UNIVERSITI TEKNIKAL MALAYSIA MELAKA

SMART PARKING SYSTEM USING IOT FOR SECURITY

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

by

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ABSTRAK

Sistem letak kereta pintar adalah penyelesaian ideal untuk mengatasi masalah dalam mencari tempat letak kereta yang kosong dan kecurian kereta. Dengan ini, sistem dengan kos rendah diciptakan di mana pengguna dengan mudah mendapatkan tempat letak kereta dan memastikan keselamatan kereta mereka hanya dengan menggunakan telefon pintar mereka. Di samping itu, pihak pengurusan tempat letak kereta juga boleh melihat maklumat tempat letak kereta mereka. Penyelidikan ini bertujuan untuk membina sebuah sistem yang boleh memantau jumlah tempat letak kereta dan pengguna dengan mudah dapat mencari tempat letak kereta yang kosong disamping menjaga keselamatan kereta mereka. Kajian ini mempunyai tiga sistem yang telah diciptakan. Sistem pertama mengandungi penggunaan Modul RFID, motor, dan mikrokontroler Arduino sebagai system utama untuk menjaga keselamatan kereta pengguna. Selain itu, kawasan tempat letak kereta juga dapat diawasi menggunakan kamera ESP32 dan dapat dilihat melalui aplikasi di telefon pintar pengguna. Sistem kedua ialah memantau jumlah ruang letak kereta. Sistem ini termasuk penggunaan pengesan IR dan mikrokontroler NodeMcuESP8266. Data daripada sistem ini diperhatikan dalam penggunaan Internet of Things (IoT) yang membolehkan pengguna mendapatkan maklumat mengenai jumlah kekosongan tempat letak kereta.

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ABSTRACT

Smart parking systems are an ideal solution to address the problem of finding available parking lots and to prevent car thefts. With the development of this project, a low-cost system was created where users could easily find parking and ensure the safety of their cars by using only their own smartphones. In addition, the parking management can also view their parking information. The research aims to develop a system that can monitor the amount of parking and users can easily find empty parking lots while keeping their cars safe. This study has two systems that have been created. The first system involved the use of the Arduino RFID Module, motor, and microcontroller as the main system for safeguarding the user's car. In addition, parking areas can also be monitored using the ESP32 camera and can be viewed through applications on the user's smartphone. The second system is to monitor the amount of parking space. This system includes the use of the IR detector and the NodeMcuESP8266 microcontroller. Data from this system is observed using the Internet of Things (IoT) that allows users to get information about the amount of parking space.

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DEDICATION

To my beloved parents, I acknowledge my sincere obligation and appreciation to them for their love, vision and sacrifice throughout my life. I am humble my thankful for their sacrifice, tolerance and considerate that were inevitable to make this effort thinkable. Their sacrifice had inspired me from the day I learned how to read, write, and think until what I have become now. I disable to bargain the appropriate words that could properly describe my appreciation for their devotion, support and faith in my ability to reach my dreams. Lastly, I would like to lead my gratitude to any person that contributes to my final year project either it is directly or indirectly. I would like to acknowledge their comments and suggestions, which are crucial for the successful completion of this research.

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TABLE OF CONTENTS

		PAGE
LIST OF TABLES		xiv
LIST OF FIGURES		xv
LIST OF APPENDICES		xviii
LIST OF ABBREVIATIONS		xx
CHAPTER 1	**INTRODUCTION**	**1**
1.1	Introduction	1
1.2	Background	1
1.3	Problem Statement	2
1.4	Aims and objective	3
1.5	Work scope	3
1.6	Gantt chart	5
CHAPTER 2	**LITERATURE REVIEW**	**6**
2.1	Introduction	6
2.2	Wireless Sensor Network	6
2.3	RFID Technology	7
2.4	Android Application	9
2.5	IoT Technologies	10
2.6	Context Aware System	12

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2.7 LoRa System 13

2.8 Short Massage Services (SMS) 14

2.9 Programmable Logical Controller (PLC) 15

2.10 Near Field Communication (NFC) 16

2.11 Cyber Physical System (CPS) 16

2.12 Parking Lot System with Theft Detection and Image Processing 17

2.13 Smart Parking System with Cloud MIMO 18

2.14 Visible Light Communication Using MSP430 for Parking System 19

2.15 Geographic Information System (GIS) 21

2.16 Comparison Between Articles. 23

CHAPTER 3 METHODOLOGY 31

3.1 Introduction 31

3.2 Project Methodology 31

3.2.1 Finding 31

3.2.2 Design 32

3.2.3 Simulation 33

3.2.4 Testing 33

3.2.5 Data Identification 34

3.2.6 Conclusion 34

3.3 Whole Planning 34

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3.4 Project Overview 35

3.5 Hardware Development 41

3.5.1 NodeMCU ESP8266 Breakout Board 41

3.5.2 Arduino UNO 45

3.5.3 RC522 RFID Module 47

3.5.4 IR Transceiver (Generic) 49

3.5.5 Servo Motor SG90 50

3.5.6 ESP-32 Camera 51

3.6 Software Development 51

3.6.1 Arduino Software IDE (Integration Development Environment) 52

3.6.2 Blynk Application 53

3.7 Overall Project and Operation of the Parking System 53

3.8 Software testing and Circuit Design 55

3.9 Expected Result 59

CHAPTER 4 RESULTS AND DISCUSSION 61

4.1 Introduction 61

4.2 Project Design and Prototype 61

4.3 Hardware Testing and Results 61

4.4 Analysis of Data 69

4.4.1 Analysis of data of radio Frequency Identification 69

4.4.2 Analysis of Data Based on the Infrared Sensor (IR) Through Blynk Application (IoT) Platform 70

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4.4.3 Analysis of Data Based on the Time Taken for notification shows by Blynk Application 71

CHAPTER 5 CONCLUSION AND RECOMMENDATION 75

5.1 Introduction 75

5.2 Conclusion 75

5.3 Recommendation 76

REFERENCES 77

APPENDIX 79

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LIST OF TABLES

TABLE	TITLE	PAGE
Table 2.1	Comparison between articles	23
Table 3.1	NodeMCU Dev Kit IO pins and ESP8266 internal GPIO Pins Mapping	43
Table 3.2	Pin Description	44
Table 3.3	Arduino Uno specification	46
Table 3.4	Pin description	50
Table 3.5	Data information of the parking using IoT platform	60
Table 4.1	The range of RFID card that can detected by RFID Reader	69
Table 4.2	The range of IR sensor can detect the presence of a car	71
Table 4.3	Time taken for Blynk notification alert the free parking When only one (1) car presence in the parking slot	72
Table 4.4	Time taken for Blynk notification alert the free parking When only two (2) car presence in the parking slot	73
Table 4.5	Time taken for Blynk notification alert the free parking When only three (3) car presence in the parking slot	74

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LIST OF FIGURES

FIGURE	TITLE	PAGE
Figure 2.1	Architecture of check-in parking system	8
Figure 2.2	Basic Hardware Modules in a pm-mode	9
Figure 2.3	System Architecture of parking system	10
Figure 2.	Local unit of the system	11
Figure 2.5	Prototype of IoT based car parking management	12
Figure 2.6	System architecture of parking system using BLE technologies	13
Figure 2.7	TTGO LoRa Module	14
Figure 2.8	Parking reservation flow chart	15
Figure 2.9	Architecture of the parking system	17
Figure 2.10	Parking system	18
Figure 2.11	Smart parking system deployment	19
Figure 2.12	Block diagram of parking slot enquiry module	20
Figure 2.13	Block diagram of parking slot monitoring module	20
Figure 2.14	Block diagram of parking slot detector module	20
Figure 2.15	Flowchart of the system	22
Figure 3.1	Basic stages in this project	31
Figure 3.2	Overview on project planning for PSM	35
Figure 3.3	Flowchart for PSM 1	36

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Figure 3.4	Flowchart for developing the hardware or prototype	37
Figure 3.5	Flowchart for entering and monitoring car parking system.	38
Figure 3.6	Flowchart for exiting and monitoring car parking system	39
Figure 3.7	Block diagram for gate opening system	40
Figure 3.8	Block diagram for monitoring system	40
Figure 3.9	Block diagram for monitoring system using ESP-32 Camera	40
Figure 3.10	NodeMCU ESP8266 board	41
Figure 3.11	NodeMCU ESP8266 PinOut Reference	41
Figure 3.12	Arduino UNO microcontroller board	45
Figure 3.13	RFID Module	47
Figure 3.14	RC522 RFID Module Pinout	48
Figure 3.15	IR Transceiver / IR Sensor Module	49
Figure 3.16	Servo Motor SG90	50
Figure 3.17	ESP-32 Camera Module	51
Figure 3.18	Arduino Website	52
Figure 3.19	Arduino IDE coding example	52
Figure 3.20	Blynk Application for IoT platform	53
Figure 3.21	The schematic circuit in Fritzing for RFID module and ESP-32 Camera system	56
Figure 3.22	The schematic circuit in Fritzing for NodeMCU ESP8266 Connection with Infrared sensor (IR sensor)	57

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Figure 4.1	The prototype of the parking system	62
Figure 4.2	RFID card get attached to the RFID reader to open the Gate	63
Figure 4.3	Notification alert when parking slot 1 and 2 are empty Shows by Blynk application	64
Figure 4.4	Notification alert when parking slot 3 and 4 are empty Shows by Blynk application	64
Figure 4.5	LED light up (ON) when no car enter the parking slot Shows by Blynk application	65
Figure 4.6	LED goes OFF when car enter the parking shows by Blynk application	65
Figure 4.7	A condition of LED when car enter parking slot 1 and 2 Shows by Blynk application	66
Figure 4.8	IP address obtained from serial monitor in Arduino IDE Software	68
Figure 4.9	Video streaming captured by ESP-32 camera in the Blynk Application	68

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LIST OF APPENDICES

APPENDIX	TITLE	PAGE
1	Coding for NodeMCU ESP8266 interface with Infrared Sensor and Blynk application	79
2	Coding for RFID and Servo motor	80
3	Coding for activate the camera ESP-32	81

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LIST OF SYMBOLS

%	-	Percentage
5G	-	Fifth generation
MiB	-	Mebibyte
V	-	Voltage (Volt)
Cm	-	Centimetre
mA	-	milliampere
KB	-	Kilobyte
MHz	-	Megahertz (Frequency)
mm	-	millimetre
Kb/s	-	Kilobytes per second
VCC	-	Power supply
GND	-	Power supply ground
OUT	-	Active High Output

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LIST OF ABBREVIATIONS

IoT	Internet of Things
RFID	Radio Frequency Identification
GSM	Global System for Mobile
BLE	Bluetooth Low Energy
LED	Light Emitting Diode
PC	Personal Computer
CO2	Carbon Dioxide
WSN	Wireless Sensor Network
OCR	Optical Character Recognition
QR Code	Quick Response Code
SMS	Short Messaging Services
LCD	Liquid Crystal Display
GPS	Global Positioning System
MMS	Multimedia Messaging Services
RTU	Remote Terminal Unit
PIC	Peripheral Interface Controller
PLC	Programmable Logical Controller
NFC	Near Field Communication
CPS	Cyber Physical Syatem
MIMO	Multi-Input Multi-Output
BS	Base Station

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MMSE	Minimum Mean Square Error
VLC	Visible Light Communication
GIS	Geographic Information System
IEEE	Institute Electrical and Electronic Engineers
IDE	Integration Development Environment
PSM	Projek Sarjana Muda
SOC	System On Chip
ROM	Read Only Memory
RAM	Random Access Memory
USB	Universal Serial Bus
EN	Enable
PWM	Pulse Width Modulation

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CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter will explain the background of this project in designing a Smart Parking System Using IoT for Security. This will act as a sensor that need to try towards a smart parking system that secure with a security system. This chapter include background, problem statement, objective and scope of the project.

1.2 Background

Finding an unoccupied parking space in larger parking spaces is one of driver problem. It is because every year the car on the road increases. On the other hand, finding the parking space during peak hour and holidays is more difficult because this is the time people want to relieve stress and spend time with family. Furthermore, the parking problem is also faced by students and staff in somewhere institution. In other hand, people also want to secure their vehicles from been stolen. Thus, it is useful to have some solutions that can provide information on parking space occupancy. The efficient parking monitoring system must be designed to overcome the problem.

The tittle of this project is “Smart Parking System Using IoT for Security”. The technical problem to be addressed in this project is to find the closest parking spot for a car and to secure the vehicles within the parking area. The proposed system will provide faster, cheap, reliable and efficient system. The idea came about observing the efficiency of current methods of parking system. The parking problem also has been observed in this faculty and also other place that had faced the same problem such as mall and shopping complex where people mostly come. There is also a lot of cases about vehicle has been stolen nowadays.

Basically, this project it equip with several hardware components such as NodeMCU ESP8266 Breakout Board, Arduino, IR Transceiver, RFID Module, Servo

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Motor, and ESP-32 Camera. This system also use some software programme and online service or application to configure the system. Arduino IDE will be used to configure the microcontroller with some coding then the system will work smoothly as expected. The main part of this system or this project is the IoT (Internet of Things) that will be use. Some research has been done to find out the online services that suitable to use for the IoT in this system. Blynk application will be used in this system because it is suitable to display the data that expected from this project. In previous system in the world, manufacture used GSM (Global System for Mobile) in some model of telecommunication to send or receive some data or information. But nowadays, IoT was quite popular rather than GSM. Before proceed to the hardware display or manufacture, this project will be constructed on breadboard and jumper wires will be used to make a connection between the equipment. For the security system, it will be used Arduino to configure the system with the RFID Module. Then, Servos (Tower Pro MG996R) will be used as a security gate and to make the system more advanced, this security system also equip with camera which is ESP32 to monitoring the car parking area.

Before the cars get into the parking system, it need to go through a security system. User or the driver need to scan their ID through the RFID module or system then, the gate that that controlled by the Servos (Tower Pro MG996R) will be open and the car can pass through into the parking system. Then, in the parking system, IR transceiver generic sensor will be interface with microcontroller as brain of this system. The sensor is design to detect the presence of the car and sent data to the microcontroller. The data from microcontroller will also display on mobile phone by using online application which is Internet of Things (IoT).

1.3 Problem Statement

There is an ever-increasing number of vehicles in modern society. This leads to problems such as inefficient large urban parking lots, increasing difficulties in finding open spaces in busy parking lots, and increasing need for additional parking spaces to be committed to larger areas of land. According to this, drivers will difficult of looking for parking lots to park their car. The process of looking for a parking lot will cause time

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wasting because driver will spent time waiting for empty space in the parking lot. At this point, someone may miss or late for their important event.

Other than that, more fuel consumed while idling or driving around parking lots, leading to more CO2 emission being produced. Otherwise, once the vehicles are in the parking area, they will slow down their vehicles to find an empty parking space. This slow moving traffic will make the car queue longer. Eventually, when the car park is crowded, traffic jam will occur, which will also lead to some accident cases.

While the country and nation's development is growing rapidly, crime rates are also rising daily. Security has therefore become one of the company's main concerns in everyday life. Parking is also one of the places where people are frequently attacked. Theft and robbery occur in the car park as it is considered a quiet place where there would be not many people in the car park all the time. Then, it may easier some individuals to steal a car in somewhere parking area. All these problem is very serious and need a better solution to handle it.

1.4 Aims and objective

This project aim is to develop a smart parking system with security and has a few objective to be achieved. These objective are:

1. To design and develop a prototype of a smart parking system using IoT for security.
2. To develop a security system for car parking and to monitor car parking system through IoT.
3. To analyse car parking entry and their performance.

1.5 Work scope

The scope of this project is to make a prototype of a smart parking system using IoT for security which is user can determine whether there is a free space for parking and secure their car. The movement of the gate security system are controlled by the Servos (Tower Pro MG996R) after a driver scan or attached their ID to a RFID Module (Generic) which allow a user pass through within their car. Both hardware components are follow

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