UNIVERSITI TEKNIKAL MALAYSIA MELAKA

MOBILE LOCKING SYSTEM FOR HOME SECURITY

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

by

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2019

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DECLARATION

I hereby, declared this report entitled MOBILE LOCKING SYSTEM FOR HOME SECURITY is the results of my own research except as cited in references.

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APPROVAL

This report is submitted to the Faculty of Electrical and Electronics Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Computer Engineering Technology (Computer Systems) with Honours. The member of the supervisory is as follow:

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ABSTRAK

Di era globalisasi internet pelbagai benda (IoT), implementasi IoT sangat di perlukan oleh sama ada syarikat mahupun masyarakat bagi memudahkan urusan seharian. Secara umumnya diketahui bahawa internet menghubungkan peranti ke peranti dari seluruh dunia bagi membolehkan urusan perkongsian maklumat. Dengan wujudnya IoT, pengguna boleh mengawal peranti dari jarak jauh. Bagi mengimplimentasi IoT sebagai alat kawalan jauh khususnya mengawal rumah, ianya memerlukan sistem keselamatan agar privasi pengguna tidak terdedah kepada umum lebih-lebih lagi sekiranya pengguna ingin mengawal dari mana-mana lokasi. Ini kerana setiap hari internet digunakan oleh masyarakat. Di dalam kertas kerja ini, internet digunakan sebagai pengantara antara pengguna dan pintu rumah, ini bagi membolehkan sistem kawalan akses di kawal oleh pengguna di mana-mana lokasi. Ianya membantu pengguna mengakses pintu sekiranya pengguna jauh dari rumah untuk mengunci dan membuka kunci pintu. Ramai pengguna sering terlupa sama ada mereka sudah mengunci atau belum mengunci pintu rumah mereka apabila mereka sudah keluar dari rumah. Sistem ini membantu mereka untuk mengunci pintu rumah dari jarak jauh justeru membuka pintu sekiranya ada tetamu yang ingin masuk ke dalam rumah. Sistem ini menggunakan asas web dan asas telefon mudah alih yang dihubungkan ke pengkalan data bagi log masuk ke dalam sistem kawalan akses. Setiap kali pintu dibuka, camera akan mengambil gambar dan dihantar terus ke emel dan notifikasi akan dihantar ke telefon mudah alih pemilik rumah. Gambar tersebut boleh diguna sebagai bukti sekiranya ada penyalah gunaan akses pintu. Pengguna juga boleh melihat rakaman secara langsung melalui kamera yang dipasang. Implementasi pad kekunci dipasang bagi memudah kan pengguna sekiranya pengguna tiada akses internet.

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ABSTRACT

In the era of globalization of internet of things (IoT), the implementation of IoT is very much needed by either company or society to facilitate daily business. It is generally known that the internet connects devices to devices from around the world to enable information sharing. With the existence of IoT, users can control devices remotely. In order to implement IoT as a remote control especially in controlling the home, it requires a security system so that user privacy is not exposed to the general even more if users want to control from any location. This is because every day the internet is used by the community. In this paper, the internet is used as an intermediary between the user and the door of the house, this allows the access control system to be controlled by the user at any location. It helps the user access the door if the user is away from home to lock and unlock the door. Many users often forget whether they have locked or have not locked their door when they are out of the house. This system helps them to lock the door of the house remotely and open the door if there are guests who want to get into the house. This system uses the web base and mobile phone base connected to the database to log into the access control system. Every time the door is opened, the camera will take a picture and send it directly to the email and the notification will be sent to the homeowner's mobile phone. The picture can be used as proof of any misuse of door access. Users can also view live recordings via installed cameras. Keypad implementation is installed to facilitate user if user does not have internet access.

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DEDICATION

To my beloved parents (Mr Abdul Halim Bin Shaaban and Mrs Jamaliah Binti Yunus)
and beloved family members.

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ACKNOWLEDGEMENT

Firstly, thank God for the completion without any trouble and inconvenience of the Final Year Project (FYP). I want to take this valuable chance to thank all those of you who have greatly helped me and assisted me complete this Final Year Project (FYP).

Most of all, I want to thank Mr. Ahmad Fairuz bin Muhammad Amin from the Electrical Engineering Department from the Faculty of Technology Engineering, Universiti Teknologi Malaysia Melaka (UTeM) for his tremendous help, encouragement, guidance and advice throughout the development of this project. In addition, my appreciation to all the dedicated lecturers from Faculty of Technology Engineering (FTK) for teaching me the knowledge that helped me to successfully complete this project. In addition, thanks also to the family members who have been supportive throughout the development of this project.

Lastly, thanks to everyone who took the time to help and give their opinion throughout the development of this project.

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TABLE OF CONTENTS

PAGE

TABLE OF CONTENTS **viii**

LIST OF TABLES **xii**

LIST OF FIGURES **xiii**

LIST OF APPENDICES **xv**

LIST OF ABBREVIATIONS **xvi**

CHAPTER 1 INTRODUCTION **1**

1.1 Background 1

1.2 Problem Statement 2

1.3 Objectives 4

1.4 Scope 4

1.5 Organization 5

CHAPTER 2 LITERATURE REVIEW **6**

2.1 Related Work 6

2.1.1 Raspberry Pi Microprocessor 6

2.1.1.1 BCM2837B0 7

2.1.1.2 GPIO 7

2.1.2 Smart Door System for Home Security Using Raspberry Pi 3 7

2.1.3 An Intelligent Door System using Raspberry Pi and Amazon Web Services IoT 8

2.1.4 Access Control of Door and Home Security by Raspberry Pi Through Internet 9

2.1.5 WIFI 10

2.1.5.1 How Wi-Fi Networks Works 10

2.1.5.2 Wi-Fi Support in Applications and Devices 10

2.2 Advantages and Disadvantages of WIFI 11

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2.3 Comparison in Between WIFI and Bluetooth Technology 11

CHAPTER 3 METHODOLOGY 13

3.1 Project Workflow 13
3.1.1 Planning 14
3.1.1.1 Gantt Chart PSM 1 14
3.1.1.2 Flowchart Project Flow 15
3.1.2 Research and Data Gathering 15
3.1.3 Design the Mobile Locking System for Home Security 16
3.1.3.1 System Access Using Mobile Device Flowchart 18
3.1.3.2 Access to Camera Monitoring System Flowchart 19
3.2 Hardware Implementation and Circuit Connection 19
3.2.1.1 4x4 Keypad with Raspberry Pi 3 B+ 19
3.2.1.2 I2C LCD Display with Raspberry Pi 3 B+ 19
3.2.1.3 Servo Motor with Raspberry Pi 3 B+ 20
3.2.1.4 Camera Module with Raspberry Pi 3 B+ 20
3.2.1.5 Power Supply for Raspberry Pi 3 B+ 20
3.2.2 Installation of Mobile Locking System 20
3.2.2.1 Attachment 20
3.2.2.2 Operation 21
3.2.2.3 Mobile Device Usability 21
3.3 Software Implementation 21
3.3.1 Using MySQL on Raspberry Pi 21
3.3.2 Using PHP and HTML to Design Layout and Function Ability for Mobile Application 23
3.3.3 Using Android Studio for Mobile Application Ease of Use 25
3.4 Hardware Specification 26
3.4.1 Raspberry Pi 3 B+ 26
3.4.2 I2C LCD Display 26
3.4.3 Servo Motor MG90S 27
3.4.4 Raspberry Pi Camera Module Rev 1.3 27

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CHAPTER 4 28

4.1 Implementation Stages 28

4.1.1 Development tools 28

4.1.1.1 Python 3 Programming Language 28

4.1.1.2 MySQL 29

4.1.1.3 Apache Web Server 29

4.1.1.4 MJPG-Streamer 29

4.1.1.5 HTML Programming Language 30

4.1.1.6 PHP Programming Language 30

4.1.1.7 CSS Programming Language 30

4.1.1.8 PiTunnel Tunnelling Server 31

4.1.1.9 PiGPIO Library 31

4.1.1.10 Android Studio 31

4.1.2 Communicate Hardware with Raspberry Pi 3 B+ 31

4.1.3 Creating Web Server and Web Page using Raspberry Pi 3 B+ 32

4.1.4 Tunnelling Webpage to Outside Network 32

4.1.5 Implement Webpage into Android Application 33

4.2 Workflow of The Project 33

4.2.1 Login Page 33

4.2.2 General Page for User and Administrator 34

4.2.3 Administrator Page 35

4.2.4 Manual Locking using Keypad 37

4.3 Coding 37

4.4 Testing 38

4.4.1 Hardware Testing 38

4.4.2 Web Page and Mobile Application Testing 38

4.4.3 Complete System Testing 39

4.5 Analysis 39

4.5.1 Analysis of The Stability of Raspberry Pi Wi-Fi Connectivity to The Router 39

4.5.1.1 1 Meter Range 40

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4.5.1.2 10 Meter Range 41
4.5.2 Execution Time to Lock Door using Mobile Devices 42
4.5.3 Execution Time to Unlock Door using Mobile Devices 42
4.5.4 Email Received Time 43
4.6 Discussion 43
4.7 Project Drawback 44

CHAPTER 5 46

5.1 Significant of Project 46
5.2 Achievements Achieved Through the Objectives to be Worked Out 46
5.3 Issues Raised During the Development 46
5.4 Possible Recommendations 47

REFERENCES 48

APPENDIX 51

Appendix 1 Coding for Password Check Using MD5 51
Appendix 2 Coding for Servo Motor 53
Appendix 3 Link to Full Coding 55

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LIST OF TABLES

TABLE	TITLE	PAGE
Table 1:	Comparison Table of WIFI and Bluetooth	12
Table 2:	List of MySQL Commands	23

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LIST OF FIGURES

FIGURE	TITLE	PAGE
Figure 1.1:	Property crime index Malaysia in 2017	3
Figure 1.2:	Crime statistics regarding house burglary in Kedah from 2014 till 2017 (Source: Royal Malaysian Police Force, Kedah State Contingent Headquarters)	3
Figure 2.1:	Raspberry Pi 3 B+	6
Figure 2.2:	GPIO Pin Numbering	7
Figure 2.3:	Smart Door System Structure	8
Figure 2.4:	Block Diagram of Intelligent Door System	9
Figure 2.5:	Project Outline of Door Access Using Internet	10
Figure 3.1 :	Project Work Flow	13
Figure 3.2:	Gantt Chart PSM 1	14
Figure 3.3:	Project Flowchart	15
Figure 3.4 :	Mobile Locking System Design	16
Figure 3.5:	Flowchart of System Access Using Mobile Device	18
Figure 3.6:	Flowchart for Access to Camera Monitoring System	19
Figure 3.7:	Installation of MySQL Software on Raspberry Pi	22
Figure 3.8:	Login into MySQL	22

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Figure 3.9: Mobile Locking System Login Page Design 24

Figure 3.10: Admin (left) and User (right) Page Interface Design 24

Figure 3.11: Create User and User List Page Design 25

Figure 3.12: Interface After Using Android Studio 26

Figure 4.1: Home Page (Left) and Login Page (Right) 34

Figure 4.2: Home Page (Left), Livecam Page (Middle) and Gallery Page (Right) 34

Figure 4.3: Administrator Home Page (Left) and Menu for Administrator (Right) 35

Figure 4.4: Administrator Logs Page 36

Figure 4.5: Manage User Page 36

Figure 4.6: Registration Page (Left) and User Type Selection (Right) 37

Figure 4.7: 1 Meter Wi-Fi Stability Information 40

Figure 4.8: 1 Meter Wi-Fi Connectivity Histogram 40

Figure 4.9: 10 Meter Wi-Fi Connectivity Information 41

Figure 4.10: 10 Meter Wi-Fi Connectivity Histogram 41

Figure 4.11: Graph Door Lock Using Mobile Devices 42

Figure 4.12: Graph Door Unlock Using Mobile Devices 42

Figure 4.13: Graph of Email Received Time 43

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LIST OF APPENDICES

APPENDIX	TITLE	PAGE
Appendix 1: Coding for Password Check Using MD5		51
Appendix 2: Coding for Servo Motor		53
Appendix 3: Link to Full Coding		55

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LIST OF ABBREVIATIONS

APK	Android Package Kit
ARM	Advanced RISC Machine
AWS	Amazon Web Services
BLE	Bluetooth Low Energy
CCTV	Closed-Circuit Television
CSS	Cascading Style Sheets
GND	Ground
GPIO	General Purpose Input/output
HTML	Hypertext Mark-up Language
HTTP	Hypertext Transfer Protocol
IDE	Integrated Development Environment
IEEE	Institute of Electrical and Electronics Engineers
IoT	Internet of Things
JPEG	Joint Photographic Experts Group
LAN	Local Area Network
LCD	Liquid Crystal Display
LED	Light Emitting Diode
MCMC	Malaysian Communications and Multimedia Commissions
MD5	Message Digest 5
MJPG	Motion Joint Photographic Expert
PDA	Personal Digital Assistant
PHP	Hypertext Pre-processor

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PIR	Passive Infrared Sensor
PoE	Power Over Ethernet
PSM	Projek Sarjana Muda
RDBMS	Relational Database Management System
RF	Radio Frequency
RFID	Radio Frequency Identification
SDA	Serial Data
SCL	Serial Control
SoC	System on Chip
UART	Universal Asynchronous Receiver-Transmitter
URL	Uniform Resource Locator
VDD	Voltage Drain Drain
VLC	Visible Light Communication
WIFI	Wireless Fidelity
WLAN	Wireless Local Area Network
WPAN	Wireless Personal Area Network

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CHAPTER 1

INTRODUCTION

According to a study conducted in 2017 on 3,469 Malaysian respondents on internet usage, the percentage of internet usage by smartphone devices was 89.4%. Hence the use of internet by devices such as laptops and tablets has decreased (MCMC Survey 2017). Therefore, the implementation of smartphones on an internet-based control system is very well suited today.

Furthermore, there are various types of microcontroller-based device and microprocessor-based devices available at affordable rates that interact with internet such as Arduino and Raspberry Pi. This device is widely used by developers to implement a wireless control device because the function of this device is able to connect wirelessly using Wi-Fi or internet modem. Raspberry Pi devices typically have the ability to be servers while at the same time controlling basic components such as motor, led, keypad, even serial peripherals interfaces such as RFID, UART and much more.

The ability to implement strict security by this device also enables users to apply security to a project that they want to implement without worrying about the privacy and security of a project.

1.1 Background

The main focus of this project is the wireless control system that can control the door of the home using smartphones at the same time being a security system for the home itself.

Each door unlocks either by the host or other person will turn on the notification system to the host informing that there is an unlocking happening. This is to facilitate the host to monitor every unlocking so that home security is always in good shape. With the installation of the camera on the system, it allows the user to monitor directly thus allowing user to act on controlling the door if required.

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The locking control system used by the smartphone itself is to facilitate the everyday business of the user in case of user negligence when the user often forgets to lock the door. This is because the user himself can control the state of the door using a smartphone regardless of where the user is located.

This system uses web-based mediators as well as databases that directly serve as servers implied in Raspberry Pi to reduce the use of additional devices and thus require no intervention from external servers. The use of the database itself increases the security value because users who are enrolled into the database can access the door using a smartphone. This is because every device connected directly to the internet can control the door if there is no security access system built in.

As a precautionary measure in the absence of internet access or loss of smartphone access due to battery drainage or no access to smartphones, this system also comes with a keypad that allows users to access the door manually using the pin without using the mobile phone.

1.2 Problem Statement

Although home is the most valuable asset, many are less sensitive to the consequences of not locking the house. According to the head of the crime prevention and security community of Perak, through the Sinar Harian newspaper (2018), states that many home-breaking cases occurred because the house was not properly locked. Despite many programs implemented by the government through the Royal Malaysian Police and cooperation by the private sector to prevent home-breaking cases, there are still a handful of people who are still ignorant. Negligence is still happening among the population, this gives the irresponsible side the opportunity to break into the house. This often happens because people are often forgot to properly lock the door when rushing to work or studying places.

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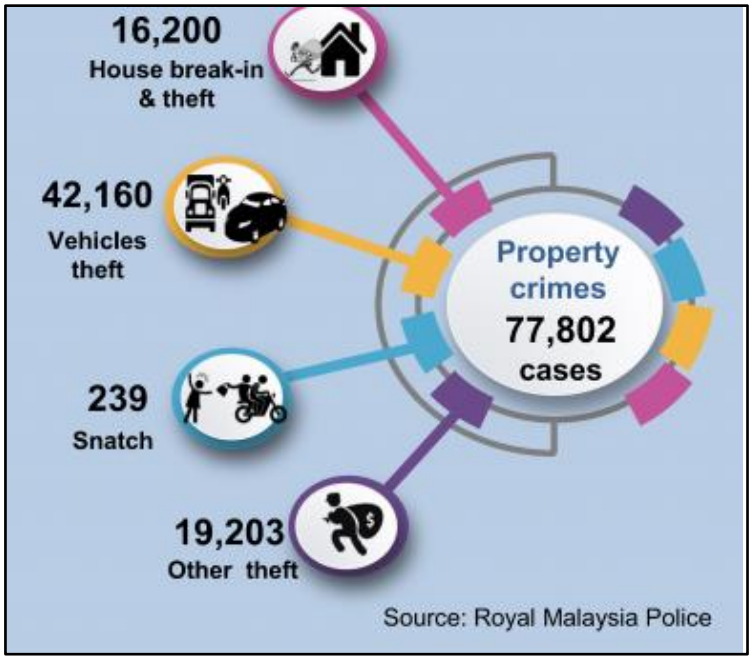

Figure 1.1: Property crime index Malaysia in 2017

(Source: Royal Malaysia Police)

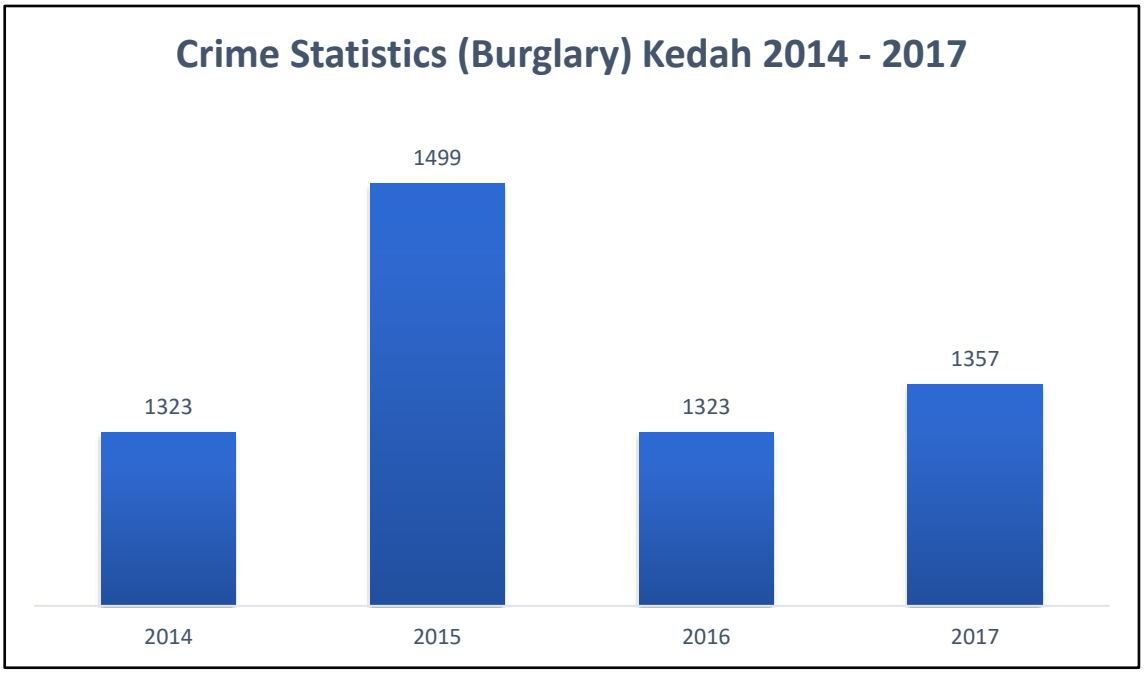

Figure 1.2: Crime statistics regarding house burglary in Kedah from 2014 till 2017

(Source: Royal Malaysian Police Force, Kedah State Contingent Headquarters)

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Apart from home-breaking cases, key loss cases are also common cases. This is because most homes still use manual locking systems. Small key size factor makes it easy to mix with other items and easily drop out without the individual's knowledge. This has become commonplace among community. According to Pixie's lost and found study (2017), key loss shows a 28 percent percentage among Americans. Although only 28 percent, it still shows that key loss cases are still occurring among the community. The impression of losing such key items causes the individual to spend a lot of time looking for the item which causes an impression such as missed an appointment, late to work, argued with family and missed flights.

Apart from the following problems, the most common problem is that Malaysians often leave home for days while celebrating the celebration in their hometown. This makes the house unobserved by anyone and it creates the risk of home-breaking cases. Even though there is a home installed with a CCTV system, it does not help to monitor the situation if the individual is outside the area as most home-based CCTVs cannot monitor live recording remotely

1.3 Objectives

Based in the problem statements stated above, the objective of this project is:

i. To use and control door lock system using mobile device via mobile application.
ii. To monitor door state and live footage remotely using mobile application.
iii. To allow user to access door system from anywhere and anytime.

1.4 Scope

The scope of this study is based on the stated objectives. This door lock system is built using Raspberry Pi which is responsible for the door control and a server to enable mobile applications to interact with the instructions the user wishes to provide for the door lock system. Mobile applications are created to allow users to use smartphones to control the door lock system. The servo motor is mounted to control the state of the lock

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and the condition of unlocking the door. The camera is used to monitor the situation and take pictures if the lock is open. The keypad is installed on the system to enable users to manually control the door in the absence of internet or smartphones.

1.5 Organization

This project focuses on improving the door lock system by applying mobile application to control door system. This report contains five chapters. The first chapter explains the introduction, objectives, statements of problems and scope of the project. In the second chapter, it is relevant to writing literature studies that have been implemented from previous sources for reference purposes. Next, the description of the component, the method used and the flowchart for the project can be found in chapter three. In the fourth chapter, all the analyses undertaken throughout the process of developing the project include data tabulation and the results are explained. Finally, chapter five explains project conclusions as well as suggestions for the future and improvements that can be made.

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CHAPTER 2

LITERATURE REVIEW

In this chapter, the purpose of the literature review is to analyse and conduct research on previously implemented projects related to the door control system using mobile devices. All research is conducted based on a study conducted not later than 5 years from the date the project is implemented so that it is suitable for reference. Additionally, the suitability of the research to the project to be implemented will be discussed, reviewed and determined. Comparison of hardware use is also done to enable the selection of suitable hardware to be used as well as all the advantages and disadvantages of hardware and systems so that more accurate selection of hardware can be made. The results and methods of previous researches that have been reviewed will be compared and evaluated to ensure that they are the best and valid source of reference for this project.

2.1 Related Work

2.1.1 Raspberry Pi Microprocessor

Raspberry Pi 3 model B + is the newest product in the Raspberry Pi line-up. Equipped with a 4-core 64-bit processor with running speed at 1.4GHz, this model also comes with dual band 2.4GHz and 5GHz wireless LAN, Bluetooth 4.2 / BLE, ethernet faster than previous model, and PoE capability via a separate PoE HAT.

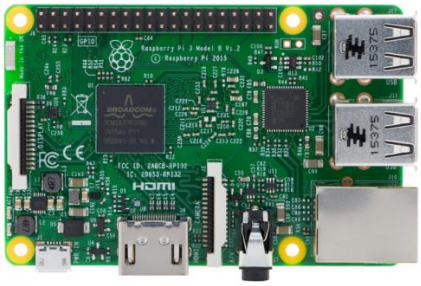

Figure 2.1: Raspberry Pi 3 B+

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The dual-band wireless LAN features modular compliance certification, enabling the board to be designed into end products with significantly reduced wireless LAN compliance testing, enhancing both cost and market time.

2.1.1.1 BCM2837B0

This is Broadcom chip installed in the Raspberry 3B+. The BCM2837B0's underlying architecture is the same as the BCM2837A0 chip used in other Pi versions. The core hardware of the ARM is the same, only higher is the frequency. The ARM cores can run at up to 1.4GHz, making the 3B+/3A+ around 17% faster than the original Raspberry Pi 3. The Video Core IV is running at 4.

2.1.1.2 GPIO

GPIO is the general-purpose input output. GPIO pins can be configured either as a general-purpose input, as a general-purpose output, or as one of up to six special alternate settings with pin-dependent functions. BCM2835 has three GPIO banks. Each of the three banks has a VDD pin of their own. All GPIO banks are delivered from 3.3V on Raspberry Pi. Connecting a GPIO to a voltage above 3.3V is likely to destroy the SoC's GPIO block.

A powerful feature of the Raspberry Pi is the row of GPIO pins along the top edge of the board. On all current Raspberry Pi boards, a 40-pin GPIO header can be found.

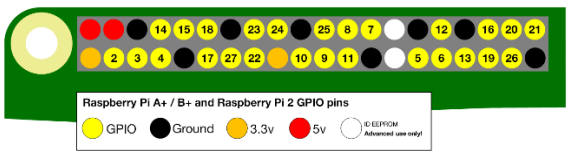

Figure 2.2: GPIO Pin Numbering

2.1.2 Smart Door System for Home Security Using Raspberry Pi 3

Based on project proposed by (Hussein and Al Mansoori 2017), this project aims for a security door locking system based on Raspberry pi technology which cameras, keypads and pi-lids are used to provide an alarming system that can notify the owner and

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