UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF IOT BASED SMART AUTO GATE

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

by

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ABSTRAK

Pada masa kini, IoT merupakan tokoh utama kepada semua peranti pintar yang membantu menyambung hampir semua benda elektrik bersama-sama. Berdasarkan projek dan penyelidikan terkini, ia menunjukkan bahawa projek berasaskan IoT semakin meningkat secara mendadak. Dalam thesis ini, pembangunan pintu auto pintar IoT telah dicadangkan. Projek ini dibangunkan untuk mengatasi cara tradisional pembukaan pintu pagar yang menggunakan cara manual dan untuk menambah baik teknologi sedia ada berdasarkan IoT. Ia menyasarkan kawasan perumahan berpagar yang mempunyai sistem sekuriti yang lemah. Hanya pengguna yang berdaftar akan dibenarkan untuk mengawal penutupan dan pembukaan pintu pagar menggunakan peranti telefon pintar. Projek yang dicadangkan akan menerima isyarat daripada telefon pintar pengguna melalui aplikasi Blynk sebelum NodeMCU memberi arahan kepada pemacu motor yang disambungkan ke motor yang akan mengawal pergerakan pintu. Setiap pengguna yang diberi kuasa akan menerima pemberitahuan melalui aplikasi Blynk untuk setiap pergerakan pintu yang disebabkan oleh pengguna lain. Dengan bantuan NodeMCU yang berdasarkan modul Wi-Fi ESP8266 Soc, sambungan antara telefon pintar dan NodeMCU boleh diwujudkan selagi internet tersedia. Untuk memastikan tidak ada kemalangan yang berlaku, sensor Infrared digunakan untuk mengesan pergerakan apabila menutup pintu. Hasil percubaan menunjukkan bahawa projek itu mempunyai beberapa kelebihan iaitu mempunya kos rendah, responsif yang cepat dan keselamatan pengguna.

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ABSTRACT

Nowadays, IoT is a key figure to all smart device that help to connect almost all electrical and electronic thing together. Recent project and research show that IoT based project has been increasing dramatically. In this paper, the development of IoT smart auto gate has been proposed. This project is developed to overcome the traditional way of opening gate using manual labor and improvise the existing technologies based on IoT. Its targeted housing area with gate system which also help to improve the security. Only authorized user will be allowed to control the closing and opening of the gate using smartphone device. The proposed project will receives the signal from user's smartphone through Blynk application before the NodeMCU trigger the motor driver connected to the motor that will control the movement of the gate. Each authorized user will receives notification through the Blynk application for every gate movement that cause by other users. With the help of NodeMCU that are based on ESP8266 SoC Wi-Fi module, the connection between the smartphone and NodeMCU can be established as long the internet is available. To ensure that no accident will happen, Infrared sensor is used to detect any movement when closing the gate. The experiment result shows that the project has several advantages which low cost, fast responsive and safety.

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DEDICATIONS

This thesis is dedicated to whom who have support me from the early and end of the project development:

My beloved parent and family

My supervisors

My lecturers

And all my friend

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LIST OF ABBREVIATIONS

ADC	Analog to Digital Conversion
GPRS	General Packet Radio Services
GSM	Global System for Mobile
GPIO	General Purpose Input/output
GUI	Graphic User Interface
IR	Infrared
IP	Internet Protocol
IoT	Internet of Thing
LED	Light Emitting Diode
MQQT	Message Queuing Telemetry Transport
MCU	Microcontrollers
RFID	Radio Frequency Identification
RSSI	Received Signal Strength Indicator
SoC	Socket on Chip
USB	Universal Serial Bus
WSN	Wireless Sensor Network
Wi-Fi	Wireless Fidelity

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CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter briefly explain the concept and idea of the propose project. In this chapter, the explanation on the background of the project, problem statement that lead the idea of this project, objectives that should be achieve, project scope and the expected outcome of this project.

1.2 Project Background

Nowadays, automatic gate is very commonly used for housing and premise. The housing area especially for those who live along the busy road and live in closed housing. This is because it helps to ease user burden especially during the rainy and night day. Hence, the house security also can be increase when using automatic gate. Smartphone and IoT is not a common thing in this present day and almost everything is connected through the smartphone application. Besides that, from the statistic provided by Statistica, the smartphone users for 2018 is 17.2 million and this proved that almost every people owned smartphone devices in Malaysia. This invention use smartphone as key to open and close the gate with the help of smartphone application. Furthermore, this smartphone application also serves as monitoring system for registered user because it notifies the user when other registered user uses the application to open and close the gate. With IoT system, user can control the gate anytime and everywhere thorough the internet access.

From the previous technology, the first gate uses manual labour to open and close the gate. Then in February 1931, the first garage door opener using code pulse remote radio-controlled is invented. In 1970, fixed code pulse was used for both remote and gate device and this enable gate to be open when it heard correct code even in the same frequency with another remote controller. Today, the trend of IoT and smart automation has been evolving and spreading to people lifestyle. The Bluetooth system,

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RFID tag, password based automatic gate has been invent and the newest internet-controlled gate system has been used especially in Japan, Europe country and United Stated. Besides that, smartphone is likely to be the paradigm in the future and more convenient to be apply in this rapid growth technology world.

1.3 Problem Statement

Currently, opening gate using manual labour is still the most typical ways in Malaysia which sometimes burden and may bring unexpected danger to house owner. For example, house owner that lives along the roadside that still use manual labour gate, they might face difficulties when opening the gate because cause by other incoming cars especially when the house located at the opposite side of the road. Therefore, automatic gate is more convenient solution to overcome this problem. Besides that, some current automatic gate system and normal gate has weak security protection to the house. The gate can be open by force and house owner is not aware when someone open the gate. Furthermore, the current automatic gate usually uses remote controlled and sometimes owner forget to bring the remote controller when going out. Losing and broken remote controlled may bring another problem to the owner to open the gate. As for using smartphone device, it is very convenient because user usually keep it all the time and the smartphone application can be install at other device when facing problem such as lost and broken smartphone.

1.4 Objectives

Objectives of the project are:

1.4.1 To develop an automatic gate system that can allow authorized user only.

1.4.2 To monitor and track the status of the gate (open or closed) condition.

1.4.3 To develop IoT based automatic gate opener that can be controlled using smartphone application.

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1.5 Scope of Projects

From the stated problem statement and objectives, the scopes of this project are mainly to ease the user burden and improve the house security. This project mainly targets the user from grounded housing area. The project focuses to only open and close the gate for authorized user only and alert another user when registered user uses the smartphone application to open and close the automatic gate.

The hardware use in this project Node MCU based on ESP8266 Wi-Fi SoC. This Node MCU is a small chip microcontroller that integrated Wi-Fi functionality. In this project, the Node MCU will send command to the motor to open and close the gate when receiving signal from the smartphone application through wireless connection. The interface for the smartphone application can be create using Blynk software. The user will register with login ID and password in the application and this application use internet connection for sending signal to control the gate. The data for registered user will be keep in the cloud storage system and the tracking of gate usage by user also can be save for further monitoring. Furthermore, by using internet access, the gate can be control anywhere and anytime as long as the smartphone and Node MCU device at house has internet access.

1.6 Expected Outcome of The Projects

Considering the main function of this is to ease use burden and improve the house security, there are several expected outcomes of this project that can be state under several condition. Because of this project is meant to be apply to the housing area., several condition that can be related has been listed based on given situation that has been took consideration. The listed table stated all the possible outcome that are corresponding with the situation with usage of the device to make the possible operation happen.

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Table 1.1.1: The expected outcome of the project.

Conditions	Expected Outputs	Reasons
Detect signal/command from the smartphone.	The NodeMCU will control the motor to open or close the gate based on the received signal from the smartphone. All registered user will received notification when someone among them use the gate through the smartphone.	Smartphone application is used to act as interface between smartphone and the NodeMCU. IR Sensor is used to detect human present and to prevent people squeezed by the gate.

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CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter discussed about the previous project and research that have been done by other people which related to the proposed project. The sources have been collected from journals, books, article, thesis, research papers and other suitable sources. All of the related sources have been read, reviewed, compared, evaluated and analysed in order to find the current trend of technology which will be implemented and improvise for the proposed project. The literature review also helps to expand the knowledge about the proposed project.

2.2 Research on Previous Project

Previous project is researched to develop a better smart auto gate system using Internet of Things (IoT). The selected previous project ranging from year 2012 until year 2018. Ten summaries of selected previous project are added in the next section in order to understand more about the topic and to find a method to improvise the proposed project.

2.2.1 Smart Gate by Sujata Jadhav, Chirayu Lalwani and Neil Parikh.

Human life has become easier when the concept of automation is introduced to the world which lessen human effort and mistakes made by human. (Ohal *et al.*, 2018) state by introducing technology to the gate work system, the security can be increase and the dependency toward human can also be diminish. Based on the current trend, mostly gate is open automatically by using remote control or manual labour. This study had proposed using RFID tag and IR sensor to detect the oncoming vehicles which then connected to the smartphone through IoT. Arduino IDE with the help of embedded C

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program is used to control the movement of motor and buzzer which will detect the unique id at the RFID tag. The smart phone will be used to remotely control the gate when unauthorized personnel is detected and the main user which control the application can remotely open the gate. The figure above shows the architectural block diagram for smart gate.

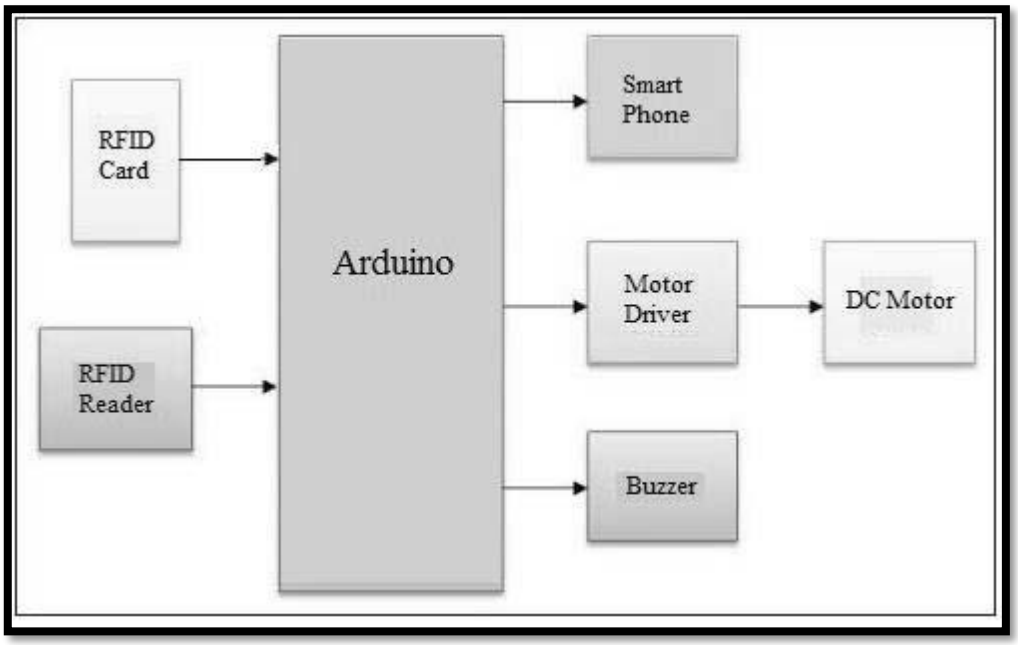

Figure 2.1: The Architectural Diagram for Smart Gate.

Although the project managed to achieve positive result, there are several improvements that can be made through the limitation. Firstly, the RFID tag can be replacing with smartphone app that can fully control the smart gate. This is because, the human or user will be expose to danger when they open their window to touch the RFID tag to the reader. Second, the smartphone app can be improved to notify the main user when another registered user using the app to open the smart gate. This will make the system will be completely independent without human presence.

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