

Home Automation System Using Android Application

Saptarshi Bhowmik¹, Sudipa Biswas², Karan Vishwakarma³, Subhankar Chattoraj^{4*}, Parami Roy⁵

¹Department of Computer Science Jadavpur University

²IBM India

³Research Associate ESL Technologies

^{4*}Research Associate ESL Technologies

⁵TCS, India

Abstract - In today's world automation has played a key role in developing human's life and enhancing safety and security protocol. Mobile phones nowadays are very common to all people. Everyday household work like switching ON /OFF the fan or lights, decrease or increase in air conditioner temperature can be easily done using smartphone. Today home automation system (HAS) has been a key area of research in recent times. Home automation using android platform eliminates the process of individual involvement and enhancing easier and faster daily household needs for everyone. The home automation system (HAS) designed on android platform has been interfaced with 8 bit microcontroller i.e. arduino to control the home appliances using relay. Bluetooth has been used as the most reliable and efficient technology for short range communication. Different sensor has been used which are illustrated in details below. This paper provided a novel approach enhancing automation in household works and eliminating the traditional method of switching.

Index Terms- Arduino, Relay, Android, Home automation system, Bluetooth

I. INTRODUCTION

Today most home uses the electronic appliances such as fans, light, air conditioner etc. As the mobile phones are very common to all people nowadays using mobile as the key for controlling the home appliances will enhance the affordability and simplicity of the HAS. Mobile phones with android based operating system are regarded as smart phone. This smart phone has the capability of connecting to most electronics equipment. The android application needed for the operation of HAS is designed in Android platform. To increase the security feature of the android application password protection has been implemented. Arduino has been used as a microcontroller. Bluetooth has been used for the short range efficient connections. Sensors like MQ5 the LPG sensor and LM35 the temperature sensor and DHT11 the humidity sensor has also been interfaced with arduino to enhance the safety feature of the HAS [1]. The MQ5 is the most reliable gas sensor it can

detects the leakage of LPG gas and a buzzer has also been implemented to alarm the user in case of gas leakage. In case of fire breakout the temperature increases rapidly. LM35 detects the temperature and alarms the user so that possible measure could be taken to withstand a vital disaster.

II. HARDWARE PLATFORM

The hardware platform comprises of an Arduino UNO, digital computer, temperature sensor (LM35), gas sensor (MQ2), temperature and humidity sensor (DHT11), and a buzzer which are discussed below with their function in the home automation system.

A. Arduino UNO

Arduino UNO [2-3] is an 8 bit microcontroller board which is based on ATmega328P. It comprises of 14 digital input and output pins, a 16 MHz quartz crystal, USB connection for easy computer connectivity and a reset button to eliminate and restart in case of malfunction. It has an operating voltage of 5V, a flash memory of 32KB and a clock speed of 16 MHz for faster data processing.

B. Temperature Sensor (LM35)

LM35 are integrated-circuit temperature [4-5] devices which generates an output voltage linearly proportional [6] to centigrade temperature. It requires no calibration or trimming to achieve most precise output. Lower cost if the device makes it more affordable. It operates on the input voltage of minimum of -0.2 V and maximum of 35 V. It works on an output voltage of maximum of 6V and minimum of -1V.

C. LPG Sensor (MQ5)

The MQ5 gas sensor [9-10] is the best choice for LPG leakage detection as it provides a wide range of accurate LPG detection range from 200ppm to 10000 [12]ppm it works on AC or DC in $5V \pm 0.1$ [11]. It is a better choice rather than MQ2 [7-8] as it has a shorter detection range from 5000ppm to 10000ppm [12].

D. Humidity Sensor (DHT11)

DHT11 is a humidity sensor [13] utilizes a capacitive humidity sensor along with a thermistor to analyze the surrounding air to provide digital output to the data pin connected. It provides with almost accurate data in real time for every 2 seconds. Because of its low cost and high accuracy rate it makes it more popular in the weather sensing and analyzing industry.

E. Bluetooth Module

Bluetooth module HC-05 provides radio communication between almost all communications enabled devices enabling user with efficient wireless communication on an unlicensed radio spectrum [14]. It typically operates on a frequency of 2.4GHz and has a range of up to 20m to communicate with other devices.

III. SYSTEM ARCHITECTURE

In the home automation system (HAS) the user interfaced android application has been implemented in android platform enabling easy access for the user and arduino has been used as a microcontroller with relay circuit and Bluetooth module for wireless access.

A. Interfacing of instruments

A Bluetooth based mobile with android OS has been interfaced with the Bluetooth module and the Bluetooth module has been interfaced with arduino UNO. The relay circuit has been interfaced with the appliances and the relay circuit has been connected to arduino. LM35 and MQ5 and DHT11 have also been interfaced with the arduino. A detail description has been illustrated in the Block diagram below Fig1.

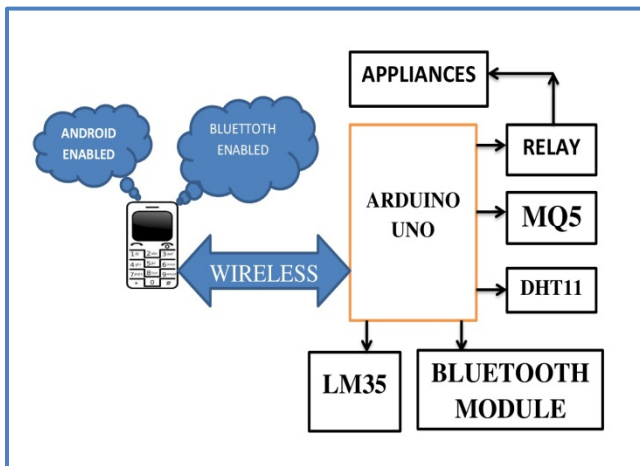


Fig1: System Architecture Overview

B. Bluetooth Application Controller for Arduino

Bluetooth application controller for arduino [15-16] is available in GOOGLE play store it serves as a six controlling devices which is touch operated android application. It makes the home automation system more

easily accessible, enhances easy operation and eliminates the tradition method of switching. It has been linked via the Bluetooth module HC-05. The control action has been done by relay. The Fig1.1 provides the snapshot of the used android application.

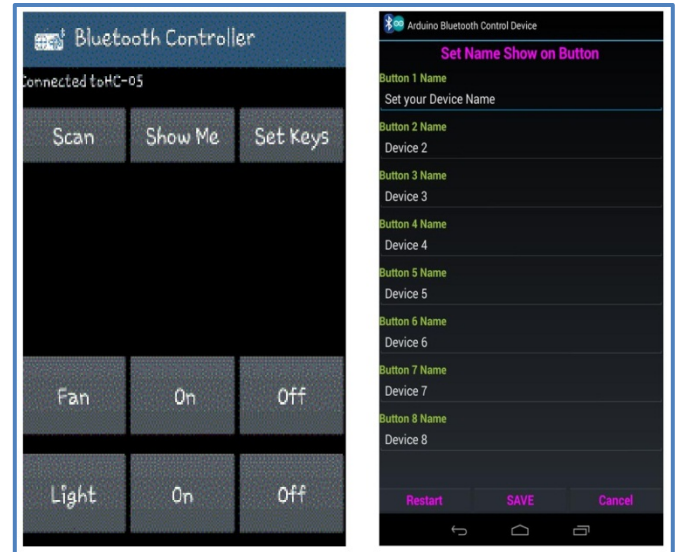


Fig1.1: Snapshot of the Application

IV. APPLIANCES IMPLEMENTATION

In this section the appliances used are illustrated. Various daily house hold required devices in day to day life are used.

The following devices used are given below:-

- Bulb
- Television
- Fan
- Refrigerator
- Music player
- Air conditioner

The appliances are simulated using relay and the dc motor drives the appliances when the command is given using the application. Below in Table1 the simulation for appliances for different input is illustrated.

Table1. Simulation Table for Appliances

SL.NO	TOUCH INPUT	OUTPUT
1.	DEVICE ON	BULB ON
2.	DEVICE OFF	BULB OFF
3.	DEVICE ON	TELEVISION ON
4.	DEVICE OFF	TELEVISION OFF

5.	DEVICE ON	FAN ON
6.	DEVICE OFF	FAN OFF
7.	DEVICE ON	REFRIGERATOR ON
8.	DEVICE OFF	REFRIGERATOR OFF
9.	DEVICE ON	MUSIC PLAYER ON
10.	DEVICE OFF	MUSIC PLAYER OFF
11.	DEVICE ON	AIR CONDITION ON
12.	DEVICE OFF	AIR CONDITION OFF

V. CONCLUSION

The home automation system using android application has been tested and successfully implemented. This system is highly reliable and efficient for the aged people and paralyzed person on a wheel chair who cannot reach the switch for the switching of ON/OFF the device and are dependent on other. This system has a wide scope development and modification. The voice control system can be implemented with accuracy in voice recognition and better pitching analysis. More devices can be simulated and timer could be set for automatic operation.

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AUTHORS

First Author – SaptarshiBhowmik, M E Computer Science Jadapur University,

Second Author – SudipaBiswas, IBM India,

Third Author – Karan Vishwakarma, Research Associate ESL Technologies, karan11071993@gmail.com

Fourth Author- SubhankarChattoraj, Research Associate ESL Technologies, subhankarchattoraj@ieee.org

Fifth Author- Parami Roy, TCS India

Correspondence Author – SubhankarChattoraj,
+918450846544, subhankarchattoraj@ieee.org