UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF IOT BASED DOOR LOCK SYSTEM WITH CAMERA FOR HOMESTAY USING ARDUINO

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electrical Engineering Technology (Industrial Automation & Robotics) with Honours.

by

PANG KOK KING

B071710042

940123-05-5571

FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING TECHNOLOGY

2020

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

Tajuk: DEVELOPMENT OF IOT BASED DOOR LOCK SYSTEM WITH CAMERA FOR HOMESTAY USING ARDUINO

Sesi Pengajian: 2020

Saya **Pang Kok King** mengaku membenarkan Laporan PSM ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka (UTeM) dengan syarat-syarat kegunaan seperti berikut:

1. Laporan PSM adalah hak milik Universiti Teknikal Malaysia Melaka dan penulis.
2. Perpustakaan Universiti Teknikal Malaysia Melaka dibenarkan membuat salinan untuk tujuan pengajian sahaja dengan izin penulis.
3. Perpustakaan dibenarkan membuat salinan laporan PSM ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. **Sila tandakan (X)

☐	SULIT*	Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia sebagaimana yang termaktub dalam AKTA RAHSIA RASMI 1972.
☐	TERHAD*	Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan.
☒	TIDAK TERHAD	

Yang benar,

KING

.....

Pang Kok King

Alamat Tetap:
No 9 Taman bakti II,
71000 Port Dickson
Negeri Sembilan

Tarikh: 16/2/2021

Disahkan oleh penyelia:

Wafi

.....

En Ab Wafi Bin Ab Aziz

Cop Rasmi Penyelia

AB WAFI BIN AB AZIZ
Pensyarah
Jabatan Teknologi Kejuruteraan Elektrik
Fakulti Teknologi Kejuruteraan Elektrik Dan Elektronik
Univeristi Teknikal Malaysia Melaka

Tarikh: 17/02/2021

*Jika Laporan PSM ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali sebab dan tempoh laporan PSM ini perlu dikelaskan sebagai SULIT atau TERHAD.

DECLARATION

I hereby, declared this report entitled DEVELOPMENT OF IOT BASED DOOR LOCK SYSTEM WITH CAMERA FOR HOMESTAY USING ARDUINO is the results of my own research except as cited in references.

Signature: KING .....

Author : Pang Kok King

Date: 16/2/2021

APPROVAL

This report is submitted to the Faculty of Mechanical and Manufacturing Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Mechanical Engineering Technology (Industrial Automation & Robotics) with Honours. The member of the supervisory is as follow:

Signature: .....

Supervisor: En Ab Wafi Bin Ab Aziz

ABSTRACT

In Malaysia, tourism has become one of the largest sectors contributing to national income. Because of tourism, there are many sub-industries from tourism are able to grow. Homestay is one of the tourism products that supporting the sub industries of tourism. Homestay are introduced to let the tourist to stay with the local families and experience their daily lifestyle to learn their cultures. Many Malaysian took these opportunities to invest in homestay business as their side incomes. In the homestay industry, homestay business owner often stays in different building and they have difficulty to make time and even unable to meet up to pass the house key. This project shows the IOT based door lock system can help the owner of the homestay on solving the problem of having difficulties of meeting up to pass the house key. The system consisting of keypad, electrical door lock, microprocessors like Arduino and NodeMCU to read the passcode from the database and to unlock the door. Then, owner can also use phone application to change the passcode at the same time it can be also used to view the live footage of the front door. So, with this system the homestay business owner can give access of the house to the tourist without having to meet them. This helps saves time to the owner and the tourist.

ABSTRAK

Di Malaysia, pelancongan telah menjadi salah satu sektor terbesar yang menyumbang kepada pendapatan negara. Ini adalah kerana sector inap desa, terdapat banyak industri yang masih boleh berkembang. Inap Desa adalah salah satu produk daripada sector pelancongan yang menyokong industri pelancongan. inap desa diperkenalkan untuk memberi peluang kepada pelancong untuk tinggal bersama keluarga setempat dan mengalami gaya hidup harian mereka serta mempelajari budaya mereka. Ramai rakyat Malaysia mengambil peluang ini untuk melabur dalam perniagaan inap desa sebagai pendapatan sampingan mereka. Di dalam industri inap desa, pemilik inap desa ini salaunya tinggal di bangunan yang berbeza dan kadang-kadang mereka sibuk dan tidak dapat bertemu untuk menghantar kunci rumahnya. Projek ini adalah untuk menunjukkan sistem kunci pintu IOT ini akan membantu pemilik homestay dalam mengurangkan beban dalam perniagaan mereka. Sistem kunci pintu ini mengandungi pad kekunci, kunci pintu eletrik dan mikropemproses seperti Arduino UNO dan NodeMCU untuk mendapatkan kod laluan daripada pangkalan data dan membuka kunci pintu. Selain daripada itu, pemilik juga boleh menggunakan aplikasi telefon bimbit untuk menukar kod laluan dan juga melihat rakaman langsung hadapan rumahnya. Jadi, sistem ini dapat menolong pemilik memberi akses rumah kepada pelancong tanpa perlu berjumpa dengan mereka. Ini telah membantu menjimatkan masa kepada pemilik dan pelancong.

DEDICATION

I would like to express my utmost gratitude for those who supports me with this thesis. I am grateful for my supervisor, parents, and friends that supports and encourages me to complete this bachelor's degree project.

ACKNOWLEDGEMENTS

I would like to take this opportunity to express my gratitude to my one and only bachelor's degree project supervisor, Mr Ab Wafi Bin Ab Aziz for giving me guidance, encouragement, and support. I am truly grateful of his invaluable guidance since the beginning of this bachelor's degree project until the ends of the project. I am very lucky and honor to be able to work and study under his guidance.

I would like to present my most sincere gratitude to my parents who continuously giving me their loves and supports. It is their patience and understandings that helped me to make this project possible.

Lastly, I would like to thank all my friends from BEEA who gives contributions for me to finish this bachelor's degree project.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATION, SYMBOL, AND NOMENCLATURE

PO Box	–	Post Office Box
QR Code	–	Quick Response Code
RIFD	–	Radio Frequency Identification
IoT	–	Internet of Things
IoE	–	Internet of Everything
IoNT	–	Internet of Nano things
IoMCT	–	Internet of Mission Critical Things
CPU	–	Central Processing Unit
UART	–	Universal Asynchronous Receiver/Transmitter
PWN	–	Pulse-Width Modulation
SPI	–	Peripheral Interface

CHAPTER 1

INTRODUCTION

1.0 Introduction

A huge rise of homestay business has formed ever since there are a lot of platform on the phone that promotes and helps people with homestay business to share, made a listing, and even have a smart messaging system between owner and tenant. However, it does not change the fact that there are still a lot of processes that cannot be done through a handphone apps. Such as passing the house key from the house owner to the tenant and the owner must be there to open the door for the maids to clean the house. However, just by a little bit of improvement, it may help the homestay business owner to save precious time with minimum effort.

1.1 Project Background

Malaysia is one of the major international tourism destination and in the year 2011, Malaysia has placed in the 9th position as the most visited country in the world with the amount of 24.7 million (Hanim *et al.*, 2014). With the titled of the 9th position of the most visited country, it has given so many opportunities to a lot of business field to develops. One of the most obvious examples are homestay business. The increased number of homestays in our country has given its expansion a momentum and it has encouraged the homestay operator to improve their house facilities (Kamisan Pusiran and Xiao, 2013).

Table 1: Total number of Tourist to Malaysia and Joined the Homestay Program (Kamisan Pusiran and Xiao, 2013)

Year	Total Tourist Arrival to Malaysia (Millions)	Total Number of Tourist to Homestay Program	Percentage (%)
2010	24.6	49,126	0.19
2009	23.6	31,523	0.13
2008	22.0	23,117	0.11
2007	20.9	21,368	0.10
2006	17.4	14,458	0.08

This project is about developing a door lock system that unlocks with passcodes rather than the traditional keys. The house owner also has the ability to change the passcode by using his handphone anytime and anywhere through internet connection. With this function, the house owner saves time and effort by just message tenant the passcode so that tenant has access to the house. The house owner also can monitor the surrounding to confirms that the tenant is there, or the maid has arrived before giving out the passcode.

1.2 Problem Statement

Homestay business has been a hassle and difficult for the house owner and tenant. To give access to the tenant, the owner must plan an early meetup with the tenant in order to pass the house key. Some owner decided to solve this problem by putting the house key in the PO Box and the tenant can collect themselves, but this is not a good way to pass the key. If someone ended up get the house key and duplicate it, there will be great danger for the tenant that will be staying in the house.

Moreover, the passcode of the door lock system can be obtained through a phone application. The passcode can be set or edited by the house owner to every tenant that stays in the house. The passcode then can be obtained by the tenant through the owner. Then, the houseowner can also view the front door through the phone application to verify the tenant.

1.3 Objective

The main objective of this project was listed below:

a) To develop an automatic door-lock system.

b) To create a phone application that can generate passcode for door-lock system.

1.4 Scope of project

The scopes of the project are as below:

a) Only suitable for homestay purpose.

b) Only suitable for landed house.

c) Focus on house that have Wi-Fi.

d) The houseowner must have android smartphone.

e) Houseowner must be able to install the door lock system application in their phone.

f) The door-lock system can only be unlocked by passcode.

g) Can only set one master code for owner and one passcode for tenant and at a time.

h) Houseowner must manually change the passcode by using phone application.

i) Passcodes are only available to get inside the house. Going out of the house will have a button from the inside.

1.5 Project Significant

This project's main audience are people with homestay business. The reasons for this project are to help the homestay business owner stayed very far from their homestay and sometimes unable to meet the tenant to pass they key. This system also helps people who has homestay business as their side income and their timetable are mostly occupied by their jobs. The most common ways for the houseowner to pass the key to the tenant is to leave the key in the letterbox, which is unsafe because anyone can take the key from the letterbox. Then, some of the houseowner also pass they key to the neighbor to keep where the tenant needs to get the key from neighbor by setting time to meet with the neighbor by the neighbor's convenient time. Therefore, this system can help the owner by minimize the need of meeting the tenant or to pass they key with unsafe ways because the owner can just set a passcode and send it to the tenant from wherever they are. Then, the tenant can use the passcode to gain access to the house.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

In this chapter, research and case study was done by reviewing the previous research paper, journal, and related project titles that within the project of scope and tittle. The information is summarized and described what is auto lock system and live monitoring system. The information's from the past projects can gives insight of how to prepare for the projects and it can be used to improve the efficiency and functionality of the system.

2.1 Auto Lock System

Auto lock system can also be known as electric door locks or smart locks. It allows the user to lock and unlock the doors automatically and remotely without using keys. The system can be programmed to lock and unlock at specific or preset time without human intervention, they could work with a keypad security, access card or even biometric input depending on what the user sees fit. Even though it is hard to setup, but system like this can be great to replace messy wires system (Park, Sthapit and Pyun, 2009).

Auto lock system also involve electrical components called "actuators," which connect the cylinder to a small motor and buried within the door or frame itself. The actuator is then can be controlled by an electronic card reader, by a keypad or by a wireless

remote-control sensor. Either way, the auto lock system is programmed to start the actuator once it has received the correct electronic input.

2.1.1 Auto door lock system with smartphone apps

Every house owner has the common threat of burglary and they can always break into your home no matter how strong your lock is. Therefore, a smart locking system can ensure you a high security. Since it is without keys, burglars are unable to pick on the lock. It is statistically shown that houses with home security installed are less likely to be break into by burglars and if a burglar are smart enough to attempt to break into a house with home security system, the chances of getting caught are higher than them getting away (Tilala, Roy and Das, 2017). On the other hand, the house owner also has the power to grant anyone he wants to enter his house.

2.1.2 Auto door lock system using RIFD technology

Radio Frequency Identification also known as RIFD is an inexpensive technology with various of uses, it can be implemented in all sorts of applications like security, inventory detection and people tracking. Other than that, it can be also used as a security system where it secures a place and only authorized people can enter. The door locks open when the user put their tag in contact of the reader. And this system can also create a log where we can record down the check-in and check-out of each user. Then, This system can be very efficient because passives types RIFD are battery-less and they gain power to operates from the reader itself (Verma and Tripathi, 2010).

2.1.3 Auto door lock system using QR code

A QR code (abbreviated from Quick Response code) is a two-dimensional barcode that consist of black and white pixel pattern that allows encoding up to a few hundred characters. To use a QR code, we must have a smartphone that supports URL redirection, which allows the QR code to sends metadata to the existing applications on the device (Pragna P Rao, 2017). The QR method are the cheapest method because you will need less hardware to accomplish a project that are related to QR codes.

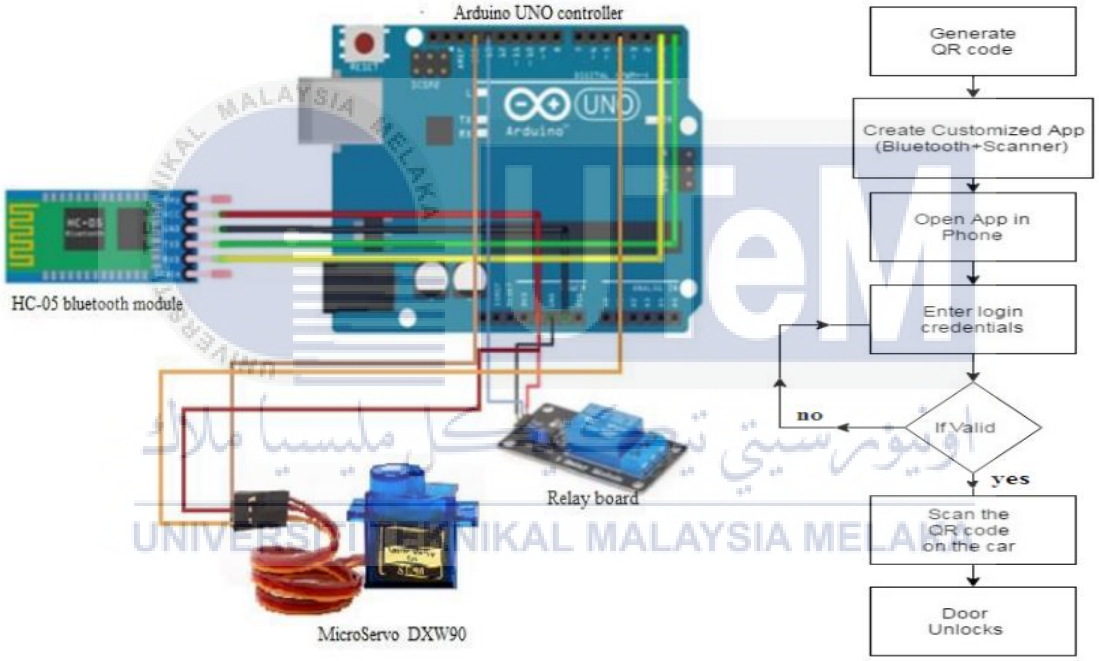

Figure 2.1: Circuit connection and flow chart of the embedded system (Pragna P Rao, 2017)

2.1.4 Passcode Based door lock system

Nowadays, there are a lot of safety lock lock available in the market and the most common door locks are password-based door lock system. This kind of door lock are functional without using a key to unlock the door. Instead, this kind of door lock are functional by using a password

base or passcode to unlock the door (Prabhakar *et al.*, 2013). When the passcode input by the user is correct, the door will unlock. On the other hand, when the user key in the wrong passcode, buzzer will be switch on and LCD screen will display a message to indicates the passcode is wrong.

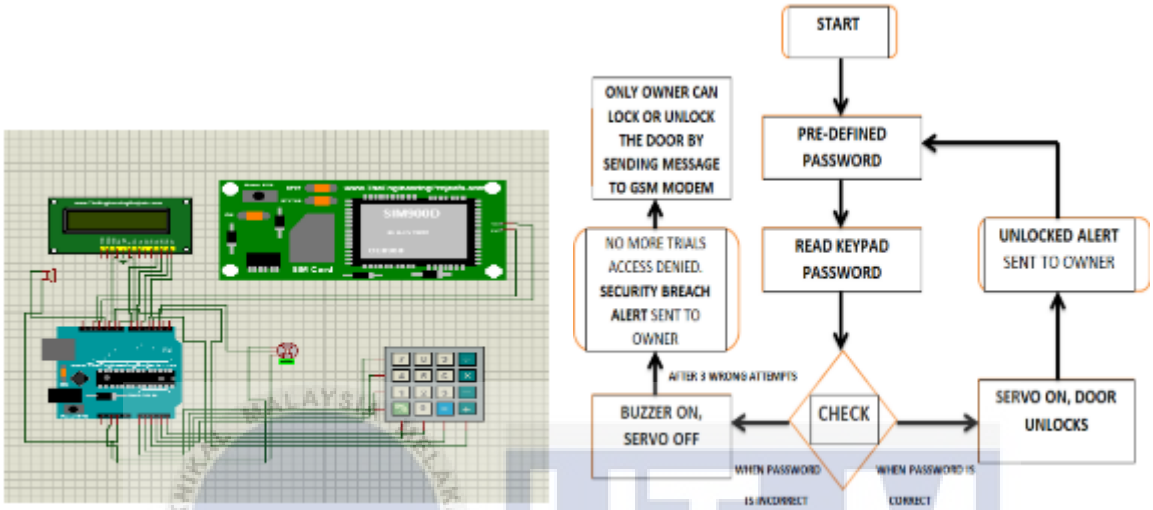

Figure 2.2: Circuit connection and flowchart of passcode-based door lock system(Prabhakar *et al.*, 2013)

2.1.5 Auto door lock system connects with Internet of things

A remote access control system might be most advanced technology because it comprises the internet to control a device or application at home when you are anywhere in the world. It allows the user to remotely control and to monitor the electronics through external network such as internet (Hwang and Baek, 2007). Auto lock system by using the IOT also enables you to do guest authentication and use solenoid actuator for the door opening while you are at anywhere around the globe. As the guess click on the switch on arriving at the door, the door entry system will let the host to conveniently monitor and control the entry of people to the house by just using internet (Gupta *et al.*, 2016).

2.2 Internet of things (IOT)

Internet of Things (IoT) is a system that interconnects hardware to each other through the internet. The interconnection happens through IP address without human-to-human or human-to-computer interaction because it is a wireless communication system (Gregorio *et al.*, 2020). As long as the devices is connected to the internet, with IoT, they can be reached and managed at any place (Keoh, Kumar and Tschofenig, 2014). Sensors like RFID and GPS enable the IoT by collecting the data for smarter decisions and is used for identifying, managing & controlling the devices. The Internet of Things (IoT) consists of IoT Board Arduino/ Raspberry Pi, RF Module, Sensor Module, Access Point (WiFi/4G/3G), IoT Server & Cloud Point. Then, IoT also has drawn so many attention because the expansion of appliances are connected to the internet (Alaba *et al.*, 2017). By using network devices with different sensors can create such an amazing applications and services that can bring significant personal, professional and economic benefits (Khan *et al.*, 2012). The Internet of Things merge digital and physical universes and acts as the fabric of the world around us smarter and responsive.