Home Automation System: A Step Forward To Better Lifestyle

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Abstract: This paper presents the overall design of Home Automation System (HAS) with combination of Bluetooth technology and Android Application. Our proposed model represents an effective technique for the user to control the home appliances and other devices via the Android App. A person can control all home devices from any place in home with the help of an android application, this application connected with system using Bluetooth technology. If connection between system & android application is disconnected then all ON devices in home will be automatically OFF, this is the main aim of our proposed model. The home automation improves the daily life of control of the home device. Also, the smart home concept in the system improves the standard living at home. This system is intended to help and give support in order to fulfil the needs of aged and disabled in our home.

Keywords: *Home Automation System (HAS), Bluetooth, Android, Application, Wireless, Technology, Graphical User Interface (GUI).*

I. INTRODUCTION

Everyone in this economical world prefers to make the things easy and simple to handle, our proposed model gives an example to some extent for controlling home Systems. We present the design and implementation of a low cost prototype of a Bluetooth-based home automation system using an Android App. This model focuses on the development of an embedded system for home automation system that uses standard devices as a user input devices. The design uses the electrical home appliances that are physically connected to input/output ports of this board via relays and Android application, is developed to provide a user friendly Graphical User Interface (GUI) for the mobile control of home appliances. Control operation is achieved by android application upon a GUI based touch screen operation. In order to achieve this, Android app act as transmitter, which sends ON/OFF commands to the receiver where loads are connected. By operating the specified remote switch on the transmitter, the loads can be turned ON/OFF remotely through wireless technology.

Due to the improvement of wireless technology, there are several different of connections are introduced such as GSM, WIFI, and Bluetooth, each of the connection technology has their own unique specifications and applications. All of these four popular wireless connections that often implemented in HAS model, Bluetooth is being Chosen with its suitable facility. Bluetooth is a standard way to connect the devices and eliminate the wire between them. It is low power, low cost, and easily available device. Bluetooth is presented in many device like smart phone, tablet etc. Bluetooth technology is easy to use and recognize. Hence it could be used properly in a cost efficient way. The main advantage of Bluetooth technology is, if we go far away from the Bluetooth range then the connectivity breaks and device turns OFF automatically. Thus it makes very much easier as well as saves our electricity also. Such system is uses for short range area mainly for Houses.

II. LITERATURE SURVEY

The Home automation systems can make use of host of communication methods such as Wi-Fi, GSM, Bluetooth, ZigBee. Different controlling devices and their configurations can be found in existing systems. Such systems have been found already in many places for a wide variety of applications. We had done study about different systems using different communication methods as per their need and requirements. As per survey of our Literature various workers gain achievement in this field.

"Angel Deborah S" [1] along with their students has made a review study about different Home Automation Systems methodology like GSM based Home Automation System, Bluetooth Based Home Automation, Phone Based Home Automation, ZigBee Based Home Automation, Wireless Control Systems, Mixed Type of systems.

"Aporva Mishra" [2] with his colleagues has developed a system which runs on Dual Tone Multiple Frequency (DTMF) technology using mobile phone that makes a call to the mobile phone attached to the robot. It receives DTMF tone with the help of the mobile phone attached to the robot. The received tone is processed with the help of DTMF decoder. Here the drawback is of using separate mobile phones for user and robot attached to system as well.

A. Existing Systems

There is various wireless technologies are available that we already mentioned. There are various technologies and system using some developer makes home automation systems, few of them are listed below.

1. Advance Home Automation Using FPGA Controller

The author [3] proposed of this system, in this type of technology with Field Programmable Gate Array (FPGA) controller, Bluetooth and Android phones. It is wireless technology, VHDL language is used for a Xilinx Spartan-3E. V means VHSIC (Very High Speed Integrated Circuit). FPGA Controller is based on Basys2 development board, FPGA has a many input and output pins so, and it can connect number of home equipment's. FPGA is used for controlling home equipment's. Bluetooth is used for monitoring equipment by wireless technique. Android phone is used for speech recognition. DC motor, stepper motor, a LED is connected to FPGA. A microcontroller has less number of input and output pins than FPGA Controller. Main aim of this technology is to increases the speed using parallel communication.

2. GSM Based Home Automation System Using App-Inventor for Android Mobile Phone

Home automation based on GSM system using App-inventor for Android mobile proposed Mahesh N. Jivani [4]. In App

inventor, the programme has to design different blocks than design the source code like in Lab VIEW software. Programming is not essential. The key aim in this paper stated that is to have ease in programming using App inventor and security using GSM. App inventor is a platform to design a new smart phone apps using android. User has to login first online then start to devise both part the screen objects (Designer) & the programming logics (blocks). User can control home equipment using GSM by each corner of world. In hardware, ULN2803 octal peripheral driver array, ATMEGA328 Arduino board with microcontroller, GSM Modem, Relay and some other small components are used. Arduino board worked as a transceiver. It has 23 I/O lines. In this Home Automation System hardware and software part was done individually.

3. Efficient Interactive Control System based on GSM

This system proposed by Mohamed Salman, Jayavrinda Vrindavanam, [5]. In this paper they had stated the wireless GSM technology used with with AT89S52 microcontroller. Simulation software is Proteus v7.7 and Keil compiler used for embedded C programming. Prime aim of this model is if in future any accident will happen then system will send SMS messages to the user. At any instance, user can send request for condition of system. Home appliances can be control using SMS service means GSM so user can save his/her money and time. In this the proposed system, power supply gives 5V power to the system. AT89S52 is 8- bit, low cost controller. MAX232 is used for conversion of signal. Relay driver ULN2003 drives the all relays which connected to the loads. Last but not the least GSM module SIM300 is messenger between the user and microcontroller using AT command.
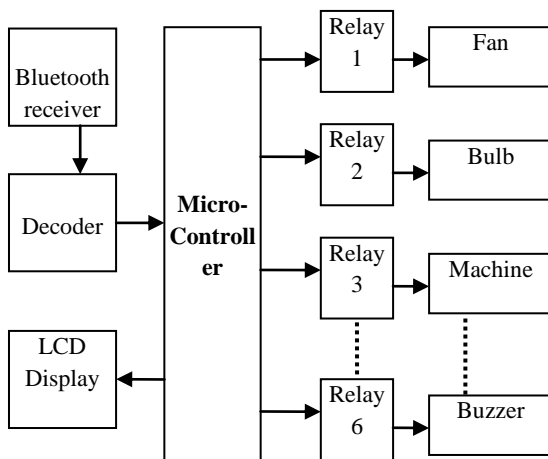
III. BLOCK DIAGRAM

Figure 1:- Block Diagram

1. Micro-Controller (8051)

It is the major part of our proposed model. It maintains the temperature, humidity and light intensity to the desired value. The 8051 has one serial port that receives and transmits data. Transmission and reception can take place simultaneously, the four communication modes possible with 8051 present the system designer and programmer with opportunity to conduct very sophisticated data communication network. It is the heart of the system which controls all the inputs and the controlling action to be taken at the output. In our system we are using Microcontroller is the AT89S51.

2. Relay

Relay is used to control the on/off operation of device. Relays are driven by the transistors. We are using single pole double throw (SPDT) relay.

To perform switching of relay transistor BC 548 is used, Relays are used because:-

- Relay can switch AC & DC, whereas transistor can only switch DC.
- Relays can switch high voltage, transistor cannot.
- Relays are a better choice for switching large currents (i.e.>5A).
- Relays can switch many contacts at once.

Relay acts as a switch which is used to control the 230 volt AC supply. This relay will be turned off if there is no person inside the room. This relay can be used to turn off the electrical appliances like fan, tubes etc.

3. Bluetooth decoder

It consists of Bluetooth decoder. It gives ASCII code output. This receiver enables wireless transmission& reception of serial data. It has 10 meters range.

4. Display

It is used to display the current values of the measuring quantities. It can be used to display the various options and all the readings that have been stored in the EEPROM. There are two types of display LCD or 7 segments. In this system we used LED display can be used. Here the LCD used is the 16×2 line LCD. Liquid Crystal Display which is commonly known as LCD is an Alphanumeric Display it means that it can display Alphabets, Numbers as well as special symbols thus LCD is a user friendly. Here we have used 16 x 2 Alphanumeric Display which means on this display I can display two lines with maximum of 16 characters in one line.

IV. EXPERIMENTAL RESULT

The model is developed which aims at controlling different house appliances. Below figure 2 shows the Graphical user Interface of our android app.
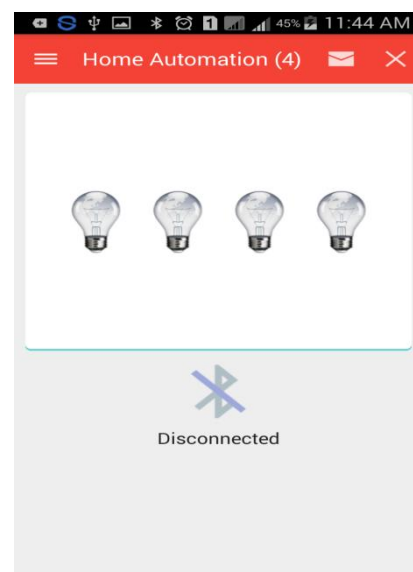

Figure 2:- Graphical user Interface

As after the App gets open the Bluetooth of Mobile automatically starts. The Menu list is as shown in figure 3 below.
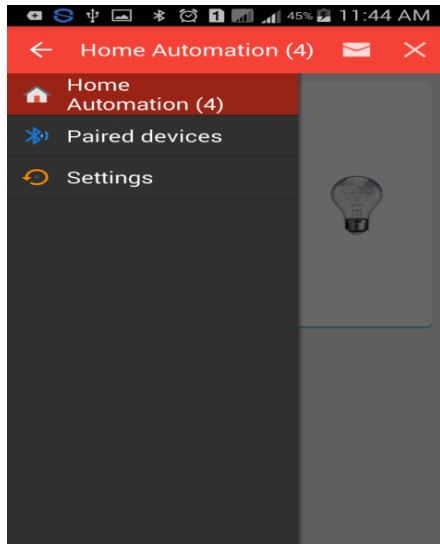
Figure 3:- Menu List

We have to search Bluetooth devices so as to connect with our model. After it gets connected it looks as shown in figure 4.

Now since Bluetooth is connected to model, we can click on the bulb icon which serves as button, we have four buttons then each for on device to ON/OFF.
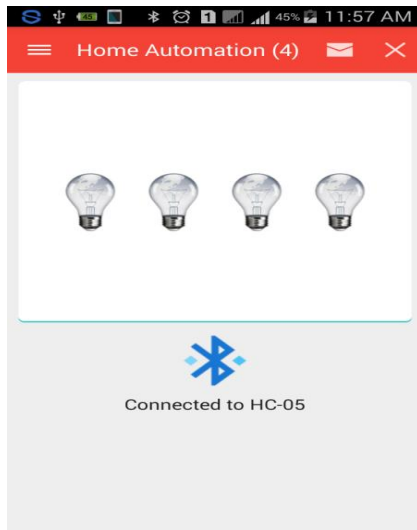

Figure 4:- Connected to HC-05

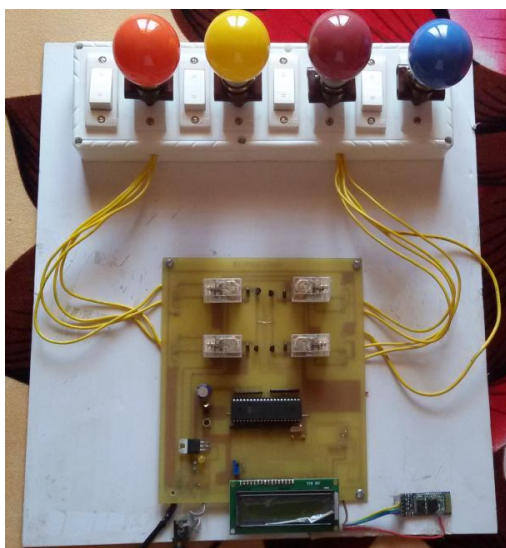The hardware board of our model looks like as shown in figure 5.

Figure 5:- Hardware board with 4 devices.

Here, for testing and running purpose we have taken four devices as bulbs. So as in our app figure 4.3, we have four buttons. On clicking the first button the first bulb gets ON and it is indicated in 16*2 LCD attached with our board. So, the first test is by clicking the first button as in figure 6.

Figure 6:- First device gets ON.

Figure 7:- Device 1 ON

Similarly for device 2

Figure 8:- Device 2 gets ON when Button 2 is clicked

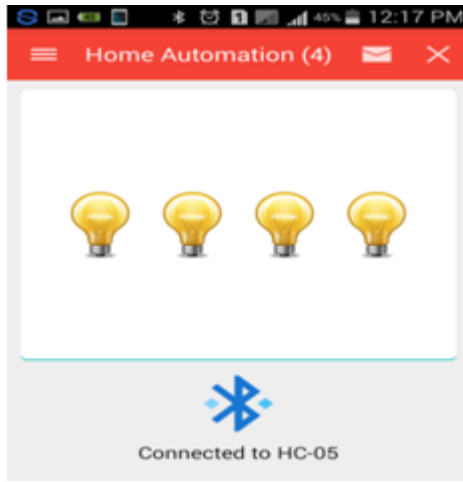Similarly all devices are functional as shown in figure 9 and 10.

Figure 9:- All buttons are clicked.

Figure 10:- All devices work properly through our app.

The Two-way switch is provided in our proposed model so as to maintain the normal functioning of On/Off of devices. Suppose, if the person in home who has the Smartphone and app, goes out of home then what will the other persons in home will do. For that purpose the two-way switches are provided which gives same function as our normal electrical board provides in our homes. The other persons can then switch buttons in traditional way. This gives two way usage of model also.

Thus all devices work properly and it fulfils our model aim of controlling devices i.e. On/Off. We have extend our proposed idea as whenever the mobile, having this app goes out of Bluetooth range, the devices which are ON will get automatically OFF. It means we don't have to worry if we forget to switch OFF devices in case, the devices will be OFF automatically when the application goes beyond Bluetooth range. This is the new idea that we have implement in our model which makes it different from conventional Bluetooth based models. Following snapshots gives demonstration of this.
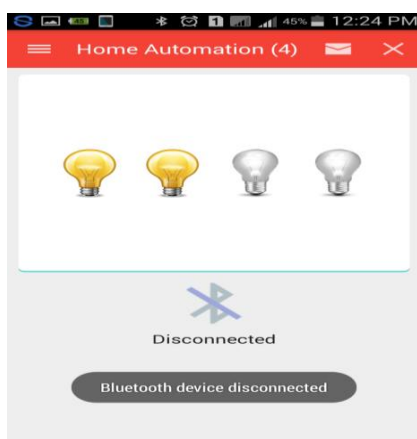

Figure 11:- Bluetooth device disconnected

When the Smartphone goes beyond Bluetooth range, it gets disconnected and devices get off as shown in figure 12.

Figure 12:- Devices gets OFF automatically when the Smartphone is not in Range.

This is where Two-way switch that we have provided will come in use as there is power supply but the application which was controlling is not in range. So, by using such switches we can ON/OFF devices in our traditional way as shown in figure 13.

Figure 13:- Two-way switch board is used to switch ON/OFF devices

V. APPLICATIONS

This Model idea has wide range of applications, few of them are listed below:-

- It is easy to use by elderly and disabled persons.
- No need to carry separate controlling device.
- This model can be in other automation sector also, like industrial automation, etc.
- Can also be used for security purpose after modification.

VI. ADVANTAGES

It has advantages like:-

- This model is simple and easy to access.
- It can be used in 3BHK flat and also more than that as per Bluetooth range goes.
- There is low power consumption.
- Very helpful for disabled person in home.

VII. FUTURE ENHANCEMENT OF THE PROPOSED MODEL

Since it is an embedded system based model it has some limitation which can be overcome in future time, some of them are as follows:-

- As it works on Bluetooth so it consumes more battery more resulting in fast draining of battery.
- Bluetooth technology is used for short range area like home, if there comes, a situation to use it in big bungalow then it might fails to work.

- Data logging facility can be included in case of recording historical data, special data, special events and system data.
- Computer can be interfaced for more complex & precise application.
- System reliability can be improved.
- Voice interactive services can be added to offer better interaction with user.

CONCLUSION

With the advent of technologies, the concept of automation is also increasing. Thus it comes to make this model. The home automation system has been experimentally proven to work satisfactorily by connecting sample appliances to it and the appliances were successfully controlled from an Android application. The Bluetooth module was successfully tested on a multitude of different mobile phones from different manufacturers, thus proving its portability and wide compatibility. It provides remote access to the system to deliver service at any time of the day. This proposed mode will not only provide convenience to the common man but will be a boon for the elderly and disabled.

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