POLITEKNIK MALAYSIA
Sultan Salahuddin Abdul Aziz

TITLE:

RFID CAR PARKING WITH PLATE NUMBER RECOGNITION SYSTEM

BY:

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(08DEP20F1046)

PROJECT SUPERVISORS:

Ts. Ilya Binti Ismail

CONFIRMATION OF THE PROJECT

The project report titled " RFID Car Parking with Plate Number Recognition System " has been submitted, reviewed and verified as a fulfills the conditions and requirements of the Project Writing as stipulated

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Supervisor's name : Ts. ILYA BINTI ISMAIL

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"I acknowledge this work is my own work except the excerpts I have already explained to our source"

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DECLARATION OF ORIGINALITY AND OWNERSHIP

TITLE : RFID CAR PARKING WITH PLATE NUMBER RECOGNITION SYSTEM

SESSION: SESI 1 2022/2023

1. I, **1.**

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As a project supervisor, on the date:

ACKNOWLEDGEMENTS

I put effort on this project. However, without the kind support and assistance of many people and organizations, it would not have been feasible. I want to express my sincere gratitude to each and every one of them. I owe a great deal to Supervisor Ts. Ilya and Puan Nadiah for their direction, continuous oversight, and provision of the information required for the Project as well as their assistance in seeing it through to completion.

My gratitude and appreciations go out to my coworker who helped me build the Project as well as others who volunteered their skills and time to assist me.

I also would like to thank my parents and the DEP5C members for their wonderful encouragement and cooperation in helping me finish this project. I want to offer my sincere appreciation and thanks to those in the profession who took the time to pay me such close attention.

ABSTRACT

Lack of parking and the actual resident vehicles has become major problem in every car parking in residential area. Sometimes it becomes difficult to identify vehicle owner who residents or non-residents. In addition, non -resident vehicles may be able enter and exit residential areas because the system does not have plate number recognition. Therefore, there is a need to develop a more efficient parking system RFID Car Parking with Plate Number Recognition system by using Raspberry Pi. There are numerous RFID Car Parking systems available today but without the Plate Number Recognition systems. These systems are based on different methodologies but still it is really challenging task as some of the factors like non-uniform vehicle number plate, language of vehicle number and different lighting conditions can affect a lot in the overall recognition rate. In this project, the researcher uses Raspberry Pi to enhance the recognition parameter. The selection of Raspberry Pi instead of Arduino is due to Arduino is used for beginner's projects and quick electronics prototyping while Raspberry Pi is used for and some complicated projects can be easily handled by Pi. PI is best for performing multiple tasks in one time, connecting to the Internet and the camera interface is very useful for this project is used to recognize plate numbers. The system has high security features that use RFID tags and plate number recognition to ensure only resident vehicles can enter residential area. The plate number recorded by the camera will be processed and matched with the plate number that has been registered in the system. This system is built because car parking solutions are not an end itself, but rather a means of achieving larger community goals to improve parking security and make the residential area more live able and efficient.

Keyword: Car parking, RFID, Plate Number Recognition, Raspberry Pi, Camera

ABSTRAK

Kekurangan tempat letak kereta dan kenderaan sebenar penduduk telah menjadi masalah utama di setiap tempat letak kereta di kawasan perumahan. Kadang-kadang menjadi sukar untuk mengenal pasti pemilik kenderaan yang pemastautin atau bukan pemastautin. Selain itu, kenderaan bukan pemastautin mungkin boleh keluar masuk kawasan perumahan kerana sistem tersebut tidak mempunyai pengecaman nombor plat. Oleh itu, terdapat keperluan untuk membangunkan sistem tempat letak kereta RFID Tempat Letak Kereta dengan sistem Pengecaman Nombor Plat yang lebih cekap dengan menggunakan Raspberry Pi. Terdapat banyak sistem Tempat Letak Kereta RFID yang tersedia hari ini tetapi tanpa sistem Pengecaman Nombor Plat. Sistem ini berdasarkan metodologi yang berbeza tetapi ia masih merupakan tugas yang sangat mencabar kerana beberapa faktor seperti nombor plat kenderaan yang tidak seragam, bahasa nombor kenderaan dan keadaan pencahayaan yang berbeza boleh mempengaruhi banyak dalam kadar pengecaman keseluruhan. Dalam projek ini, penyelidik menggunakan Raspberry Pi untuk meningkatkan parameter pengecaman. Pemilihan Raspberry Pi dan bukannya Arduino adalah disebabkan Arduino digunakan untuk projek pemula dan prototaip elektronik pantas manakala Raspberry Pi digunakan untuk dan beberapa projek rumit boleh dikendalikan dengan mudah oleh Pi. PI adalah yang terbaik untuk melaksanakan pelbagai tugas dalam satu masa, menyambung ke Internet dan antara muka kamera sangat berguna untuk projek ini digunakan untuk mengenali nombor plat. Sistem ini mempunyai ciri keselamatan tinggi yang menggunakan tag RFID dan pengecaman nombor plat untuk memastikan hanya kenderaan pemastautin boleh memasuki kawasan perumahan. Nombor plat yang dirakam oleh kamera akan diproses dan dipadankan dengan nombor plat yang telah didaftarkan dalam sistem. Sistem ini dibina kerana penyelesaian tempat letak kereta bukanlah satu tujuan, sebaliknya satu cara untuk mencapai matlamat komuniti yang lebih besar untuk meningkatkan keselamatan tempat letak kereta dan menjadikan kawasan kediaman lebih mampu hidup dan cekap.

Keyword: *Tempat Letak Kereta, RFID, Pengecaman Nombor Plat, Raspberry Pi, Camera*

TABLE OF CONTENTS

CHAPTER 1

1 INTRODUCTION

1.1 Introduction

RFID (radio frequency identification) is a form of wireless communication that incorporates the use of electromagnetic or electrostatic coupling in the radio frequency portion of the electromagnetic spectrum to uniquely identify an object, animal or person [1]. An RFID tag works by transmitting and receiving information via an antenna and a microchip also sometimes called an integrated circuit or IC. The microchip on an RFID reader is written with whatever information the user wants [2]. RFID is not a new technology. It is already in various industries such as production, where it can be used to manage goods and inventory, as well as the identification of data in travel documents such as passports and luggage managed by airlines [3].

Plate number is a unique identification for every single vehicle. Hence, it has been used in various applications such as for security monitoring, access parking systems, private area identification. In general, the characters for vehicles plate number are arranged in two structures, either the characters are placed in a single row or in two rows. All plate numbers have the combination of alphabet and number for example “BQX 3712”. In Malaysia, the plate number is begun with alphabet and followed by number, except for the vehicles that registered in Sarawak, Sabah and Langkawi Island, which will end up with another alphabet for example “SU 562 H” [4]. The implementation of background color for vehicle plate number in Malaysia is different with Singapore [5], since the license plates in Malaysia only used two colors, black and white. The background color of the plate number is black, and the font is white. In Singapore, in Singapore there are various types of background colors that necessarily give a certain meaning [7].

1.2 Background Research

Currently in Malaysia there are 31.2 million units of motor vehicles registered, according to data recorded until 31 December 2019 by the Road Transport Department (JPJ). According to a statement issued by the Ministry of Transport, this data also shows an average increase in new vehicles of more than 1 million per year [8]. (Mohamad Fazrul Abdul Majid, "IMalaysia rekod 32,378,174 kenderaan pada 2020, melakahariini.my, 5 Januari 2021).

A total of 32,378,174 total motor vehicles were recorded in Malaysia in 2020, according to statistics released by the Ministry of Transport Malaysia (MOT). The increase in vehicles also increased the number of drivers licensed by the Road Transport Department (JPJ) with an increase of 2.86 percent, which is 15,810,413 compared to 15,371,130 in 2019 [6] (Izwaashura Sadali, "Pendaftaran kenderaan bermotor di Malaysia cecah 31.2 juta unit sehingga 31 Disember 2019 — JPJ" paultan.org, 2 April 2020).

On September 2018, Touch n Go (TnG) began the utilisation of radio-frequency identification (RFID) for electronic toll collection with the start of a public pilot programmed, which has since seen a sizeable community of over 200,000 pilot testers across the Klang Valley, Johor and Penang being enabled during the initial pilot stage deployment. (Anthony Lim, "All about RFID technology in Malaysia, and the potential value it offers to connected motorists", 30 April 2019).

1.3 Problem Statement

The problem that has been faced is parking capacity is insufficient due to non-residents park their vehicles in residential areas illegally. It happens because any car could enter the residential area without limit just by using RFID tags. That parking in residential areas has certain unique characteristics is evident from a comparison between parking in residential and non-residential areas. For example, parking in residential areas consists of more than merely providing an adequate number of parking spaces. In non-residential areas, however, space is provided for all cars used to reach them.

There is another reason why parking capacity is always insufficient, and it is because some residents can afford to own more than one vehicle. This caused the residents to park their vehicles in the residential area in excess of the set limit which is a resident of two vehicles.

The next problem is the crime occurs such as car theft and house robbery also kidnapping case. This could be happened because of the low-level security of the residential area that allowing any vehicles even non-resident vehicles to get into the residential area. Based on a newspaper issued by METRO in December 15, 2017, entitled “10 years of living in fear”, tells the story of an apartment in Malaysia which is understood, more than 140 criminal cases occurred including motorcycle theft, snatch theft, burglary and many more thus threatening the safety and comfort of the occupants involved. This is because, because the residential area does not have a fence to protect the area.

1.4 Research Objectives

More specifically the principal objective of this research are:

1. To build a RFID car parking system with plate number recognition to ensure only the registered vehicle can pass through the gates.
2. To develop a database to records the plate number of resident's vehicles.

1.5 Scope of Research

The scope of this project is each resident is allowed only two vehicles to park in the residential area and each vehicle will be given an RFID tag.

Secondly, Plate number recognition can read the plate numbers within range of 5 meters with high accuracy.

Next, vehicle data recorders are limited to 30 plate numbers or 15 house which is one house has two car parking capacities.

1.6 Project Significance

The scope of this project is each resident is allowed only two vehicles to park in the residential area and each vehicle will be given an RFID tag.

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Next, vehicle data recorders are limited to 30 plate numbers or 15 house which is one house has two car parking capacities.

1.7 Chapter Summary

Chapter one is an introductory chapter which consists of background and motivation, problem statement, research objectives, scope of work and thesis overview. This chapter is written in order to provide the basic ideas and fundamental understanding of the research area. It is also explained in general about the car parking problem that currently become more critical especially in Malaysia.

CHAPTER 2

2 LITERATURE REVIEW

2.1 Introduction

In this project, they will combine these two systems, an RFID system and an LPR system, into a single car parking gate, and use the Raspberry Pi as a microcontroller to run the system and analyze its effectiveness on car parking in residential areas, as well as previous problems and what happens if no action is taken.

2.2 Concept of Radio Frequency Identification (RFID)

In a nutshell, a Radio Frequency Identification (RFID) system is a wireless system made up of two parts: tags and readers. The reader is a device that emits radio waves and receives signals from the RFID tag via one or more antennas. The RFID technology was, however, officially invented in 1983 by Charles Walton, who filed the first patent with the term "RFID" in it. Then, in 2002, NFC made the news, and it has continued to grow since then.

An article from Bernama states that the use of RFID systems in Malaysia is becoming more widespread with now over 1.5 million RFID users, and is often adapted by tolls in Malaysia. Furthermore, on January 2022, the Ministry of Works (MoW) announced that they would start stopping Touch ‘n Go (TnG) and SmartTag lanes along the North-South Highway and replace them with Radio Frequency Identification (RFID) lanes in stages.

2.3 Concept of Plate Number Recognition

This is a technology that employs optical character recognition on photos to create a highly accurate system that can read automobile licence plates without the need for human participation. It can also be used to save photos recorded by the cameras as well as text from the licence plate, with some configurations allowing for the storage of a driver's photograph. Infrared lighting is often used in systems to allow the camera to take pictures at any time of day or night.

The License Plate Recognition (LPR) Technology, which was deployed by Sunway in early 2020, is the beginning of this system being used more frequently and adopted by Malaysia, according to an article written by Alexander Wong from SoyaCincau. Sunway claims to have the largest fully integrated licence parking recognition system, which will accept a variety of cashless payment methods. Sunway Pyramid was one of the first malls in Malaysia to deploy a parking assistance system in 2008, and it wants to be at the forefront of using new technologies.

2.4 Concept of Control System

A control system is a collection of devices that manages, orders, directs, or regulates the actions of other devices or systems in order to achieve a specific goal. Control loops, which are a procedure meant to keep a process variable at a specified set point, are how a control system accomplishes this. To put it another way, a control system can be defined as a system that controls other systems. The desire for automation has risen in tandem with the modernization of human society. Controlling systems of interconnected devices is required for automation. controls other systems. The desire for automation has risen in tandem with the modernization of human society. Controlling systems of interconnected devices is required for automation.

2.4.1 Microprocessor

The microprocessor is the heart of a computer system, performing arithmetic and logic tasks such as adding, subtracting, moving numbers from one location to another, and comparing two numbers. It's also known as a logic chip, a central processing unit, or a processor. When the computer is turned on, it's essentially the engine or brain of the computer that gets to work. It's a versatile, programmable device that combines the operations of a CPU (central processing unit) into a single integrated circuit (integrated circuit).

Microprocessors are used in a wide range of devices, not just computers. Microprocessors are now used in everything from cellphones to household appliances to automobiles. There are several reasons why microprocessors are so widely utilised: they are inexpensive and fast, thanks to the technology used to manufacture modern microprocessors, which allows them to work at extraordinarily high speeds. Microprocessors today are capable of executing millions of instructions per second.

2.4.2 Raspberry Pi

The Raspberry Pi Foundation, a UK nonprofit, created a series of single-board computers with the goal of educating people in computing and making computing education more accessible in schools and in underdeveloped nations. With sales outside of the target market for uses like as robotics, the initial model proved more popular than expected. People use the Raspberry Pi all across the world to learn programming, construct hardware projects, undertake home automation, Edge computing, and even industrial applications.

The Raspberry Pi is a low-cost computer that runs Linux and has a set of GPIO (general purpose input/output) ports for controlling electronic components and experimenting with the Internet of Things (IoT). A Broadcom system on a chip (SoC) with an integrated ARM-compatible central processing unit (CPU) and on-board graphics processing unit is used in Raspberry Pi SBCs (GPU).

Raspberry Pi (issued in 2014), Raspberry Pi Zero (released in 2015), and Raspberry Pi Pico (launched in 2016) are three series of Raspberry Pi, each with numerous iterations (released in 2021).

2.5 Comparison of Project

This section focusing on two different sections, the first is an RFID system that security departments will use. Then, the Plate Number Recognition System is therefore a system to control and keep track of vehicles when they enter the parking lot. The control system's second section is revealed, along with the choice of the Raspberry Pi 4 type of microprocessor to process RFID and plate number recognition data.

NO.	TITLE/AUTHOR	OBJECTIVE	METHOD	RESULTS
1.	Jorge Eduardo, Herrera-Serrano (June 23, 2020) Access control using RFID cards and Raspberry Pi	To control access using RFID cards	Using RAD (Rapid Application Development) Use embedded computing for RFID cards store information as Identifier	The program is executed and in turn communicates with the sensor
2.	Nisha Gupta, (May 2016) Automatic Number Plate Recognition Using Raspberry Pi 2 In Shovel-Dumper Combination	To detect all the plates in the current camera frame	Using motor for gate operation Setup Raspberry Pi 2 to run latest version	Images produced after the Python code has been inserted to the Raspberry Pi2

2.6 Chapter Summary

Table shows the comparison between few sections focusing on two different sections, the first is an RFID system that security departments will use. Then, the Plate Number Recognition System is therefore a system to control and keep track of vehicles when they enter the parking lot. The control system's second section is revealed, along with the choice of the Raspberry Pi 4 type of microprocessor to process RFID and plate number recognition data.

CHAPTER 3

3 RESEARCH METHODOLOGY

3.1 Introduction

This chapter will provide a detailed overview of the approach used to complete and working well the project. There are four parts to this chapter. The research design used in this study is described in the first part. The third section explains a description of measurements, and the final section highlights a discussion about the technique for analyzing the study's data. The second section describes how to develop a system for this project.

3.2 Project Design and Overview

This project is separated into two parts which is hardware and software. The RFID Car Parking with Plate Number Recognition System is designed by using Raspberry Pi 4 as the main controller, MFRC522 as RFID reader, and Raspberry Camera as secondary element. As for software the Python coding of this project will carry out its duty for controlling motor as gates also recognition of plate number by Camera.

3.2.1 Block Diagram of the Project

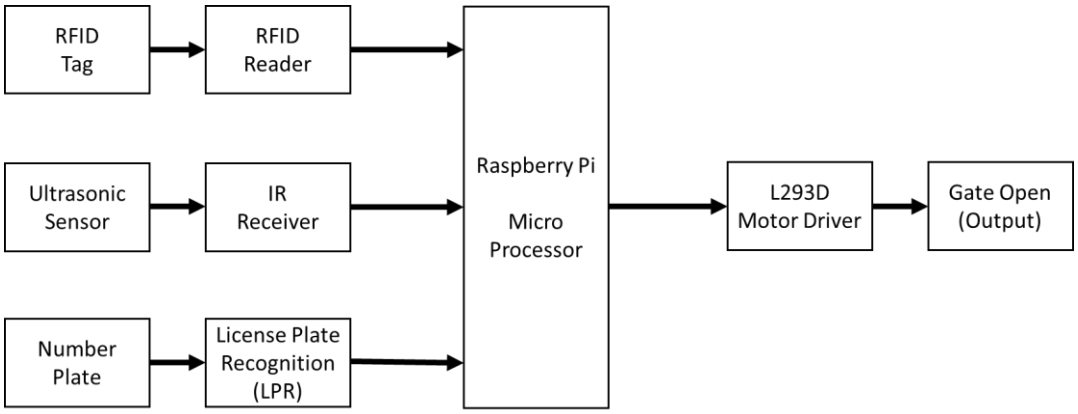


Figure 3.1 Block Diagram of the Project

According to the diagram, the idea behind this project is to use a Raspberry Pi4 as a microcontroller with inputs for an RFID reader and licence plate recognition. When a licence plate number is read from an RFID tag and compared to the input plate number in the microcontroller, the motor will either move or open. Once the car has fully passed the gate, the motor will shut it.

3.2.2 Flow Chart of the Project

The project is divided into two parts. In the first section, a Raspberry Pi 4 circuit with the script software was created. Connecting RFID and a Raspberry Camera for plate number recognition is the second step. The circuit will be designed using software. The development procedure for this project is shown in Figures 3.2.

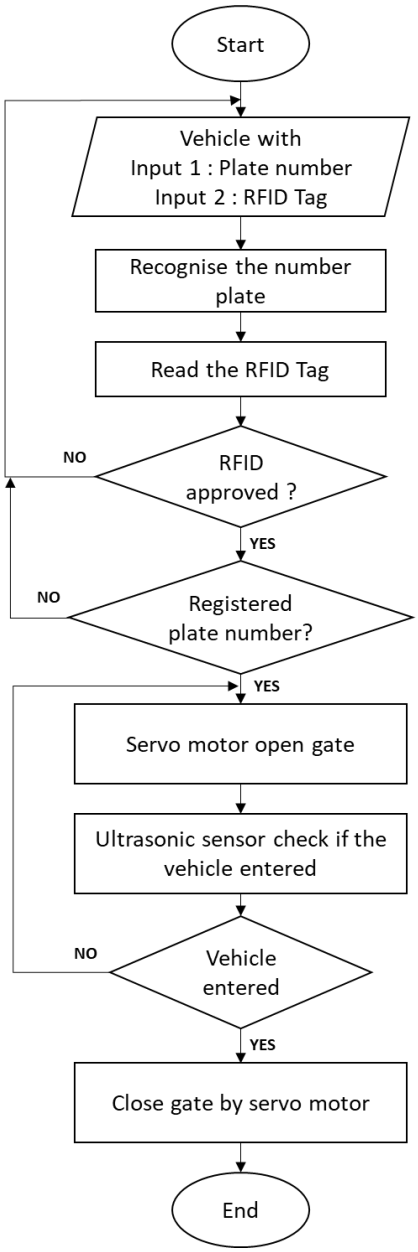


Figure 3.2: Flow chart of operation of the system

3.3 Project Hardware

Project hardware of this project requires Raspberry Pi 4 as a microcontroller. Reason, Raspberry Pi 4 is a single-board computer (SBC), all of its hardware components are mounted on a single circuit board. In addition, its compatible with Raspberry Camera and a programmable component, which can be used to make different projects. This allows the Python code to be modified to produce the required results.

3.3.1 Schematic Circuit

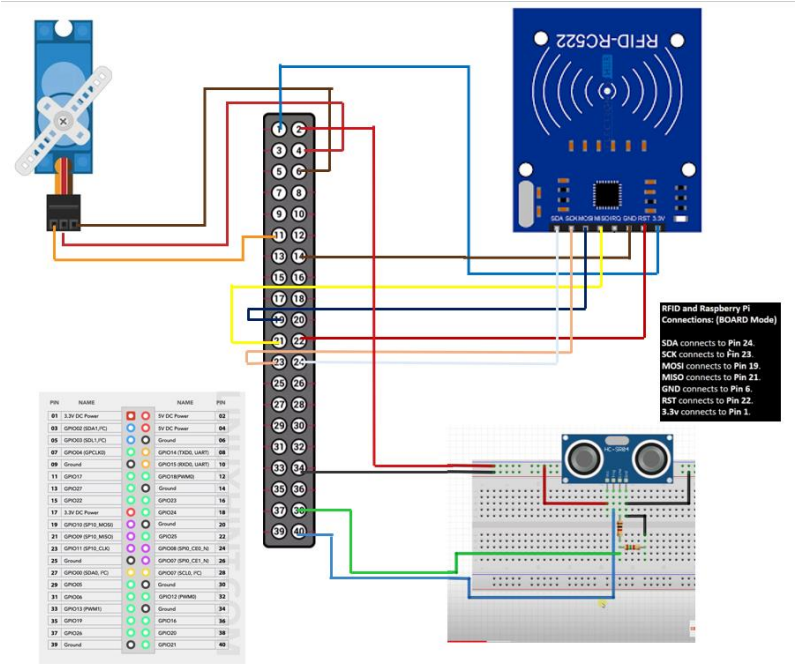


Figure 3.3: Schematic Circuit Diagram

3.3.2 Description of Main Component

To make sure that the circuit continues to function in the system that the computer code has established, the major component is crucial. To guarantee accurate input and output, it is also necessary to identify key components. The effectiveness of each component used in this project is also crucial to its success.

3.3.2.1 Raspberry Pi 4

A 1.5 GHz 64-bit quad-core ARM Cortex-A72 processor, built-in 802.11ac Wi-Fi, Bluetooth 5, full gigabit Ethernet (throughput not limited), two USB 2.0 ports, two USB 3.0 ports, 1–8 GB of RAM, and dual-monitor support via a pair of micro-HDMI (HDMI Type D) ports for up to 4K resolution are all features of the Raspberry Pi 4 Model B, which was released in June 2019. The power supply adapter has an input range of AC 100-240V 50/60Hz and a USB-C output port.

Figure 3.4: Raspberry Pi 4

3.3.2.2 Raspberry Pi Camera

A top-notch especially developed add-on board for the Raspberry Pi, the Raspberry Pi Camera Module v2 features a fixed focus lens and an 8-megapixel Sony IMX219 image sensor. It supports video in 1080p30 and can create static photos with a resolution of 3280 × 2464 pixels.

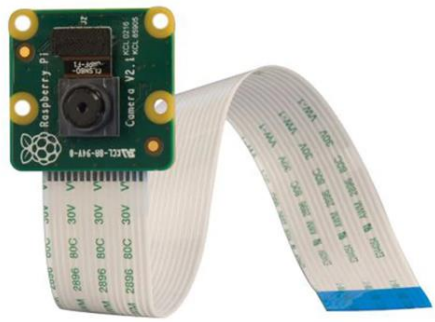


Figure 3.5: Raspberry Pi Camera

3.3.2.3 RFID Reader And Tag MFRC522

A 13.56MHz electromagnetic field is produced by the RC522 RFID reader module to communicate with RFID tags (ISO 14443A standard tags). With a maximum data rate of 10 Mbps, the reader may interface with a microcontroller using a 4-pin SPI connector. Additionally, it supports the I2C and UART protocols for communication. Although the logic pins are 5-volt tolerant and the module's working voltage spans from 2.5 to 3.3V, it may connect it to any 5V logic microcontroller, such the Raspberry Pi, without the need for a logic level converter.

Figure 3.5: MFRC522

3.3.2.4 Servo Motor SG09

A small, light-weight server motor with high output power is called a micro servo motor, or SG90. Servo rotates around 180 degrees (90 in each direction) and functions similarly to larger types of servo. These servos can be controlled by any servo code, hardware, or library.

. Figure 3.6: SG09

3.4 Project Software

This project's software components enable the RFID tag to be read by an RFID reader (MFRC522) and the Raspberry Pi Camera to recognize and record license plate numbers. The output, which is a motor moving to open gates, is then obtained by matching the input (plate number).

3.5 Prototype Development

The prototype development only addresses the first component, which is the behavior of the servo motor when an RFID tag is detected. To demonstrate the efficiency of the circuit, this prototype must change various code programmed.

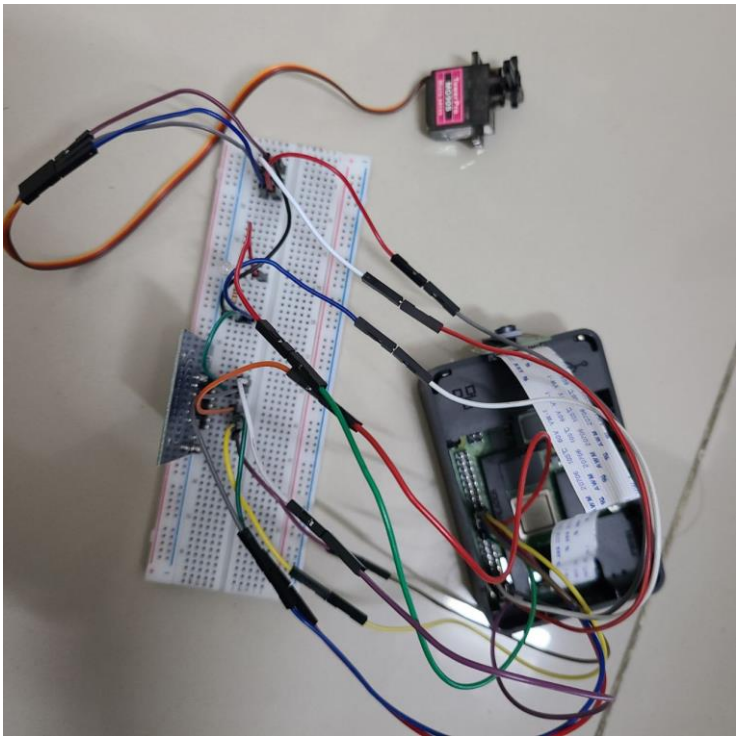


Figure 3.7: Prototype design of circuit

3.6 Chapter Summary

This chapter provides a thorough explanation and discussion of the methods employed in the current study's examination. In the current effort, positivism is considered as a philosophical undertaking and logical reasoning is used as an interpretive tactic. Project operations and project testing are routinely carried out as part of the methodology study to gather the data and knowledge required to support the research instrument and more fully describe it in this study.

CHAPTER 4

4 RESULTS AND DISCUSSION

4.1 Introduction

As for the completion of this project, Chapter 4 will discuss about the analysis and outcomes of the continuing project. The project has two parts that need to be finished, to put it simply.

4.2 Results and Analysis

4.2.1 Results

Analysis 1: Implementation of coding circuits and complete wiring

Objective:

1. To find out the RFID part fully functional

Procedure:

1. Connect USB-C to Raspberrry Pi 4 to turn on
2. Ready tag card
3. Touch the tag card to RFID reader

Results:

INPUT (Tag Card)	**PROCESS (Library)**	**OUTPUT**	
		ACCESS	**MOTOR (Gate)**
Sahril (VJG5831)	Sahril (VJG5831)	Granted	Open
Arash (VBC5445)	No data library	Denied	Not open
Nazrul (WXS9970)	Nazrul (WXS9970)	Granted	Open
Ammar (WYS950)	Ammar (WYS950)	Granted	Open

Analysis 2: Test the functional of RFID with Plate Number Recognition

Objective:

1. To test function of circuit after connecting the RFID to camera recognition

2. To ensure that RFID and camera recognition can properly connect.

Procedure:

1. Turn on Raspberrry Pi 4 and Camera Raspberry

2. Ready the number plate and RFID

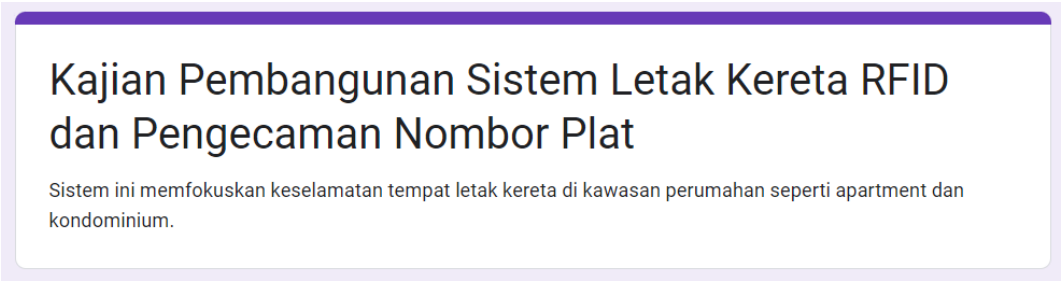
3. Read number plate by camera and touch the tag card to RFID reader

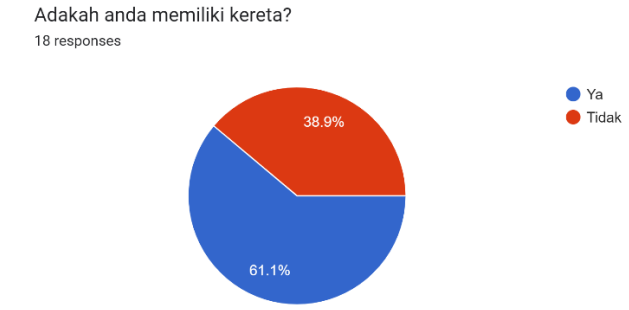
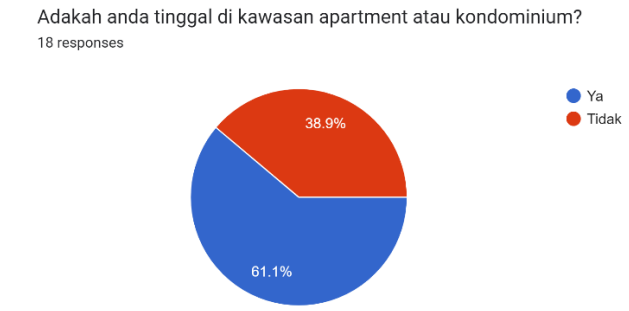
Results:

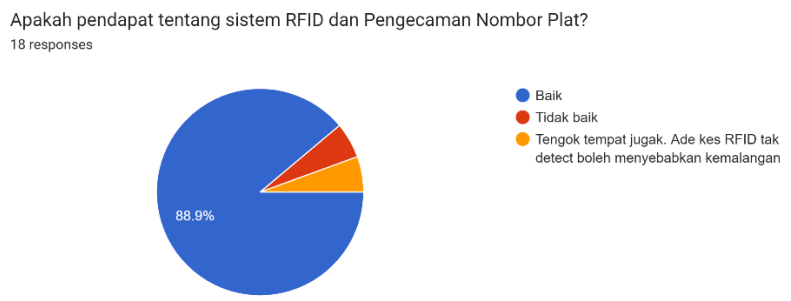
INPUT (No. Plate)	**INPUT (Tag Card)**	**PROCESS (Match No. plate)**	**OUTPUT**	
			RESULTS	**MOTOR (Gate)**
VJG5831	Sahril (VJG5831)	Sahril (VJG5831)	Match	Open
VBC5445	Arash (VBC5445)	No data library	Unmatched	Not open
WXS9970	Nazrul (WXS9970)	Nazrul (WXS9970)	Match	Open
WYS950	Bahri (WB6096X)	Ammar (WYS950)	Unmatched	Not open

4.2.2 Analysis

A Google form has been created in the analysis section to get feedback regarding applying my project in a residential neighbourhood from other individuals.



	Most people have their own cars, according to this pie chart.
	Based on this, 3/5 persons living at condominium or apartment.
	The majority of respondents to this survey admit that residential automobile parking is at a modest level.
	The most of respondent are satisfied with automobile parking they have at their residential place.

	The respondent had a positive opinion of RFID and plate number recognition technology. One of the reply mention that RFID sometimes its not efficient and it will lead to accident.
	Respondents in this chart concurred that this technique can address their car parking issues.
	According to this graph, most people are interested in replacing their current auto parking system with a new.

4.3 Discussion

In analysis 1, Raspberry Pi4 manages this project's functionality, together with input RFID tags and RFID reader (MFRC522). In simple terms, RFID tag will read by touching the RFID reader and the Raspberry Pi4 will work as access control that if the RFID tag has been granted access by the system, to grant access. Then, the gate (motor) will automatically open. Once the car has fully passed through the gate, the gate (motor) will automatically close.

In analysis 2, each vehicle's number plate is recognized by the Raspberry camera, which is then utilized to compare it to the RFID Tag that the RFID reader (MFRC522) has read. If the plate number and RFID tag matched, "match" will appear as the results. If not "unmatched" will appear as the results.

4.4 Chapter Summary

There are two sections in this chapter which is a result and analysis of RFID Car Parking with Plate Number Recognition System that performs as intended. The second section is a discussion about how the RFID Car Parking with Plate Number Recognition System function in that way with a brief and simple piece of information.

CHAPTER 5

5 CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

To summarize the whole results record, the conclusion of (RFID Car Parking with Plate Number Recognition System) must be tested and measured in order to demonstrate full functionality of this project and to analyze improvement of this project in order to maximize the potential.

5.2 Conclusion

In conclusion, the aim and objectives of this project, known as RFID Car Parking with Plate Number Recognition System, which is employed for guarded residential areas such as apartments or condominiums, have been met. Uses for this project is when a car wishes to enter, the driver must use an RFID tag, and the number plate will be immediately detected by a camera. The gates will then open automatically under Raspberry Pi 4 control suitable with logic and programmed function. Additionally, once the car has completely passed through the gate, the gates will automatically close. With the aid of an ultrasonic sensor, Raspberry Pi 4 fully controls this auto close gate function.

5.3 Future Recommendations

For further recommendation improvement, this system may include more features and functionality, such as connecting the enter and exit gates and tracking when cars enter and exit the residential area using IoT. Based on the concept, it is possible to establish networking utilizing wireless IoT protocols to connect the gates. Additionally, a cooler might be added to the Raspberry Pi4 to control the temperature of the processor if it becomes hot due to the extreme heat in Malaysia. By continuing this research, it might give the following researcher a new and innovative idea for making new machinery with new materials and tools in the most efficient way.

CHAPTER 6

6 PROJECT MANAGEMENT AND COSTING

6.1 Introduction

In chapter 6, it will explain about how the management of the project also the expense being used to succeed the project. To depict all the activities involved in making this project successful in the management section, a Gantt chart will be provided. The costing of project expectation at start is less than RM1000.

6.2 Gantt Chart and Activities of the Project

NAME	Zulhariz Iman Bin Mahizul
MATRIX NO	08DEP20F1046
TITLE PROJECT	RFID Car Parking with Plate Number Recognition
	Task(Plan)
	Task(Actual)

GANTT CHART

PROJECT TITLE : RFID CAR PARKING WITH PLATE NUMBER RECOGNITION SYSTEM

Course	NO	Task Name	Implementation	Duration (Days)	Cost (RM)	Date	Week 1 (22.08.2022- 29.08.2022)	Week 2 (30.08.2022 - 20.3.2022)	Week 3 (21.03.2022 - 27.03.2022)	Week 4 (28.03.2022 - 3.04.2022)	Week 5 (04.04.2022 - 10.04.2022)	Week 6 (11.04.2022 - 17.04.2022)	Week 7 (18.04.2022 - 24.04.2022)	Week 8 (25.04.2022 - 01.05.2022)	Week 9 (02.05.2022 - 08.05.2022)	Week 10 (09.05.2022 - 15.05.2022)	Week 11 (16.05.2022 - 22.05.2022)	Week 12 (23.05.2022 - 29.05.2022)	Week 13 (30.05.2022 - 05.06.2022)	Week 14 (06.06.2022 - 12.06.2022)
DEE40082 PROJECT 1	1	PROJECT BRIEFING	Plan	1																
			Actual	1																
	2	MEETING WITH SUPERVISOR	Plan	14																
			Actual	1																
	3	PROJECT DESIGN	Plan	14																
			Actual	21																
	4	PROJECT CODING	Plan	75																
			Actual	77																
	5	COMPONENT SOLDERING	Plan	14																
			Actual	10																
	6	SOFTWARE COMPLETION	Plan	80																
			Actual	65																
	7	HARDWARE COMPLETION	Plan	65																
			Actual	63																
	8	PROJECT TESTING	Plan	14																
			Actual	12																
	9	PROJECT PRESENTATION	Plan	2																
			Actual	2																
	10	LOGBOOK WRITING	Plan	14																
			Actual	14																
	11	ISOLMS UPDATE	Plan	14																
			Actual	11																
	12	GOOGLE FORM	Plan	7																
			Actual	10																
	13	FINAL REPORT	Plan	21																
			Actual	24																
	14	ELECTRICAL & ELECTRONIC ENGINEERING INNOVATION COMPETITION	Plan	1																
			Actual	1																

6.3 Cost and Budgeting

Throughout the course of this project, there will be expenses for the purchase of materials and components. Hardware components that have a cost are the Raspberry Pi 4, Pi Camera, RFID Reader, RFID Tag, servo motor, and Ultrasonic sensor. To make things simpler and save money, all of these components are obtained through online methods.

According to Figure 6.2, the overall gross budget estimate for implementing this project is RM491.50, while additional expenses are at RM40.00. This project can be regarded as less expensive than others, which may cost more than a thousand ringgit, based on the budget cost. The project's cost is also consistent with one of the essential characteristics of a competent project developer, which is having a cheap cost yet high-quality project.

Figure 6.2 List of Components and Materials

No.	Component and materials	The unit price	Quantity	Total
1	Raspberry Pi 4 Model B (1GB) Basic Kit	RM 298.00	1	RM 298.00
2	Raspberry Pi 8MP Camera Module V2.1	RM 115.00	1	RM 115.00
3	Arduino MFRC-522 RC522 RFID Card Reader Module Kit	RM 8.90	1	RM 8.90
3	Servo Motor MG90s-180Deg	RM 11.90	1	RM 11.90
4	Ultrasonic Sensor HC-SR04	RM 3.30	1	RM 3.30
5	RFID Card Tag	RM 1.10	4	RM 4.40
6	Other materials	RM 50.00	1	RM 50.00
			Total :	**RM 491.50**
	List of other costing			
1	Transportation		-	-
2	Postage	RM 4.00	5	RM 20.00
3	Craft Work	RM 20.00	1	RM 20.00
4	Internet		-	-
5	Application		-	-
			Total :	**RM40.00**
			Overall total	**RM531.50**

6.4 Chapter Summary

The conclusion for project costing management of RFID Car Parking with Plate Number Recognition System is the cost is still within budget and less expensive than estimated. This resulted in projects with low costs but great quality. Although RM1000 is the maximum anticipated cost, only RM531.50 is actually required to complete this project successfully.

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APPENDIX – 1: Program Coding

```
# -*- coding: utf8 -*-

import RPi.GPIO as GPIO
import MFRC522
import signal
import time

continue_reading = True

# Capture SIGINT for cleanup when the script is aborted
def end_read(signal,frame):
    global continue_reading
    print ("Ctrl+C captured, ending read.")
    continue_reading = False
    GPIO.cleanup()

# Hook the SIGINT
signal.signal(signal.SIGINT, end_read)

# Create an object of the class MFRC522
MIFAREReader = MFRC522.MFRC522()

# Welcome message
print ("Welcome to the MFRC522 data read example")
print ("Press Ctrl-C to stop.")

# This loop keeps checking for chips. If one is near it will get the UID a
while continue_reading:

    # Scan for cards
    (status,TagType) = MIFAREReader.MFRC522_Request(MIFAREReader.PICC_REQI

    # If a card is found
    if status == MIFAREReader.MI_OK:
        print ("Card detected")

    # Get the UID of the card
    (status,uid) = MIFAREReader.MFRC522_Anticoll()

    # If we have the UID, continue
    if status == MIFAREReader.MI_OK:

        # Print UID
        print ("Card read UID: "+str(uid[0])+","+str(uid[1])+","+str(uid[2
        # This is the default key for authentication
        key = [0xFF,0xFF,0xFF,0xFF,0xFF,0xFF]
```

```
48
49          # Select the scanned tag
50          MIFAREReader.MFRC522_SelectTag(uid)
51
52          #ENTER Your Card UID here
53          my_uid = [61,84,4,114,31]
54
55          #Configure LED Output Pin
56          LED = 18
57          GPIO.setup(LED, GPIO.OUT)
58          GPIO.output(LED, GPIO.LOW)
59
60          #Check to see if card UID read matches your card UID
61          if uid == my_uid:                #Open the Doggy Door if matching
62              print("Access Granted")
63              GPIO.output(LED, GPIO.HIGH)  #Turn on LED
64              time.sleep(5)                #Wait 5 Seconds
65              GPIO.output(LED, GPIO.LOW)   #Turn off LED
66
67          else:                            #Don't open if UIDs don't match
68              print("Access Denied, YOU SHALL NOT PASS!")
69
70  ##          # Authenticate
71  ##          status = MIFAREReader.MFRC522_Auth(MIFAREReader.PICC_AUTHENT1A,
72  ##
73  ##          # Check if authenticated
74  ##          if status == MIFAREReader.MI_OK:
75  ##              MIFAREReader.MFRC522_Read(8)
76  ##              MIFAREReader.MFRC522_StopCrypto1()
77  ##          else:
78  ##              print "Authentication error"
```

APPENDIX – 2: Project Manual Product