UNIVERSITI TEKNIKAL MALAYSIA MELAKA

ANDROID PASSWORD BASED REMOTE DOOR OPENER SYSTEM FOR AUTO GATE

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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2016

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: **Android Password Based Remote Door Opener System for Auto Gate**

SESI PENGAJIAN: **2016/17 Semester 1**

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ABSTRAK

Pada masa ini, sistem keselamatan rumah mendapat perhatian secare besar-besaran. Ini kerana mereka lebih bimbang terhadap keselamatan keluarga mereka. Dengan pertumbuhan teknologi yang pesat, telefon pintar telah menjadikan kehidupan kita lebih mudah dan mudah. Dalam hal ini, aplikasi yang berkaitan dengan keselamatan telah direka untuk pengguna telefon pintar. Oleh itu, berdasarkan sistem pembukaan pintu pagar automatik dengan menggunakan kata laluan pada sistem operasi Android dilaksanakan untuk membantu pengguna dalam memantau keselamatan rumah mereka. Objektif projek ini adalah untuk membangunkan satu sistem yang boleh mengawal pintu auto untuk pengguna yang sah, untuk memantau prestasi sistem pintu automatik baru dengan menggunakan telefon pintar dan juga untuk menganalisis fungsi sistem pagar automatik di rumah pemilik. Pembuka pintu automatik adalah cara yang baik untuk menyediakan akses mudah di rumah. Bagi seseorang yang menggunakan pintu automatik di rumah mereka, kadang-kadang mereka cenderung untuk tidak membawa alat kawalan jauh pintu mereka apabila mereka keluar. Kadang-kala, alat kawalan jauh ini juga tidak berfungsi dengan baik. Selain daripada itu, sistem pintu automatik baru yang berkaitan dengan teknologi aplikasi mudah alih juga boleh dilaksanakan. Dalam pembinaan projek ini, Arduino Uno dan Arduino WiFi Shield untuk bahagian perkakasan dan juga App Inverter dan Android sebagai bahagian perisian akan digunakan. Sistem pembuka pintu yang baru untuk pintu automatik di rumah dengan menggunakan aplikasi android dalam rangkaian WiFi akan diwujudkan. Sistem ini akan berfungsi apabila kata laluan yang tepat yang telah ditetapkan oleh pemilik rumah dimasukkan oleh pengguna yang diberi kuasa melalui telefon pintar mereka.

ABSTRACT

Currently, home security system is getting massive attention widely from the citizens. This is because they are more concerns about their family"s safety. In a rapid growth technology, smartphone has made our lives easier and convenient. In this regard, application that related to the safety has been designed for smartphone users. Therefore, android password based remote door opener system for auto gate is implemented to aid users in monitoring their house safety. The objectives of this project are to develop a system that can control the auto gate for authorized user, to monitor the performance of new auto gate system by using smartphone and also to analyze the functionality of auto gate system to house owner. Automatic gate openers are a great way to provide convenient access to the house. As for a person who use automatic gate at their house, sometimes they tend to forget to bring their gate"s remote control whenever they are going out and sometimes, the remote also not functioning well. Other than that, a new automatic gate system can be implemented which related to technology of mobile application. In constructing this project, an Arduino Uno and Arduino WiFi shield for the hardware part and also App Inverter and Android as the software part will be used. The new remote door opener system for automatic gate at home by using android application within WiFi range will be created. This system will work whenever the right password that has been set by the house owner was entered by the authorized user through their smart phones.

DEDICATIONS

Alhamdulillah, praise to the Almighty Allah S.W.T

I dedicate this project to:

My parents,

My beloved family,

My supervisor,

My lecturers,

And all my friends

Thanks for their never ending encouragement and support.

ACKNOWLEDGMENTS

First and foremost, I would like to thank Allah SWT for the great health and because of His blessing, I finally manage to complete my final year project successfully.

Next, I would like to express my gratitude towards people around me who never stop supporting and guiding me throughout the entire course of this project. I would like to extent my deepest appreciation to my beloved parents and siblings for their support from the beginning.

Most importantly, I would like to thank my project"s supervisor, Mr Zulhasnizam Bin Hasan, for being the most patience lecturer that I have ever met. Having to deal with eight students at the same time is quite a headache and not an easy task. A big respect for him and may Allah reward him for his sincere, endeavour and contribution in the way of knowledge.

Last but not least, thank you to my best friends Mumtazahiqa Mazlan, Nur Fazlin Atiqah Ramli and Nurul Fatihah Ali for being parts of this journey and I will forever be grateful. To all lecturers, friends and everyone who has directly or indirectly involved in making this project, your endless support and cooperation will never be forgotten.

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GSM	=	Global System for Mobile communication
GPS	=	Global Positioning System
iOS	=	Iphone Operating System
IoT	=	Internet of Things
NFC		Near Field Communication
OS	=	Operating System
PCB	=	Printed Circuit Board
PWM	=	Pulse Width Modulation
RFID	=	Radio Frequency Identification
SD	=	Secure Digital
USB	=	Universal Serial Bus

CHAPTER 1

INTRODUCTION

The first chapter introduces brief idea of the project. The main focus is on the overview of the project, problem statements, objectives, work scope, significant of study and also the outcome of the project.

1.1 Background

Nowadays, there are many houses with automatic gate. This is because it is convenience to open or close the gate by using remote control that can be used with any smartphone without having to leave the vehicle especially during night or rainy day. Hence, a system which not only can ease the user but also could helps in controlling the safety of the house is invented. This system enables to unlock the auto gate only when entering the right password through an android application within WiFi range. The invention of this system can not only ease the user and also securing their house safety, but it also could helps in analyzing the functionality of the new auto gate system. Moreover, smart homes are likely to be the paradigm in the future when the owner can monitor and control their house remotely. Besides that, smartphone has made our lives easier and convenient in this rapid growth technology.

1.2 Problem Statement

Automatic gate openers are a great way to provide convenient access to the house and also add a layer of protection to the property. Nowadays, even though there are too many technologies regarding the safety of the house, there is still some

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weakness in them. The thieves still can get into the house as there is no safety measure taken by the house owner. Besides that, for people who lives along the roadside with manual gate, they might face some difficulties to open their gate as there is too many cars will pass by their house. Hence, it is recommended for them to use automatic gate to ease them. As for a person who use automatic gate at their house, sometimes they tend to forget to bring their gate's remote control whenever they are going out. There are also times when the remote not functioning well. As phone is a must have technology nowadays and people will not leave them behind, it will be a great help to use as the remote controller. Other than that, a new automatic gate system can be implemented which related to technology of mobile application.

1.3 Objective

Objectives of the project are:

1. To develop a system to control the auto gate for authorized user.

2. To monitor the performance of new auto gate system by using smart phone.

3. To analyze the functionality of auto gate system to house owner.

1.4 Scope of project

To ensure that the project is conducted within its intended boundary, the scopes are listed. The scope of this project is to help in monitoring the safety of the house. The main focuses are to develop a system to control the auto gate especially for authorized user. For instance, the automatic gate will unlock whenever the right password is inserted. Here, Wi-Fi connection is required.

Arduino UNO and Arduino WiFi shield are the hardwares that will be used in this project. Arduino is a small microcontroller board that contains USB plug. The USB is used to connect to computer and a number of connection sockets that can be wired up to external electronics. In this project, the Arduino will give instruction to

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the motor to open the gate after receiving the correct password from the user. In addition, there is also Arduino shield as this project needs to use WiFi connection to operate the gate. Note that the phone must be in the WiFi zone. If failed to do so, there will be no connection at the phone and it will prevent the user from unlocking the gate. Basically, router helps send wireless signals that are caught to nearby. This is because wireless connection can be used in short distances only. But if the users are having a hard time to get a reliable WiFi signal outside of their house, they could use a WiFi extender. It helps to extend the coverage area of the WiFi network. Furthermore, it will receive the existing WiFi signal and then amplifying it. Next, it will also transmitting the boosted signal. Hence, these WiFi extenders can double the coverage area of the WiFi network effectively. Moreover, for the software, android application will acts as the interface in the phone. This helps the user to easily use the application without any burden. The android application in the smartphone will ask a user to enter the password so that they can unlock the automatic gate. If failed, the user needs to re-enter the password again.

1.5 Significance of study

Currently, home security system is getting massive attention widely from the citizens. This is because they are more concerns about their family‟s safety. Moreover in most of the develop countries such as United States and Japan, they have dominate the smart home technology. In a rapid growth technology, Malaysia still left far behind them. So, a research that focusing on this Android password based remote door opener system for auto gate is conducted. Generally, smartphone has made our lives easier and convenient. In this regard, application that related to the safety has been designed for smartphone users.

This project is suitable for land house such as bungalow or terraced house that use automatic gate. They only have to upgrade their existing gate that requires them to use remote control to open the gate and change it by using smartphone as the remote. Besides, they only need to insert a same password as the Arduino and they also could change it if the user feels the password is not secure anymore.

1.6 Structure of report

Chapter 1: Introduction

The first chapter introduces brief idea of the project. The clarification of the project will be elaborated in a general phase. The main focus is on the overview of the project, problem statements, objectives, work scope and also the outcome of the project.

Chapter 2: Literature Review

Some literature reviews of current existing projects that related to the project have been discussed such as the usage of WiFi connection to enter the password through the android application.

Chapter 3: Methodology

This chapter describe the whole method that has been used in constructing the project. Basically, it discusses on the software and hardware that are apply to the project. It also contains the development details of the project from the beginning until the end.

Chapter 4: Result & Discussion

This section discusses on the result of the project. All simulations, data collection and data analysis obtained are discussed in detail. The result is compared with the outline of the objective in order to make conclusions.

Chapter 5: Conclusion

This chapter concludes what have been done throughout this project and followed by some recommendations on how to improve the performance of the system.

CHAPTER 2

LITERATURE REVIEW

Studies and reserch have been done in making this project a success. All of the informations for this project were collected from all kind of sources such as article, journal and internet. The informations really give a guidence in completing this project in time. It is also based on the major topic which relate to this project.

2.1 Smart Home

In the future, smart home is expected to be the regular when all aspects of the home is monitored and controlled remotely by the house owner. (Zhong et al. 2011) state that mobile phone with high accessibility and usability is the ideal interface for the users to monitor and control the future smart home surroundings. As a replacement of individual remotes of smart home appliances, it also supports a range of basic home monitoring and controlling interface functionalities. For instance, the status of the garage door can be viewed on the laptop or smart phone if the owner is unsure whether he or she has closed the garage door before leaving the house. If the garage is not closed, the owner can even close it remotely from the same device. These smart homes can not only monitoring the status of the house, but it also could enhancing comfort in daily life especially for elderly and handicapped people. According to Mohamed et al. (2014), home automation and remote monitoring, environmental monitoring, temperature, fault tracking and management, and lastly the health monitoring have been considered as the fields of smart home system. Current trends in home safety visualization provide separate interfaces for each device at home such as home alarm system has its own Web interface different from
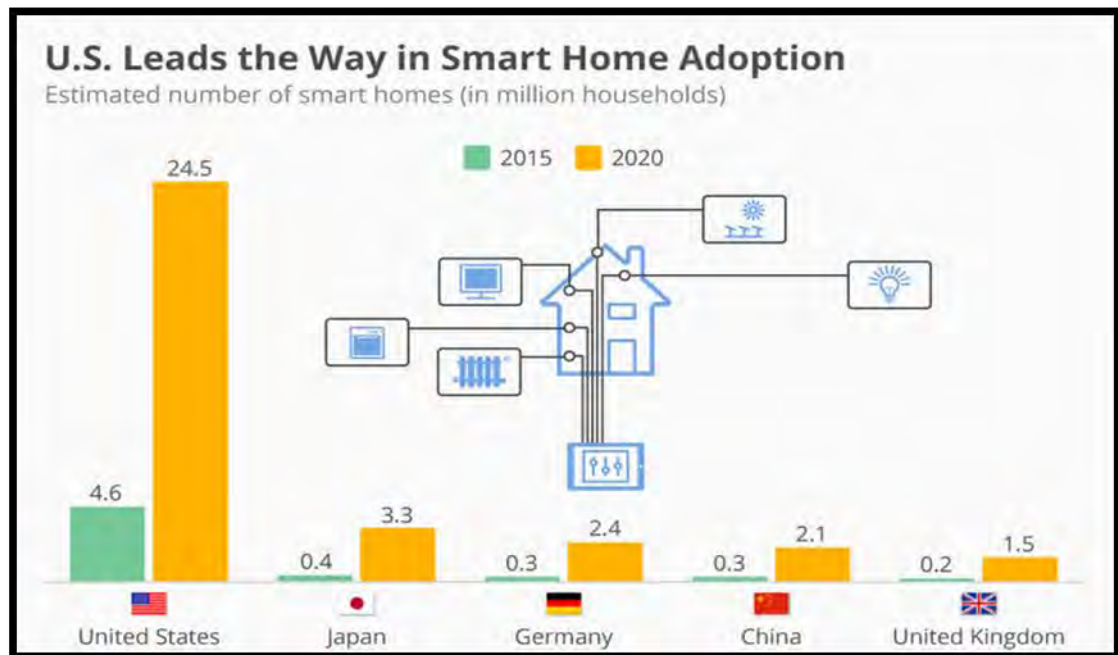
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that provided by a home security camera.

Figure 2.1: Smart Home Infographics for 2015
(*Courtesy*: http://www.statista.com/topics/2430/smart-homes/)

Figure 2.1 shows the estimated number of smart homes in five most develops country for the market of smart home technology which are United States, Japan, Germany, China and United Kingdom. According to (Statistic Portal 2015), United States leading the chart for the estimated number of smart home in year 2015 with 4.6 million households while United Kingdom is the lowest with 0.2 Million household. United States also expected to dominant the chart for year 2020 with 24.5 million households compare to other develops countries (Statistic Portal 2015).
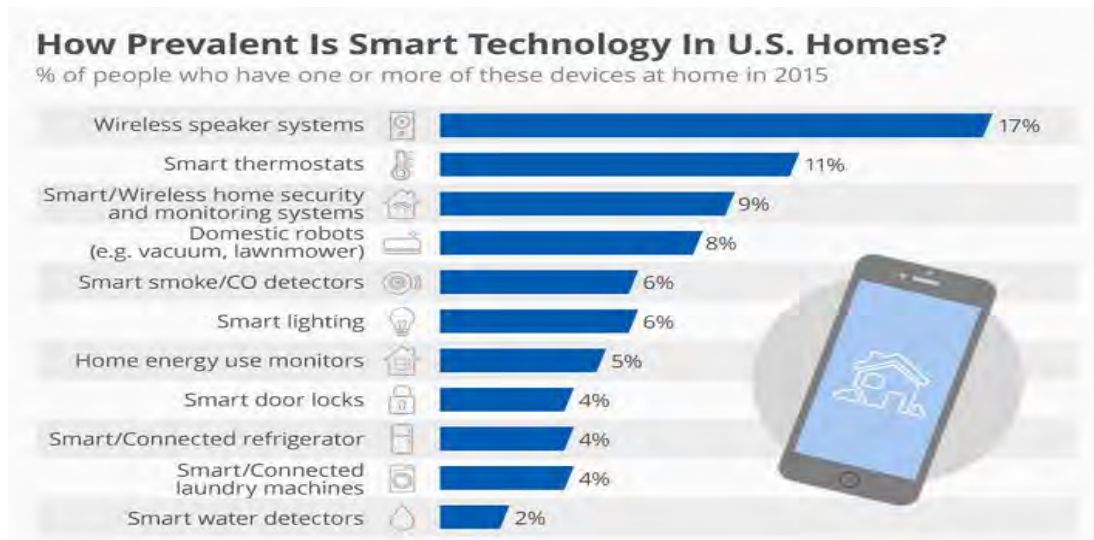
Figure 2.2: Percentage of smart technology in US home
(*Courtesy*: The Harris Poll)

From the figure, it can be concluded that wireless speaker systems dominate the percentage of people who have these kinds of devices at home in 2015 with 17%. Meanwhile, the lowest is smart water detectors with 2% and smart/wireless home security and monitoring systems ranked third with 9%.

2.1.1 Automatic Gate System

Automatic gate system is a motorized device that opens and closes the gate. It uses a remote controller to open or close the gate and also controlled by the switch on the wall. Basically, the controller contains transmitter that can be used to open or close the gate from certain distance and carried by the owner. Although some might think that having a manual gate can helps them keep fit by jumping off the car and open the gate, but certain still think that having an automatic gate is the best. Besides, in term of security aspect the house owner will not have to open the gate especially during night where there might be someone who hides somewhere and waiting for the gate to be opened. Unlike the manual gate, the automatic gates are hardly opened by the intruders and it offers a notably higher level of security compared to the manual gates.

There are few types of automatic gate such as swing gate, slide gate, fold gate and many more. But the most popular gate among users are swing gate and slide gate. It makes no difference between sliding gates or swing gate. Many prefer swing gates because they involve less maintenance but sliding gates take up less space and ensure that the driveway is always clear from wreckage. Besides that, swing gate can be forced open while for slide gate, it cannot be force open as it can only slide along the fence line. Moreover, swing gate could be affected by the wind while slide gate less affected by the wind.

Figure 2.3: Fold gate

Figure 2.4: Swing gate

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Figure 2.5: Slide gate

2.1.2 Remote Controller Attack

Fixed code remotes are used in a variety of security applications. However, these remotes are vulnerable to attacks. To gain unauthorized access to the automatic gate, all these attacks can be used (Barnett n.d.). Exposing to the internet the garage door openers might make them such easy targets as to pose a real risk (Margulies 2015). If an email account is hacked, the hacker will be given a clear course to find the user"s home address and permit to open the user"s garage. Besides, the hacker also will be able to download a whole database of user credentials of IoT openers and any of these possibilities would make home intrusions so easy as to be expected.

2.2 Software Part

2.2.1 Android

Android is an OS that are easy to use, low-cost and customizable which empowers many high technology devices across the globe such as phones, tablets and other digital mobile devices. It optimizes the efficiency of the application software in the device and also manages the hardware. Smart phones that are