UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Faculty of Electrical and Electronic Engineering Technology

IOT BASED HOME MONITORING SYSTEM

MOHAMAD HANIFAKHRI BIN JUSOH

Bachelor of Electrical Engineering Technology with Honours

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IOT BASED HOME MONITORING SYSTEM

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A project report submitted
in partial fulfillment of the requirements for the degree of
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I declare that this project report entitled "IOT Based Home Monitoring System" is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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APPROVAL

I hereby declare that I have checked this project report and in my opinion, this project report

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DEDICATION

To my beloved parents, especially my dear mother, Mrs. Siti Minah Binti Daud, and my father, Mr. Jusoh Bin Yahya, and the whole family who have given me a lot of support, encouragement, and advice,

and

To my dearest friends who have given me many reminders and help by moral support to give some ideas and opinions to fulfill the requirement to continue completing this thesis. I do not forget all the lecturers who gave a lot of guidance in the success of this final project thesis. Thank you for all, and only Allah S.W.T can repay all.

ABSTRACT

In this era of globalization, home automation systems are becoming increasingly popular due to the advancement of communication technology. A smart home is an Internet of Things (IoT) application that promotes the internet's control and monitoring of home appliances. Many existing systems are not user-friendly and are not equipped with good security features. Meanwhile, with the advancement of Automation technology, life has become more accessible in many aspects. Therefore, the purpose of this project is to develop smart homes to make it easier for consumers to control and monitor their residences. The objectives of this project are to develop one system related with smart home using microcontroller, to implement a home appliance that allows users to control using a smartphone and to design the system make it easier for users to monitor the home. This home automation system or smart home system uses the Arduino UNO as a microcontroller to control the inputs and outputs of the system. This project also has NodeMCU ESP8266 equipped with a WIFI module to connect the internet to the user, which will send the status to the user on the smartphone or computer wherever the user is either near or far. This project uses the Blynk Application to connect the smartphone to Arduino Uno and the NodeMCU ESP8266. Users can control and monitor the home through the Blynk App. Every notification and status about the residence can also be viewed through the Blynk app. Then, an ultrasonic sensor is used to measure the water level in the water tank. LCD to display water in water tank status. Buzzer as an alarm when the water tank level in the house reaches a minimum level. Users can control electrical appliances such as lights and fans, with users only having to turn on / off using a smartphone. User also can control electrical appliances using voice command through Google Assistant. Users can also easily monitor water tanks at home. Therefore, the project is easy to use, has safe and user-friendly features, especially for adults and people with disabilities.

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ABSTRAK

Dalam era globalisasi ini, sistem automasi rumah semakin popular berikutan kemajuan teknologi komunikasi. Rumah pintar ialah aplikasi Internet Perkara (IoT) yang menggalakkan kawalan dan pemantauan Internet terhadap peralatan rumah. Banyak sistem sedia ada tidak mesra pengguna dan tidak dilengkapi dengan ciri keselamatan yang baik. Sementara itu, dengan kemajuan teknologi Automasi, kehidupan menjadi lebih mudah diakses dalam banyak aspek. Justeru, tujuan projek ini adalah untuk membangunkan rumah pintar bagi memudahkan pengguna mengawal dan memantau kediaman mereka. Objektif projek ini adalah untuk membangunkan satu sistem yang berkaitan dengan rumah pintar menggunakan mikropengawal, untuk melaksanakan perkakas rumah yang membolehkan pengguna mengawal dengan menggunakan telefon pintar dan mereka bentuk sistem memudahkan pengguna memantau rumah. Sistem automasi rumah atau sistem rumah pintar ini menggunakan Arduino UNO sebagai mikropengawal untuk mengawal input dan output sistem. Projek ini juga mempunyai NodeMCU ESP8266 dilengkapi modul WIFI untuk menyambungkan internet kepada pengguna, yang akan menghantar status kepada pengguna pada telefon pintar atau komputer di mana sahaja pengguna berada sama ada dekat atau jauh. Projek ini menggunakan Aplikasi Blynk untuk menyambungkan telefon pintar kepada Arduino Uno dan NodeMCU ESP8266. Pengguna boleh mengawal dan memantau rumah melalui Aplikasi Blynk. Setiap pemberitahuan dan status tentang kediaman itu juga boleh dilihat melalui aplikasi Blynk. Kemudian, sensor ultrasonik digunakan untuk mengukur paras air di dalam tangki air. LCD untuk memaparkan air dalam status tangki air. Buzzer sebagai penggera apabila paras tangki air di rumah mencapai paras minimum. Pengguna boleh mengawal peralatan elektrik seperti lampu dan kipas, dengan pengguna hanya perlu menghidupkan / mematikan menggunakan telefon pintar. Pengguna juga boleh mengawal menggunakan peralatan elektrik arahan suara melalui Google Assistant. Pengguna juga boleh memantau tangki air dengan mudah di rumah. Oleh itu, projek ini mudah digunakan, mempunyai ciri yang selamat dan mesra pengguna, terutamanya untuk orang dewasa dan orang kurang upaya.

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LIST OF SYMBOLS

LCD   -   Liquid Crystal Display

IoT   -   Internet of Things

USA   -   United States of America

USB   -   Universal Serial Bus

NO   -   Normally Open

NC   -   Normally Close

CCTV   -   Close Circuit Television

PIR   -   Passive Infrared Sensor

GND   -   Ground

VCC   -   Voltage Common Collector

LED   -   Light Emitting Diode

CPU   -   Central Prosessing Unit

PP   -   Polypropylene

IDE   -   Integrated Development Environment

MB   -   MegaByte

RFID   -   Radio Frequency Identification

CPU   -   Central Processing Unit

PVC   -   Polyvinyl chloride

LIST OF ABBREVIATIONS

V -   Voltage

cm   -   Centimeter

Hz   -   Hertz

mm   -   Milimeter

L   -   Litre

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1   Background

The shift in technology in industry, which has now been termed as the Industrial Revolution 4.0 (IR 4.0), has conquered technology and taken over a substantial part of human existence. Every human being from different established or developing nations is striving hard to keep up with each other to advance themselves, their religion, race and nation, in terms of technology, particularly to be a platform that will be utilised by the current era and also the foreseeable future. The Industrial Revolution 4.0 has played a major and significant role in powering and nurturing human existence in accordance with this rising momentum of technology. Technological innovations have transformed the manner of life of traditional civilizations to depend on the infrastructures that have been established. The development of gadgets - technology such as laptops and cellphones - has had a major influence on each and every human being, whether for personal consumption or in a business organisation.

This communication network has profoundly affected the progress of home automation systems in conjunction with industrialization. Currently, the world is prepared for a new revolution in the domain of housing. Therefore, every residential sector must embrace the first move to meet this transformation. The world is currently advancing towards a new revolution in its industrial domain, which is the 4.0 revolution where the Internet of Things (IoT) is the cornerstone of this new industry [13].

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The Internet is a modern telecommunication network that links millions of networks throughout the globe. The Internet has been through numerous phases of growth, which fundamentally began with its connection with computers. The growth of computers is in accordance with the growth of the internet and the development of devices such as personal computers, laptops, tablets, smartphones and more. Basically, the internet just links various devices to transmit, receive, store and analyze information. Until recently, the internet connected objects to one another through a component of globalization known as the Interconnected Internet (IoT) [18].

The development and advancement of technology, especially in the field of telecommunication networks which are very modern at this time, cannot be denied that the internet is very much needed in daily life for all people regardless of the social status of the community itself. For now, the use of the internet by the public is increasing and it almost takes up to 24 hours. With these modern advances, there are now many technological devices that can be connected to the internet, both electronic devices and computers and smartphones. With these advances, an innovation emerged in which all these technological tools can be controlled remotely via the internet to be more efficient and save time. This innovation is called the Internet of Things or IoT [19].

The Internet of Things emerged due to technological developments, social, economic and cultural changes that demand any time connection, any things connection, and any place connection. The elements contained in IoT are sensors, connectivity, society and processes. The use of IoT can be applied to control several electronic devices at home such as lights, fans, automatic door locks and Automatic Fence Closing. Control can be done remotely using a smartphone device. The smartphone device is connected to the Internet, where the internet is a bridge between the tools and the control system used. Remote control of existing

equipment in the home can be called a smart home. With the smart home, it can make time and energy more efficient in controlling household electronic equipment [20].

Next, to make a smart home with the concept of the Internet of Things requires an electronic component that has been arranged with various functions as a system. The electronic component that we often use today is the Arduino. In addition, a network that has a high level of security is also needed because the use of the network is intended to control and monitor devices in the house in real time. Therefore, the research will conduct a study in the form of a tool "IOT Based Home Monitoring System". As for the design, we will be able to realize it in everyday life.

1.2   Problem Statement

People nowadays are too preoccupied with their everyday lives to remember to turn off their electrical appliance at home. As human beings, we cannot escape our clumsy attitude, which, along with our hectic daily routine, can lead to us being in such a rush that we forget to turn off the lights. It will result in a significant increase in the electricity cost. Furthermore, it is one of the sources of electrical waste that will cause the earth to become unhealthy. Besides, most homes today do not provide a good system. This is because today's homes still use manual methods to control home appliances. The house now also does not have good security features. Next, incidents such as a sudden lack of water level in the tank at home can occur. Meanwhile, it is quite limited for people with movement problems such as the disabled, older person and so on to control electrical equipment. As a consequence, smart homes are more secure, convenient, and user-friendly. This smart home project, which is centred on home monitoring, enables users, such as adults or people with disabilities, to easily control and monitor their homes. This is because users can handle and monitor their household appliances with only a smartphone connected to the internet.

1.3   Project Objective

The main objective of this project is to produce a smart application using IoT to facilitate the daily tasks of today's society in their homes. Therefore, to achieve this main objective, the following are the sub-objectives of this project that need to be achieved:

a)   To develop one system related to a smart home using Arduino UNO.

b)   To design a home appliance that allows users to control using a smartphone.

c)   To evaluate the system make it easier for users to control and monitor the home.

1.4   Scope of Project

The goal of this project's scope is to provide information on the features and components that will be employed. This project was about home automation and smart homes. The purpose of this project is to control and monitor for home with smartphone by using the internet. This smart home project is based on the Internet of Things (IoT) application that promotes the control and monitoring of home appliances using the internet. Among the scope of the project is using Arduino Uno microcontroller as a brain to control all the components used in this project. Additionally, the ESP8266 WIFI module was used for wireless connection between the microcontroller and smartphone developed using the Blynk App. The mobile application based on Blynk App will be developed to control electrical appliances for home-like lights, to monitor water tank level at home by using a smartphone. Home automation has a four-light where three light by control using smartphone while another one light as monitor where it will light on when water tank level reaches the minimum level. Besides, a computer fan can also control by smartphone which serves as a fan in the house. LCD is to display the system status. Furthermore, this project can control electrical applliances using voice command through Google Assistant. Besides,

this project also has a light switch to turn ON/OFF the lights manually. Lastly, this project made is to show home automation function only.

1.5   Project Outline

This report has five chapters. All of these chapters detail the process of installing this project's system, which is a "Internet of Things-based home monitoring system." This thesis is divided into five (5) chapters, the contents of which are given below, in accordance with the objectives stated earlier and the method presented earlier:

a) Chapter 1 introduces about the overview of this project system that include background, problem statement, objective, scope of projects and thesis outline of this project.

b) Chapter 2 consists of literature review. In this section, is about the discussion of related previous journal or article that have been conducted by other researchers for the improvement of the project. The information about several part of components, equipment that been used and technology will be discussed in detail at this chapter.

c) The methods utilised to accomplish this project are covered in Chapter 3. The study's flow is explained, as is the methodology and technique in the guide and equipment. The whole operation of this Project 5 system will be depicted in a block diagram. This chapter will go through the flow chart that was used, as well as the overall operation of the project.

d) Chapter 4 consists of result obtained regarding to the performance of this project will be discussed. Moreover, the discussion on the analysis based on the project result and findings is being concluded clearly in this chapter.

e) The conclusion and future research are discussed in Chapter 5. This chapter summarises the key findings and accomplishments of the studies included in this review and gives recommendations for further study.