HOME SMART SYSTEM IOT BASED

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2021

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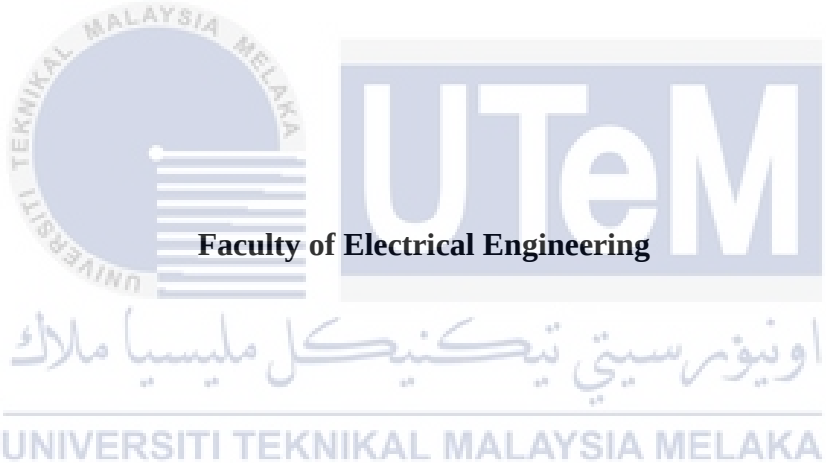
A report submitted
in partial fulfillment of the requirements for the degree of
Bachelor of Electrical Engineering with Honours



Faculty of Electrical Engineering

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2021

DECLARATION

I declare that this thesis entitled "HOME SMART SYSTEM IOT BASED is the result of my own research except as cited in the references. The thesis 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 report entitled “Home Smart System IoT Based” and in my opinion, this thesis it complies the partial fulfillment for awarding the award of the degree of Bachelor of Electrical Engineering with Honours

Signature : aziah

Supervisor Name : DR AZIAH KHAMIS

Date : 5/7/2021

DEDICATIONS

This final project is dedicated to my beloved parent and family, with my gratitude for the support, tolerance, inspiration throughout my study.

ACKNOWLEDGEMENTS

First and foremost, all praise to Allah, the most Gracious and the most Merciful for giving the opportunity to undergo final year project Home Smart System IoT Based.

Secondly, I would like to take this opportunity to express my deepest thanks to my supervisor, Dr. Aziah binti Khamis for providing invaluable guidance, comments, suggestions and continuous support throughout the course of this project. Her remarkable ideas and suggestions are very much appreciated in the whole journey of completing this report.

This gratitude is also addressed to all lecturers, friends and fellow colleagues that have been much help in sharing knowledge and ideas throughout completing this project.

ABSTRACT

This proposal proposes a modern home architecture and prototype implementation Automation framework that utilizes WiFi technologies as an infrastructure for networks connecting the elements. There are two key components of the proposed framework; the important element is the server, which introduces the system center that monitor, records, control and tracks the home of people. The aims of this project is to design an open-source, low-cost and easy to use home automation device that will integrate the Arduino open source microcontroller with the web browser to build a quick, easy-to-use home appliance control system. The Arduino is the first to be designed for Wi-Fi and web browser interfaces. First in a home model, the machine is made to operate with appliances. Finally, using Blynk App and Google Assistant, a basic user interface is developed to render the device user-friendly, completing the configuration of the home automation system. The device architecture for home automation was successfully introduced. Using the laptop and mobile web browser, a wireless network link was rendered to Arduino, enabling the appliances in the home model to be managed through smartphone.

ABSTRAK

Kertas ini mencadangkan kerangka automasi pelaksanaan seni bina rumah moden dan prototaip yang menggunakan teknologi WiFi sebagai infrastruktur untuk rangkaian yang menghubungkan elemen tersebut. Terdapat dua komponen utama rangka kerja yang dicadangkan; elemen pertama adalah pelayan (pelayan web), yang memperkenalkan pusat sistem yang mengurus, mengawal, dan menjejaki rumah orang. Projek ini bertujuan untuk merancang alat automasi rumah sumber terbuka, murah dan mudah digunakan yang akan mengintegrasikan mikrokontroler sumber terbuka Arduino dengan penyemak imbas web untuk membina sistem kawalan perkakas rumah yang cepat dan mudah digunakan. Penyelidikan dilakukan dalam banyak fasa. Arduino adalah yang pertama dirancang untuk antara muka penyemak imbas Wi-Fi dan web. Pertama dalam model rumah, mesin dibuat untuk beroperasi dengan peralatan. Akhirnya, dengan menggunakan Aplikasi Blynk dan Google Assistant, antara muka pengguna asas dikembangkan untuk menjadikan peranti ini mesra pengguna, menyelesaikan konfigurasi sistem automasi rumah. Senibina peranti untuk automasi rumah berjaya diperkenalkan. Dengan menggunakan komputer riba dan penyemak imbas web mudah alih, pautan rangkaian tanpa wayar diberikan kepada Arduino, yang memungkinkan peralatan di rumah model dikendalikan melalui telefon pintar.

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LIST OF SYMBOLS AND ABBREVIATIONS

IoT	-	Internet of Things
MU	-	Microcontroller Unit
CCU	-	Computer Control Unit
IR	-	Infrasound
AMR	-	Adaptive Multirate
GSM	-	Global Mobile Communication Systems
WLAN	-	Wireless LAN
SMS	-	Short Messages Services
IFTTT	-	If This Then That

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CHAPTER 1

INTRODUCTION

1.1 Background

The Internet of Things (IoT) is a vision of a web of communicating intelligent items, such as home appliances, vehicles, factory machinery, wearable devices, and numerous sensor forms. The advancement of innovations such as universal wireless networking, machine learning, real-time analytics and embedded devices has rendered modern IoT implementations accessible in a multitude of fields. Traditional smart house, Internet of Things, cloud computing and rule-based event management are the essential elements of the suggested revolutionary smart home embedded compound. Each element contributes its main features and technologies to the proposed composition. Combined with a number of sensors, IoT provides internet connectivity and remote mobile system command. Sensors may be attached to home-related equipment, such as air-conditioning, lighting and other environmental sensors. And so, it embeds computer information into home devices to include forms to measure home conditions and track the performance of home appliances. Cloud infrastructure includes flexible computing, storage and software tools for constructing, maintaining, operating home services and controlling home devices anywhere at any time. The rule-based event processing method offers the regulation and orchestration of the whole advanced smart home platform. Home automation relates to controlling and tracking home equipment by utilizing micro-controllers or computer technologies. Automation is popular nowadays because it provides simplicity, security and efficiency. In this way, a sensor detects the state of equipment and updates the web server. If the client is far from home, the appliance status may be reached and reconfigured, i.e. switched on / off. This paper aims to present a low-cost architecture that produces an IoT-enabled Smart Home Device utilizing IoT.

1.2 Problem Statement

The development of smart home system through the use of complex and advanced technologies there provides convenience and improve the life standard. Its ability to manage complex and centralized control systems provides the opportunity to improve energy efficiency and increased safety. It gives users to have more control to control their home, for example, it allows them to set the situation when the lights are on, and at the same time it can provide comforts to the user especially to the elderly, the disabled and those with functional disabilities. Home automation systems, although providing their users many advantages, are costly. This also avoided the availability of these goods in every residence. There are two types of wired and wireless domestic automation currently available. Wired home automation systems may be implemented at high expense, as the system requires a centralized control system for the entire house cable. The high cost measured is referred to as the lifetime to be taken into account in the operation of the consumer system. If one system functions, for example, the entire system may be affected. While the wireless implementation, if a system is damaged, the complete system won't be affected. This project therefore proposes the use of a low-cost home automation system employing wireless connection for domestic equipment and for the control of the household environment, particularly of the elderly, the disabled and those with functional disabilities in particular.

1.3 Objectives

- To develop a low-cost Smart Home System WiFi communication to control and monitor home appliances where it can provide comforts to user especially to the elderly, the disabled and those with functional disabilities.
- To develop a system of remote control that allows data transfer via smartphones.
- To evaluate the performance of the proposal Home Smart System functionalities in term of automation and system monitoring of the developed system.

1.4 Scope of Work

Designing an open source, easy-to-use and low-cost smart home device is the scope of this project. To this end, by transmitting signals to control home appliances, the Arduino microcontroller is used to serve as the key function for the machine to connect with the Blynk App and Google Assistant to control and monitor home appliances using smartphones.

CHAPTER 2

LITERATURE REVIEW

2.1 Definition of Smart Home

The home appliance industry has entered the digital era with the exponential development of information technology [1]. The introduction of automated home appliances allows it easier for individuals to access them; users can appreciate rich information and resources on the internet at the same time. The smart home system, however, is a hierarchical system consisting of a variety of multiple smart devices [2]. Because of the distinct type, structure, and style of usage, there is a significant gap between smart devices. Due to the common type, structure, and use of the smart system, there is a huge variation between intelligent devices.

Smart Home is a new technology designed with special standardized wiring to enable residents to connect a single button to remotely monitor or program a range of automated home electronic devices. For example, to set up a home security device, track temperature gauges, switch on or off appliances, regulate lighting, set up a home theatre or entertainment system, and conduct many other tasks, a traveling homeowner can use a smartphone[3]. When computer technology merges, the area of home automation is increasingly growing. Communications, television, security, comfort and information systems compose the home network.

2.2 Previous Technologies in Smart Home Systems

Many home automation projects are focused on the particular goals of the developed world. For instance, the intelligent home system [10] and the Zigbee system [11] have been built with a focus on the electricity usage of equipment. The initiative seeks to minimize the energy consumption of electrical equipment. Ramlee and others [12] have introduced wireless Bluetooth technology. By retaining physical controls, the system has been extended, with traditional switches replaced with a 5V switch, which ensures that there is no electrical shock.. Security is the main goal of the home environment. The project used a Bluetooth module with a calculated frequency of 2400 Hz and a contact range at 3 Mbps of up to 100 metres. However, regulated interfaces are restricted to seven picante interface modules. The GSM application for home automation is designed and applied [13] and [14]. The drawback of using GSM is that only the Short Message Service (SMS) makes it accessable anywhere as the end user automatically changes his new home status. The consumer does not have a graphical interfaces in this article [14] and is expected to remember basic AT commands to operate the machines. Home security based on WiFi system utilizing a web-based personal computer (PC) monitoring and control of attached home devices has also been launched [15]. A Wi-Fi network has a propagation range of up to 100 meters and a data processing capacity of up to 11 Mbps. WLAN technology needs bigger power compared to other application styles but access to a wide area of coverage and high speed.

2.3 Wifi Module NodeMCU ESP8266

One of the main components for the smart home system are NodeMCU. The only reason for choosing NodeMCU over Raspberry Pi is that the NodeMCU has built-in Wi-Fi. This reduces prices and thus NodeMCU is cheaper than other systems used on the market. Inbuilt Wi-Fi helps with remote connectivity. The device can be accessed from any remote location across the globe equipped with an internet connection. Once an input is provided, the system can continue to work even though there is no connection to the internet. The device can also be manually controlled [9]. Starting for basic smart home control capabilities; these products can be installed by anyone. NodeMCU ESP8266 is an open source IoT platform. It includes firmware operating on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" applies to firmware rather than dev kits. The firmware uses the language of the Lua script. It is based on the eLua project which is based on the Espressif Non-OS SDK for ESP8266. The NodeMCU ESP8266 is an open-source firmware and development kit that lets you prototype your IOT product.

Features:

- Open-source
- Interactive
- Programmable
- Low-cost
- Simple
- Smart WI-FI enabled inside
- Arduino-like hardware IO: Specialized hardware IO API that can significantly minimize repetitive hardware setup and manipulation work.
- Network API Node Style: an event-driven API for network applications that makes it easy for developers to write code running on a 5mm*5mm Node Style MCU

2.4 Related Works

The platform developed by Iqbal and others [4] used Kinect by Microsoft and the X10 framework to develop a network for disabled people to use smart home appliances via gestures. The computer architecture consists of a CCU (personal computer) linked with Kinect. The CCU is attached to the X10 transceiver module via USB/Radio Frequency. The X10 module transfers instructions to appliances or computers through established wires. There is also a directory that documents each address and status of these devices. The person with a disease simply motions the machine they want to run. The Kinect build sensors take the gestures and pass it to the CCU to translate them to system instructions. The downside about the strategy is it applies mainly to people who do not write.

Rashid and others are introducing a home automation app for people with disabilities [5]. Its architecture consists of an IR array (infrasound) multiple sensor, an ultrasonic sensor module (HC-SR04), a Bluetooth unit, a microprocessor unit (MU) and array of computer relays. The sensors use the relays to send the device data to the MU to activate the device. Doors immediately open and shut as individuals approach the entrance. This device's key purpose is to eliminate the use of water and energy (MU-operated pumps). The downside of this product is that it is not clearly intended to have control for individuals with disabilities and device design.

Vineeth et al. [7] suggests an eHome unit. Their structure is much the same as the method in [5], with the difference that voice controls are used to operate machines. The machine can be used for people with physical disabilities. An eHome-design contains a V3 speech recognition board, an microprocessor Arduino UNO, a Raspberry Pi Modules, Raspberry Pi and arduino power supply and a microphones. To provide input, the person uses a microphones attached to the V3 speech recognition board. The Arduino United Nations is attached to the V3 module. It transforms signals into internal data types sent to the RF receiver by the arduino UNO. The Raspberry Pi is linked to the RF receiver . The temperature, humid, motion detectors and other sensors are correlated with the Raspberry Pi. The information collected from various sensors will be sent to the data cloud for

analysis and user access. The downside of eHome is that users need to read programming manuals and it is more difficult for persons with disabilities to utilize them mostly due to the difficulty of the framework.

In the paradigm developed by Sunehra and Tejaswi [6], two systems are included. The first machine includes the HC-05 Bluetooth module and Arduino Bluetooth smartphone software for operating devices. The second method uses Global Mobile Communication Systems (GSM) to power electric equipment (GPRS). The Raspberry Pi is linked to the cameras, the Bluetooth module and the SIM 900 GSM modem. The commands Raspberry Pi are obtained by relays that monitor lights and other modules. Raspberry Pi can also be attached to web cams. Voice instructions are sent to the Raspberry pi with the Arduino Blue Control app mounted on your smartphone. The end user may only use the smartphone to pass guidance to the Rpi. It suppose that this method is complicated for disadvantaged persons and may be costly because of the strategy.

Basanta and others are suggesting a technique using both voice and motion [8]. The MPU6050 accelerometer is used to record motions rather than Kinect by Microsodt as in [4]. Voice is recorded with dedicated AMR (Adaptive MultiRate) hardware sound codecs, Bluetooth, Arduino boards and tablets. The home appliances and Bluetooth devices are connected to the microcontroller. Users may use a mobile to turn equipment on and off. The device is made up of the accelerometer MPU-6050, the microcontroller Nano ATMEGA328P and the Bluetooth HC-06 serial module to obtain knowledge of the accelerometer while waving arms and hands. The gesture scheme allows filters to be used for noise, verification and smooth effects by mathematical manipulation. Since no noise filtration is required and end consumers do not need to use a smartphone to position orders, these approach is both easier and cheaper. Users can use standard conversation phrases/commands to monitor equipment using a digital assistant.

Table 2.1 Comparison Between Previous Works

Authors	Advantages	Limitation	Microcontroller Used
[4] Iqbal and others in "Smart Home Appliance Control System for Physically Disabled People using Kinect and X10",	The person with a disease simply motions the machine they want to run. The Kinect build sensors take the gestures and pass it to the CCU to translate them to system instructions	The downside about the strategy is it applies mainly to people who cannnot write.	Microsoft Kinect and X10 Protocol
[5] Rashid and others in, "A New Design Approach of Home Automation System for Patients with Physical Disability to Reduce Water Wastage and Power Consumption using Renewable Energy",	The sensors use the relays to send the device data to the MU to activate the device. Doors immediately open and shut as individuals approach the entrance	The downside of this product is that it is not clearly intended to have control for individuals with disabilities and device design.	Its architecture consists of an IR array (infrasound) multiple sensors, an ultrasonic sensor module (HC-SR04), a Bluetooth unit, a microprocessor unit (MU) and array of computer relays
[7] Vineeth and others in "Wireless Voice-Controlled Multi-	The machine can be used for people with physical disabilities. An eHome-design uses	The downside of eHome is that users need to read programming manuals and it is	V3 speech recognition board, a microprocessor Arduino UNO, a Raspberry Pi

Functional Secure eHome",	voice recognition system to produce input to be transfer to the microcontroller.	more difficult for persons with disabilities to utilize them mostly due to the difficulty of the framework.	Modules, Raspberry Pi and arduino power supply and a microphone. To provide input, the person uses a microphone attached to the V3 speech recognition board. The Arduino United Nations is attached to the V3 module
[8] Basanta and others in, "Assistive Design for Elderly Living Ambient using Voice and Gesture Recognition System",	Used a system that utilized both voice and motion.	The accelerometer's disadvantage was the accumulated inaccuracy with null bias following a protracted measuring period which impacted its angle preciseness.	The MPU6050 accelerometer while Voice is recorded with dedicated AMR (Adaptive MultiRate) hardware sound codecs, Bluetooth, Arduino boards and tablets