoT device [3]. The Arduino IDE software is an Arduino Integrated Development Environment (IDE) that can write code and upload them to NodeMCU. This helps the process of adding the coding for the connection to a webpage in which the data from the NodeMCU is set to be displayed to the user. The NodeMCU is the medium to connect with the input and output device via WiFi. The webpage is a web server that then can be accessed by the user using the mobile browser. The NodeMCU must be connected with an external power circuit and not with the Arduino +5V power. This is due to the NodeMCU will keep resetting itself [2].

2.2.2 Ultrasonic Sensor



Figure 2.2 Ultrasonic Sensor

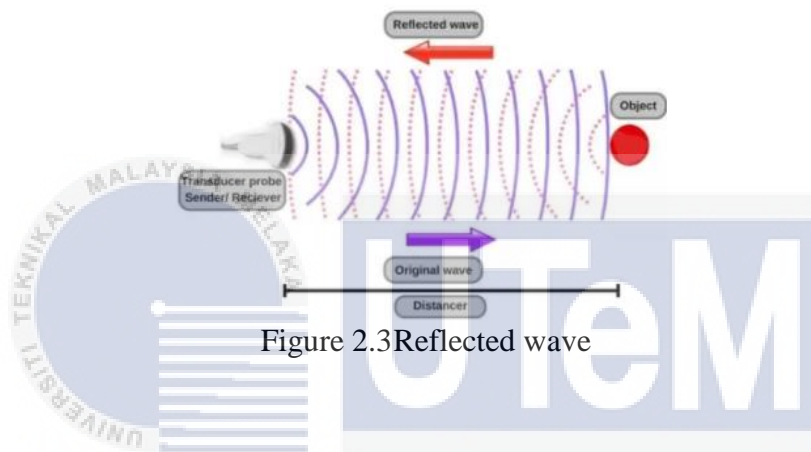


Figure 2.3 Reflected wave

The Ultrasonic sensor is shown in Figure 2.2. The Ultrasonic sensor is known as HC-SR04 that has a 4-pin connection used to measure the distance. The ultrasonic sensor consists of a transmitter module and a receiver that using the ultrasonic wave using the air as the medium module [1]. While the receiver module will receive the reflected wave that is shown in Figure 2.3. The Radio-frequency identification of the Ultrasonic ranging module HC-SR04 varies and the ranging accuracy is 3mm [2]. The distance of the obstacle from the sensor is a measurement based on the time taken and the speed of the wave receiver by the receiver module [5]. The parameter of the ultrasonic is shown in Table 2.1.