



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**HOME AUTOMATION SYSTEM USING ANDROID
BLUETOOTH**

This report is submitted in accordance with the requirement of Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Computer Engineering Technology (Computer System) with Honours

by

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APPROVAL

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ABSTRAK

Sistem automasi merupakan salah satu kemajuan dalam teknologi untuk meningkatkan taraf hidup kita. Cara kita berurusan dengan sistem rumah kita untuk menghidupkan dan mematikan lampu atau kipas sentiasa menggunakan cara yang sama yang boleh di naik taraf lebih baik. Dalam kajian ini, automasi rumah dilaksanakan untuk meningkatkan cara standard kita untuk membangunkan sistem automasi rumah kos rendah dengan menggunakan sambungan Bluetooth melalui telefon pintar Android yang mana kebanyakan pengguna boleh akses pada masa kini. Segala-galanya kini perlu dilakukan secara automatik untuk menawarkan kepada kita cara yang lengkap, murah dan mesra pengguna. Sistem ini beroperasi dengan menggunakan aplikasi telefon pintar Android yang telah dicipta untuk mengawal lampu dan kipas di rumah. Sambungan Bluetooth antara telefon pintar Android dan mikrokontroller diperlukan untuk beroperasi. Sistem ini juga menawarkan mod automatik yang di mana pengguna tidak perlu untuk mengawal lampu dan kipas, sebaliknya dengan penggunaan sensor. Sensor yang digunakan adalah sensor cahaya (LDR), sensor suhu dan sensor gas. LDR akan mengawal lampu, sementara sensor suhu mengawal salah satu kipas dan sensor gas mengawal kipas yang satu lagi. Mikrokontroller yang digunakan dalam sistem ini ialah Arduino ATmega kerana menawarkan lebih banyak input dan output yang dapat digunakan.

ABSTRACT

Automation system is one of advancement in technology to improve our standard of life. The way we deal with our home system to turn on and off the light or fan is always the same that could be improve to be more efficient. In this paper, home automation is implemented to increase these standard way be developing a low cost home automation system by using Bluetooth connection via Android smartphone which most of the people could have accessed to nowadays. Everything now needed to be automated as much as possible to offer us a complete, low cost and user friendly way. This system operate by using Android smartphone application which has been built to control the state of the light and fan in the home. The Bluetooth connection is created between the Android smartphone and the microcontroller to operate. The system also offer automatic mode which the user does not needed to control the state of the light and fan by implementation of the sensors. The sensors used are light dependent resistor (LDR), temperature sensor and gas sensor. The LDR would control the light, while the temperature sensor control one of the fan and the gas sensor control another fan. The microcontroller used in this system is Arduino ATmega as it offer more number of input and output that could be use.

DEDICATION

To my beloved parents, Mohd Shamsuri Bin Bidin and Norlida Binti Mahmud and for my beloved family who encourages me, also do not forget to whom may involve in order helping me to complete my project. Finally, a big thank to my supervisor, Effendy Onn Bin Siam, who always encourage and guide me until the completion of the project.

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LIST OF ABBREVIATIONS

ADC	Analog-to-Digital Converter
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System Messaging
GUI	Graphic Interface User
LCD	Liquid Crystal Display
LDR	Light Dependent Resistor
MMS	Multimedia Message Service
PWM	Pulse-Width Modulation
SMS	Short Message Service
USB	Universal Serial Bus
3D	Three-Dimensional

CHAPTER 1

INTRODUCTION

1.0 Introduction

In this 21st century, the smartphone device are being develop continuously to be more reliable with faster processor, many built in feature, bigger storage for memory and many more improvement. The Bluetooth connection capability gives smartphone ability to add more new features as primarily utilize to exchange data. The technology of using Bluetooth is initially invented in 1994 by Ericsson which is a telecom. This invention gives much more benefit when comprise using smartphone integrated as the Bluetooth change the way of a person on the uses in digital device either at office or home because it has become wireless devices instead of the wired device. Besides that, the one who created the Bluetooth connection which is called as the host could communicate between maximum of seven device with same Bluetooth connection at one time by using the same link. By default, it could operate within area of eight meter wide thus it specifically gives benefit to smaller area such as in the house to be implement. The utilization of the Bluetooth system technology gives the smart home automation system a best approach to provide comfortable, more convenience life and secured system that also provide the control of lighting, air conditioning system, temperature control and robotized services. As the rapid increases in the user of smartphone, it capable of changed it to many purpose remote device to be used for many features to provide the user in their needs in daily life. Some open source in Android platform is actually being used worldwide by using the smartphone in the past years. The Android system has complete package that included core application and an operating system like other devices.

1.1 Background

The home automation system is not new in current industry. There is various system that has been implement to integrate with the home automation system for it work effectively depend on the objectives. One of the current system that exist is using Global System Messaging (GSM) for the home automation system. It used the GPRS network for the connection so when the connection is down, the system could not fully work as it depend on the network. The downside is that the GPRS user need data pack as it is required to be renew every thirty days which make it not very cost friendly. It is also very costly as proved by many system that used GPRS network system compare with other such as wireless connection, WiFi. The WiFi network connection has much more system that used it as the main connection as it is easy to be use. Almost all network nowadays use WiFi which can be accessible by anyone as it is more user friendly. In this case, the implementation of WiFi required an architecture that most people would use which is the Raspberry Pi microcontroller. The Raspberry Pi is actually has many features which sometime we does not use it depend on our requirement. It also more complex for the people who new in using technology. The microcontroller is also expensive to be implement. The other implementation used in the home automation system is using Programmable Logic Controller (PLC). This system is far more superior to be implement as it is wired technology and it is outdated system to be used as of now only wireless system is more reliable and widely used. As being said that, the home automation system still does not provide feature such as automatically control the home appliance without the user depend on the condition specified. The system also does not have system notification which the user could manipulate the command to give to the system for execution regarding the notification sent. Thus, the chosen Bluetooth system technology is the vital technology for the home automation system. This system able to allow the wireless device to send data between the two connected devices as long as in the range. Piconet is the network of the Bluetooth device created in one set which is best technology for the network to be use inside home. All of these system is an effort to change the uses of cables to wireless technology for more convenience as to coup with the current modern era in our life.

1.2 Problem Statement

These day, the people are trying to find a way to improve their daily life for better quality life. This would not work without include using the latest technology that available nowadays. When new facility or appliance which could provide them with better life style, they would take it no matter what to make their life easier. Without their knowledge, as more appliance or features added to the home, it become much more complex to make the control or operate the appliances much easier than before as it mix with many feature. Besides that, the wall switch is being located on various part of the house. It becomes more tiresome as it necessary to manually operate it to control the house appliance by switch it on or off by going to the wall switch. Another problem would rise when the user is old people or disable person which make to operate the home appliance hard for them. Other than that, it getting more impossible to monitor all the appliances that has been turned on or currently running as sometime we forgot to turned off which could lead to energy waste and more costly.

1.3 Objectives

- I. To develop wireless control via Bluetooth connection for home automation system using Android application controlled remote.
- II. To analyses the capability of controlled remote device for home automation system and do enhancement.
- III. To develop low cost home automation system using controlled remote device.

1.4 Scope

The scope of this project is that this development of home automation system could be used anywhere inside home using controlled remote device which is Android smartphone via Bluetooth wireless connection. This system could be used by anyone as long as the Bluetooth connection is connected between the microcontroller and the Android smartphone control using the application developed. Besides that, the range of the wireless Bluetooth using HC-05 module for the home automation system would be in 10 metres (32 feet) range due to the specification of the HC-05 Bluetooth module.

CHAPTER 2

LITERATURE REVIEW

2.0 Overview

The home automation system that also could be called as domotics is known to control the home appliance, activity and special features by electronic control and automatic. Many different mechanism control system are used for the residential purpose in the building. The automated system application such as control home appliance, lighting, security locks for doors, windows, air conditioning or ventilation system and also surveillance camera is being implement for the home automation system. The vendors available out the is very competitive in applying a system as there not much industry that accept the standard of the smart home system as it is very fragmented heavily. Thus, the manufacturers always prevent the implementation independently through withholding the documentation and also through litigation. Nowadays, the home automation system worth 5.77 US billion dollar in 2013 market, as to be predict would be reach up to 12.81 US billion dollar by 2020.

2.1 Related Research

2.1.1 Design and Implementation of a Reliable Wireless Real-Time Home Automation System Based on Arduino Uno Single-Board Microcontroller

The paper presents plan and initial concepts of a controlling real-time domestic home system using Arduino microcontroller as the main controllers by (Bader M. O. Al-thobaiti, Mahdi H. M. Alzahrani, Iman I. M. Abosolaiman,

and Mohamed S. Soliman*, 2014). This proposed research framework has two operating modes. Begin with one is indicated as a manual automated mode which the user could observe and remote the home apparatuses from around the world by utilizing the smartphone by using Wi-Fi communication innovation. Next is alluded to a robotized mode operation that could make the controller to be competent of controlling and observing various diverse machines in the domestic actively in reaction by the electric signals produced from specify sensors. How to back up of the convenience by the submitted strategy, an equipment and tool usage by the Matlab Graphical User Interface stage for the submitted framework is carried out and the unwavering quality of the framework is presented. So that the submitted framework appeared to be a straightforward, taken a toll compelling and adaptable thus it become a reasonable and a great candidate for the home automation in the next few years.

Two primary equipment components that make the center of home automation system comprises is the Arduino microcontroller and Personal Computer home server that is adaptable, reasonable, offering an assortment by the computerized and serial interface along analog inputs which is computerized and Pulse Width Modulation outputs. Besides that, it actually simple to be utilize, interfaces with the PC by means of USB connection and transferring data utilizing built in serial convention protocol, execute in one by one mode and interfacing it as associated to the PC. Moreover, it fortunate to provide the free writing program. Open source venture as it is, the hardware and software is amazingly available while exceptionally adaptable to manipulated and expanded. Thus, the design of the system created is appeared in the Figure 2.1. The computer of domestic server has the Matlab Graphical User Interface stage administration and Arduino remotely calculate that empowers the client to get to the house apparatuses using the smartphone utilizing Wi-Fi connection technology. It send data to the Arduino microcontroller by USB information exchange wire.

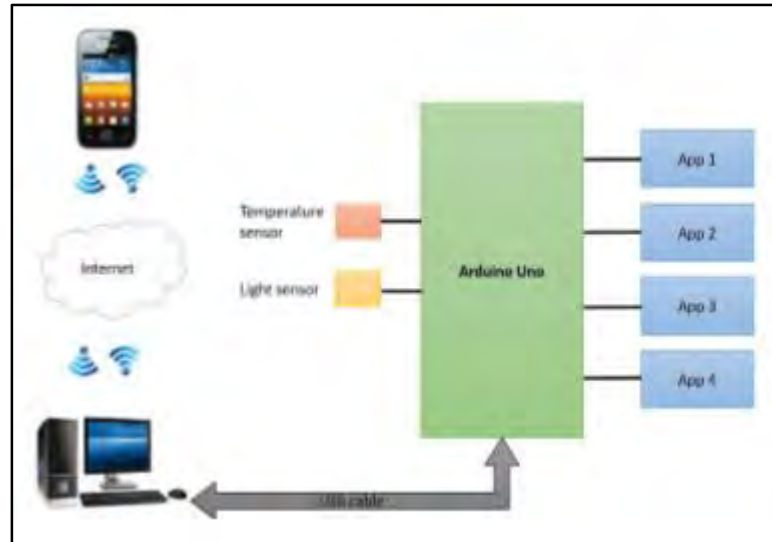


Figure 2.1: The home automation framework architecture (Bader M. O. Al-thobaiti, Mahdi H. M. Alzahrani, Iman I. M. Abosolaiman, and Mohamed S. Soliman*, 2014)

2.1.2 An Intelligent Remote Controlled System for Smart Home Automation

(Chandak and Joshi, 2018) said that home automation is a vital point of reference in accomplishing smart network and is ever energizing field that has detonated over the past few years. Progression in innovations have made homes more helpful, proficient and indeed more secure. Presenting the Raspberry Pi to the world of home automation gives various customizations to turn a normal domestic into a smart domestic. Raspberry Pi gives a low fetched stage for interconnection electrical/electronic gadgets and different sensors in a home through the web network. The fundamental objective of present work is to plan a smart home which can be controlled and observed by the Raspberry Pi. This paper proposes the plan and usage of Smart Home computerization framework with observation monitoring system utilizing Raspberry pi and PIR sensor for portable gadgets. It increments the utilization of portable innovation to supply basic security to our homes and for other control applications. The center of the venture is on making a difference clients to operate home.

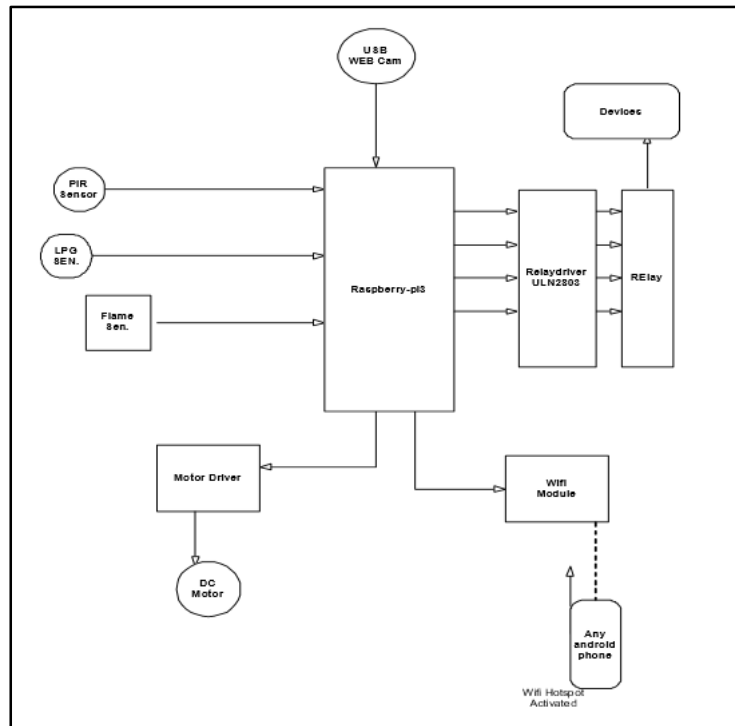


Figure 2. 2: Block diagram for home automation (Chandak and Joshi, 2018)

The capacities of the different components are firstly the USB camera system. The USB camera system captures the picture and send the signal data by using the USB port on Raspberry Pi microcontroller. That USB camera system show utilized to demonstrate 2.0. Raspberry Pi could be a little credit-card measured computer competent of performing different functionalities such as in reconnaissance frameworks, military applications, etc.

The different components of Raspberry Pi microcontroller are firstly is the SD card space to utilize by introduce Operating System, long term capacity and booting. Total of full memory of the SD card is around 8GB. The small scale USB control port gives 700mA with current 5A. Besides that, RCA video out is connected to show in case the HDMI port is not utilized effectively. The system primarily utilized to send over sound and video signals. It is specially named which known to be called as audio and video jacks. Sound out advanced sound is gotten in case HDMI has been utilized by getting the stereo sound. Thus, at this point the analoge RCA connection is utilized. Other than that, Ethernet port has been utilized by put through the Web. Moreover it runs on a

part of upgrading, obtained unused computer program less demanding. HDMI out is utilized with HDTV by screen it with HDMI input. BROADCOM BCM 2835 is something else characterized as framework on microchip of the system . It could be a 700 MHz processor of value. By using it, it encompasses the video center GPU system. Thus the GPIO permits us to manipulate and associated with genuine world.

2.1.3 A Review Paper on Home Automation System Based on Internet of Things Technology

(Tiwari and Gedam, 2016) said that Internet on Things are expansion of nowadays web aim to supply information, association, and connection of two different gadgets and apparatus that known the things. IoT meaning to indicate common architecture of the capacity of the internetworking gadgets to obtain and read information data by the surrounding world where we live in, also at that point send that data information over specify Web server at where data could be handled and used it for the different purposes to meet the requirement. The system is cooperate with keen machines association to communicate effectively with another objects, situation, frameworks or machines. Current era have each individual are associated within one to another utilizing parts where is most of communication way is web or by another meaning, we could define it as web that interface people groups could interface objects as well. A few main communication innovations utilized with the nowadays home automation system incorporate Wi Max, Bluetooth connection, and Zig Bee, Remote LAN or Wireless Wifi also Worldwide Framework to be used for Portable Communication (GSM). In this paper utilizing Wireless WiFi module. The system provide the client total control of the system by controlling machines with an inaccessible interface system. The home automation system is the utilize of remotely control frameworks also with data innovation to manipulate hardware, mechanical apparatus, forms and others diminishing requirement provided to increase human mediation.