IoT-BASED AUTOMATION SYSTEM FOR SMART HOME

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We hereby declare that we have checked this thesis and in our opinion, this thesis is adequate in terms of scope and quality for the award of degree of Bachelor of Engineering Technology in Manufacturing with Hons.

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STUDENT'S DECLARATION

I hereby declare that the work in this thesis is my own except for quotations and summaries in which have been duly acknowledged. The thesis has not been accepted for any degree and is not concurrently submitted for award of other degree.

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ABSTRACT

Home automation system gains popularity due to communications technology advancement. Smart Home (SH) is one of the Internet of Things (IoT) applications that facilitates the control and real time monitoring of home appliances over the Internet. Most existing systems are not affordable for most users due to high cost and difficult in maintenance. In addition, the existing systems are either locally or remotely controlled. Last but not the least is the lack of user-friendly interface. To overcome these limitations, this project proposes a cost effective and hybrid (local and remote) IoT-based home automation system which monitors and controls home appliances easily and efficiently via a user-friendly interface using smartphones and/or laptops. The project aims at enhancing the design and fabrication of an existing SH prototype to utilizing the IoT technology. The proposed system will integrate both technologies; Wi-Fi for local control and the IoT for enabling remote control and monitoring via an IoT platform and check ubiquitously if something is happening. This allows the system to be independent of both user location and mobile provider. NodeMCU act as a microcontroller and WIFI as a communication protocol. The status sent by the WI-FI connected microcontroller managed system can be received by the user on smart phone or computer from any distance irrespective of whether the electronic devices is connected to the internet. The software used to programme the NodeMCU is the Arduino software (IDE). This software helps to write and upload the programme into the chip in the microcontroller. The system then can merged to the switches and sensor of home appliances to prove efficient control. Several sensors will be attached to under controlled household appliances and placed throughout the home to track activities and events, and then send the sensed data wirelessly to a gateway. The system will be integrated with alert devices to detect any threats for safety and security purposes. The proposed system will be an enabler for easier, safer, and more comfortable life especially for elderly and disabled people.

ABSTRAK

Sistem automasi rumah semakin popular disebabkan oleh kemajuan teknologi komunikasi yang semakin rancak. Rumah pintar adalah satu aplikasi Internet of Thing (IoT) yang mempromosikan kawalan dan mengawas peralatan rumah dengan menggunakan internet. Kebanyakan sistem yang sedia ada tidak berpatutan kerana harga yang terlalu tinggi dan susah untuk servis. Tambahan pula, system yang sedia ada ini dapat dikawal secara dekat dan jauh. Ia juga adalah alat yang mesra pegguna. Untuk mengatasi limitasi, projek ini bertujuan untuk mewujudkan sistem yang berkos rendah dan hibrid(dekat da jauh) IoT-sistem automasi rumah yang dimana dapat mengawal alatan rumah dengan efisien dan senang, dengan menggunakan telefon pintar dan komputer riba. Sasaran projek ini adalah untuk menambahbaikkan reka prototaip rumah dengan menggunakan teknologi Iot. Projek yang dicadangkan ini akan menggunakan kedua-dua teknologi iaitu Wifi untuk kawalan dekat dan Iot untuk kawalan jauh., dan juga akan memeriksa kejadian yang aneh berlaku. Hal ini membenarkan sistem ini untuk berdikari kepada lokasi dan juga telefon pintar. NodeMCU adalah sejenis mikrokontroler dan WIFI adalah asas komunikasi. Status yang disampaikan oleh Wifi yang disambungkan ke mikrokotroler dapat mengurus sistem yang diterima oleh pengguna telefon pintar dan juga computer riba dari jarak yang dimana alatan elektronik disambungkan ke internet. Perisian yang digunakan untuk memprogramkan NodeMCU adalah Arduino (IDE). Perisian ini dapat membantu untuk memuat naik program ke dalam cip, yang terletaknya di dalam mikrokontroler. Sistem ini dapat bergabung ke suis dan juga sensor alatan rumah untuk membuktikan kawalan yang efisien. Sebahagian daripada sensor akan diletakkan untuk mengawal alatan rumah dan mengesan aktiviti. Sistem ini akan memberi data kepada alat pengawal betujuan utuk keselamatan. Matlamat projek ini dicadangkan untuk kesenangan, keselamatan, mudah dan juga mesra pengguna, terutamanya khas untuk orang dewasa dan juga orang kurang upaya.

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LIST OF SYMBOLS

RH	Relative Humidity
V	Voltage
mA	MilliAmpere
T	Time
C	Sonic Speed
L	Distance
A	Ampere
GHz	Giga Hertz
S	Second

LIST OF ABBREVIATION

IoT	Internet of Thing
SH	Smart Home
RFID	Frequency Identification
IR	Infrared
IT	Information Technology
WAN	Wide Area Networking
NO	Normally Open
NC	Normally Close
EMR	Electromechanical Relay
RTD	Resistance Temperature Detector
T/C	Termocouple
NTC	Negative Temperature Coefficient
LED	Light Emitting Diode
DC	Direct Current
AC	Alternating Current
TF	Infrared
RF	Radio Wave
PHP	Hypertext Pre-Processor
IDC	Integrated Development Environment
MQTT	Message Telemetry Transport

CHAPTER 1

INTRODUCTION

1.1 Project Background

With augmented growth of automation technology, home automation system are upgrading its technology within time to emphasize the revolution of industry 4.0 which currently is the trend of automation and data exchange in manufacturing technologies. It introduce cyber-physical system, the Internet of Thing (IoT), cloud computing and cognitive computing. The first Industrial Revolution is generally considered to be the steam machine which made the steam power exploitable opening the industry age, the Second Industrial Revolution is generally seen as the application of electricity to create mass production, especially in the new automotive industry; Third Industrial Revolution is generally linked to the extensive use of electronics and information technology to automate production. The transition of revolution is imperative as the industry 4.0 subsist to represent the fourth revolution that has appear in manufacturing. The fourth industrial revolution will take what was started in the third with the endorsement of computers and automation and enhance it with smart and autonomous systems fuelled by data and machine learning. In this case it is the automation of smart home revolution. The term automation itself means a various control system with no human intervention. It involved the process of controlling and operating of diverse equipment, machinery and industrial mechanisms. By combining the Internet of Things (IoT) applications it will guide the control and real time monitoring of home appliances over the Internet. Internet of things is developing every day from small scale machines to large scale machines that can share data and accomplish tasks while individuals are occupied with other activities.

The term Home automation or smart home is given the name as it portray a living arrangement that is equipped with technology to monitor its residents and support the prosperity of home. In another words it is the process of controlling home appliances automatically using varies control system approach. The electrical home appliances and different type of sensor such as lights, fan, motion sensor, temperature sensor and others can be control and monitor by various control system technique. The main function of smart home is to have more intelligent monitoring and remote control and enabling them for influential harmonic interaction among them such that the everyday house works and activities are automated without user intervention or with the remote control of the user in an easier, more convenient, more efficient, safer, and less expensive way.

Smart Home (SH) has been a feature of science fiction writing for many years, but has only become practical since the early 20th Century following the widespread introduction of electricity into the home, and the rapid advancement of information technology, (Muhamad, 2003). The first "wired homes" were built by American hobbyists during the 1960s, but were limited by the technology of the times. The term "smart house" was first coined by the American Association of House builders in 1984. With the invention of the microcontroller, the cost of electronic control fell rapidly and during the 1990s home automation rose to prominence. Despite interest in home automation, by the end of the 1990s there was not a widespread uptake.

Majority of the homes already have some of the "smartness" because countless devices already have built-in sensors or electronic appliance controllers. Devices of smart home system are linked with each other and reachable through one main point, which are tablet, smartphone and laptop. Light, door locks, thermostat, televisions, home monitors and cameras and also the appliances such as the washing machine, refrigerator and television can be monitored through one smart home system. The smart home system is installed on gadgets or other internet devices (Woodford, 2018). Smart home appliances appear with self-learning expert by which the users can study the homeowner’s schedules and timetables and arrange as needed. Smart homes enabled the lighting control and allow the homeowners to cut the electric consumption and thus it gives an advantage from energy-related cost savings. Some of the home automation systems give an alert to the homeowner if any motion is recognized at home while far away, and some of the appliances can call the fire fighter if in case of fire

situations. These are actually the example of Internet of Things (IoT) technology. The Internet of Things (IoT) is an approach that takes all things a step forward by introducing a main control.

The most leading form of smart home system is there are gadgets used by the homeowners and it can be controlled by themselves. It is a constant system at which it controls the home in all aspects such as switches appliances on and off. The gadgets which had been commonly used is android. Android is a well-known brand. The proved is it had been used over 328 million shipped worldwide, the system has a great monopolized the smartphone industries. According to Strategy Analytics, android managed to hold a record of 88% of the worldwide market in 2016, meanwhile for Apple's iOS devices, the share dropped to 12.1% from 13.6% the previous year (Bhattacharya, 2016). There are some of the source system for the smart home which are Linux and Kernel. Linux is the well-known and the common used as an open source operating system. It is a software that is crucial for all of the software on a computer, receiving requests from the programs and communicate the requests to the computer's hardware. Kernel is a great piece of the system that monitors the CPU hardware, allocates memory, accesses data and runs the applications. It is the first program will on the computer screen when the program starts up (Halvens, 2018).

1.2 Problem Statement

Home is the place where people live and individuals invest their most of the time at home. Walking along with the revolution industry, smart home is an emerging innovation, which has changed the way individuals live. Currently, there are various design of smart home which consist of multiple control system can be choose from. However this smart home can be categorized into two main categories which is local control and remotely controlled systems. The different between local control and remotely control systems is the way for operation. Basically, the remotely control can use internet connection by using their electronic devices for long distance while the local control using in-home controller with a stationary or wireless communication technology to connect to the central hub or gateway.

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