MODULAR SMART HOME USING WiFi TECHNOLOGY

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I/We* hereby declare that I/We* have checked this thesis/project* and in my/our* opinion, this thesis/project* is adequate in terms of scope and quality for the award of the degree of *Doctor of Philosophy/ Master of Engineering/ Master of Science in Computer Science (Computer Systems & Networking) with honours

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I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

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ABSTRAK

Malaysia sedang bergerak dengan pesat ke dalam dunia teknologi Internet of Things (IoT). Ini dapat dilihat dengan projek perintis MIMOS seperti Aquaculture Farming: From Pond to Plate, Continuous Health Monitoring, Smart Village: Lanchang and Intelligent Landfill Management. Modular Smart Home Using WiFi Technology adalah projek tindak balas terhadap usaha Malaysia di dalam IoT. Perkakasan dan sistem Smart Home boleh dilihat di seluruh dunia dari Amazon Echo ke Google Home dan sistem buatan Malaysia, VYROX Smart Home tetapi masalah dengan sistem ini adalah banyak fungsi yang dimasukkan ke dalam satu peranti di mana pengguna tidak mempunyai pilihan untuk menambah atau menghapus fungsi dan jika satu bahagian kecil sistem ini rosak, pengguna perlu mengubah keseluruhan peranti termasuk bahagian-bahagian yang berfungsi dengan sempurna. Objektif projek ini adalah untuk melaksanakan teknologi WiFi ke dalam peranti rumah pintar, untuk melaksanakan versi modular peranti rumah pintar dan untuk melaksanakan langkah-langkah keselamatan asas ke dalam aplikasi rumah pintar

ABSTRACT

Malaysia is moving rapidly into Internet of Things (IoT) technology realm. This can be seen with MIMOS pilot projects such as Aquaculture Farming: From Pond to Plate, Continuous Health Monitoring, Smart Village: Lanchang and Intelligent Landfill Management. Modular Smart Home Using WiFi Technology is a project in respond towards the effort of Malaysia in IoT. Smart Home hardware and systems can be seen around the globe from Amazon Echo to Google Home and our home grown system, VYROX Smart Home but problems with these system is many functionality squeezed into one device in which user has no choice to add or remove functionality and if one tiny part of these system is faulty, user need to change the whole device including parts that is working in perfect condition. This project objective is to implement WiFi technology into smart home device, to implement a modular version of smart home device and to implement basic security measures into the smart home application.

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LIST OF ABBREVIATIONS

AI	Artificial Intelligence
AP	Access Point
GB	Gigabyte
IoT	Internet of Things
IP	Internet Protocol
JSON	JavaScript Object Notation
LPG	Liquefied Petroleum Gas
L.E.D	Light Emitting Diode
MIMO	Multiple-input Multiple-output
PTP	Precision Time Protocol
RAM	Random Access Memory
SSID	Service Set Identifier
SSL	Secure Socket Layer
TLS	Transport Layer Security
WiFi	Wireless Fidelity

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Smart home and home automation is a term that is used to describe a house that its appliances such as fan, thermostat, lighting, security and many more is controlled or automate by smart devices. Earlier, smart home devices use Bluetooth and Infrared technology to monitor and control its functions. Nowadays, Wi-Fi is used widely due to its ability to work locally and remotely. This means, Wi-Fi can be used to create a Local Area Network privately for the smart home device alone or be connected to the cloud for remote control and monitoring.

Example of remote monitoring is the ability to view the cameras connected to the smart home devices and the ability to view statistics of smart home devices remotely. Statistic in this case ranging from power consumption, operating hours, amount of data usage to send information to cloud and more. Control means the ability for user to control the smart home devices locally or remotely without the need to physically connected or touch the device.

While the smart home technology keeps getting better year by year, modularity is only tackled by two major companies, Amazon and Google, each with Amazon Echo and Google Home. These two devices is a voice activated smart speaker. They can order products online, play music, search internet for information and many more by using voice command. Both of this company uses their AI to collect and process user

request. This is good for western market and not for the eastern side of the world. These AI is only good for people with good English pronunciation as it struggle with other accent.

Modularity in this thesis means the system or the hardware components can be separated and later recombined. This introduces flexibility to user of the system. While these components are separated from the system or hardware, the main function of the system is not affected and can continue running without any disturbance. This also means that a faulty or offline component will not have an impact towards the functioning of the main system function.

In this thesis, a WiFi connected modular smart home device with mobile application is proposed to connect modular smart home device and control it. WiFi is proposed to connect each modular smart device to a central device that will constantly sense each modular device and connect with a mobile application. Android mobile application is proposed to connect with central device to control the entire modular smart device connected to the central device.

1.2 PROBLEM STATEMENT

Followings are the problem statement of this project. The project is in action to solve the following problems.

i. Existing smart home solutions consists of one device that control the whole smart home ecosystem in a house. If a device is found faulty, user need to change the whole solutions.
ii. Existing smart home systems uses voice recognition to process user commands. This does not work fluidly in countries where the English pronunciation is not fully mastered.

1.3 OBJECTIVE

The objective is the goals that is designed to solve the problem arises in section 1.2. The objective of this project is as follows.

i. To propose encrypted data transfer into smart home mobile application.
ii. To design WiFi technology into smart home device.
iii. To implement a modular version of smart home device.

1.4 SCOPE

The scope provides the boundary for this project. The problem solving solutions and features are bounded to the scope. The scope of this project is as follows.

i. Design WiFi technology into smart home device.
ii. Build a smart home device that can work modularly.
iii. Control smart home device using android phone application.
iv. Implement encrypted data transfer into mobile application.

1.5 THESIS ORGANIZATION

This thesis consists of five chapters. Chapter 1 shall discuss on the introduction to the project. This chapter contains introduction, problem statement, objectives, scopes and thesis organization. Chapter 2 shall discuss the literature review of the project. It contains introduction, home automation today, existing systems, proposed system, comparison and conclusion. Chapter 3 shall discuss on the methodology of the project. It contains introduction, methodology, system design, hardware and software design, Gantt chart, implementation and testing. Chapter 4 shall discuss on the results and discussion on the projects based on the testing done during the development of this project. Chapter 5 shall discuss on the conclusion made based on the project findings. This includes the project constrains and future works.

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