

Smart Home Automation by Using Android Mobile

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Abstract

The main aim of this project is to develop a smart home automation system, which uses Bluetooth technology that will control the operation of these appliances with respect to the signal sent by the Android mobile. The purpose of this project is to provide to control different appliances automatically and to gain the remote access of different units using the Bluetooth technology. Smart home provides a method to control the system with advanced android mobile using Bluetooth. It is designed to give the user the ability to manage all equipment that is capable of being automated from a single controlling source. Viewing all of the automation equipment in a consistent and uniform way solves the first and primary problem with home automation.

Smart Home Technology is a collective term for information and communication-technology in homes, where the components are communicating through a Bluetooth. The technology may be used for monitoring, switching on and off the components, according to the programmed criteria. The smart home section is kept in the home. We can connect various appliances to this system. The user can control the appliances using his/her android mobile using Bluetooth technology. The information to turn ON or OFF the appliances is sent from android mobile and this is received by the Bluetooth module in the system. According to that particular appliance is turned ON or OFF.

INTRODUCTION

Smart phones are already feature-perfect and can be made to communicate to any other devices in an ad hoc network with a connectivity options like Bluetooth. With the advent of mobile phones, Mobile applications development has seen a major outbreak. Utilizing the

opportunity of automating tasks for a smart home, mobile phone commonly found in normal household can be joined in a temporary network inside a home with the electronic equipments [1, 2]. Android, by Google Inc. provides the platform for the development of the mobile applications for the Android devices. Home automation system is a mobile application developed using Android targeting its vast market which will be beneficial for the masses.

Bluetooth is a short-range wireless communication technology that comes in handy as the solution while communicating over an ad hoc network environment like the home environment for connecting the home appliances with the mobile phones. Bluetooth works over 2.4 GHz frequency range up to the range of 100 m with 1 Mbps speed, providing a safe and efficient solution for controlling home automation [3]. Home automation can be defined as a system implemented at a residential place whereby the intention is to make the place intelligent so that energy is conserved and security is maintained. It makes the life of the residents flexible, healthy and comfortable. Initially systems were developed in this regard but those systems had to be deployed on Internet and heavy machineries like a big Personal Computer. Our system will be free from all this giant components, which, indirectly suggests that our system has a good quality of portability. Most systems would exchange data or would communicate with the help of Bluetooth, ZigBee and GSM. These systems have their own disadvantages. For example, system-implementing ZigBee has too low bandwidth for the data communication whereas the GSM implementing system

Cite this article as: Y. Sreeja, "Smart Home Automation by Using Android Mobile", International Journal & Magazine of Engineering, Technology, Management and Research, Volume 4 Issue 11, 2017, Page 231-235.

has too large bandwidth for the data communication [4, 5].

Automation of the surrounding environment of a modern human being allows increasing his work efficiency and comfort. There has been a significant development in the area of an individual's routine tasks and those can be automated. In the present times, we can find most of the people clinging to their mobile phones and smart devices throughout the day. Hence with the help of his companion – a mobile phone, some daily household tasks can be accomplished by personifying the use of the mobile phone [6, 7]. Analyzing the current smart phone market, novice mobile users are opting for Android based phones.

EXISTING SYSTEM

The existing system has implemented HAS (Home Automation System) by making the use of a Microcontroller and the communication with the appliances is done through RF modules. There are 2 types of connections used viz primary and secondary connections. The disadvantages are more as compared to the advantages. The primary and secondary connections which were supposed to be the backbone and the saving – face of the system intruded it physically. Moreover, the limitations of 4 devices in a RF encoder/decoder circuits is far less than what is to be implemented practically.

PROPOSED SYSTEM

In this paper, we propose a system, which is very different than the existing system. We are going to implement it with the help of Bluetooth application. The main advantage of this system is that it can be implemented with a range of not more than 100 meters. It allows communicating with a brief and small setup without zap wired connection. The Home Automation System (HAS) was developed using Android Application program implemented on an Android based Bluetooth enabled mobile phone, and an 8 bit microcontroller based relay driver circuit with Serial Bluetooth Module, which is able to communicate with the Home- -Appliances over Bluetooth link.

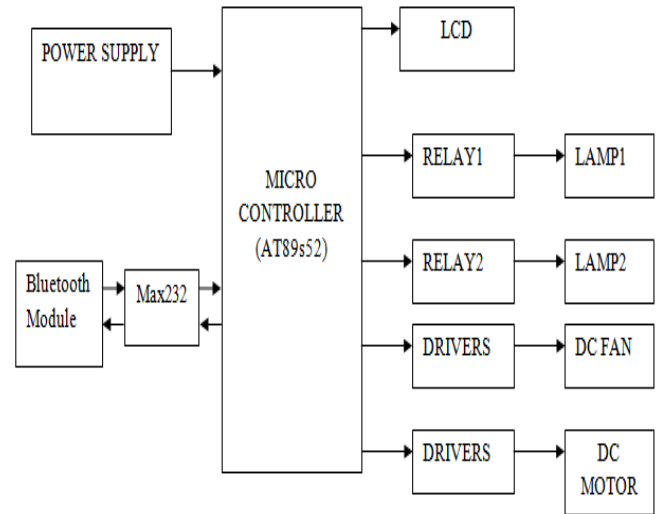


Fig. 1(a): Block Diagram of Smart Home



Fig.1 (b): Remote unit

AT89S52 Microcontroller

The microcontroller is the heart of the whole system. Analog and digital sensors are input of the Microcontroller. Displays unit is an output of the microcontroller. It receives Analog and digital signals equivalent to the quantity of the weather variable to be measured; from sensors connected to it and conversion and processing through pre- programmed instructions written in C language to ensure that corresponding measurement made by these sensors are available in forms that are meaningful and useful for human analysis, interpretation and record. The microcontroller AT89S52 has been used for the measurement of weather conditions and transmission of data to the receiver. It has 40-Pin packages. It has a 10-bit A/D converter. The microcontroller uses 11.0592MHz clock.

Liquid Crystal Display (LCD)

The 16 x 2 LCD display is capable of displaying different characters and symbols. It is used to display the measured parameters such as pressure, temperature, relative humidity and dew point temperature.

Android

Android is an open-source operating system which means that any manufacturer can use it in their phones free of charge. • It was built to be truly open. • Android is built on the open Linux Kernel. Furthermore, it utilizes a custom JAVA virtual machine that was designed to optimize memory and hardware resources in a mobile environment.

Relay Interface Circuit

The relay interface circuit is used to connect the PC with the household electronic or electrical appliances. The circuit comprises of a relay (5v, 5A), a freewheeling diode, a transistor to drive the relay energizing input and connectors to interface parallel port. For testing purpose we are using two fans and two LED's (serving as light bulbs).

Bluetooth Module (HC-05)

For the communication between mobile phone and microcontroller Bluetooth module (HC-05) is used. • HC-05 is low power 1.8V operation and is easy to use with Bluetooth SPP (serial port protocol). • Serial port Bluetooth module have a Bluetooth 2.0+EDR (enhanced data rate), 3Mbps modulation with complete 2.4GHZ radio transceiver and baseband. • Using Bluetooth profile and android platform architecture different type of Bluetooth applications can be developed.

WORKING DESCRIPTION

Power up the Circuit and scan the Bluetooth devices on your mobile device. The scanning list shows Bluetooth device named HC-05 and pairs it with following code.

- Start Bluetooth connection of your mobile phone.
- Open the 'HAS' application on your android mobile phone.

- Select connect device from option menu using scan for new devices.
- 'Bluetooth Serial Module will be available under 'select a device to connect' list.
- Pair 'Bluetooth Serial Module' by providing pair code '1234'.
- Start selecting particular device for making 'ON/OFF' from List Menu as shown ON and OFF according to combination.

The android application is act as a user interface, through which the user can easily control the devices. The Liquid crystal display is used to denote the commands sent by the android application The ON/OFF commands near the devices will turn ON/OFF the particular device. We can also turn ON/OFF all the devices at the same time by pressing all devices ON/OFF button.

The various modules used in our project are communication module, user interface module and display module. The communication module describes how the connections are made with the microcontroller for Bluetooth communications. For Smart Living concept, Bluetooth technology has been one of the major technologies. It is a wireless technology developed to replace cables on devices like mobile phones and PCs. By using Bluetooth, wireless devices are able to communicate with each other within range. Nowadays lot and lots of Smart Living applications have been developed which are based on Android and Bluetooth. Android system provides SDK and APIs for developers to build new applications. Many Smart Living systems are constructed under Android system with Bluetooth integrated into Android system.

Bluetooth connectivity:

The Bluetooth APIs

All of the Bluetooth APIs' are available in the Android Bluetooth package. The following is the overview of the classes needed during the application's development.

- Bluetooth Adapter: Represents the local Bluetooth adapter (Bluetooth radio)
- Bluetooth Device: Represents a remote Bluetooth device, to query information such as its name, address, class, and bonding state.

- Bluetooth Socket: Represents the interface for a Bluetooth socket (similar to a TCP Socket).
- Bluetooth Class: Describes the general characteristics and capabilities of a Bluetooth device.

Bluetooth Permissions

In order to use Bluetooth features in an Android application, at least one of two Bluetooth permissions: BLUETOOTH and BLUETOOTH_ADMIN are needed to be declared. We declared the Bluetooth permission(s) in our application's AndroidManifest.xml as below:

C. Methods for Bluetooth connectivity Normally, before commencing communication, devices can use two methods for initiating communication with each other which can be done normally either by discovering other nearby devices to detect the address and services that are provided by other devices or by knowing the device address beforehand and directly using that address for further communication process.

RESULTS

Finalized hardware is shown in figure 2. The android operated smart home was designed and implemented. Simulation in Proteus showed expected results. The proposed design used a smart phone app to control the electrical equipments. The system reduces the human labor required for switching on and off the electrical equipments.

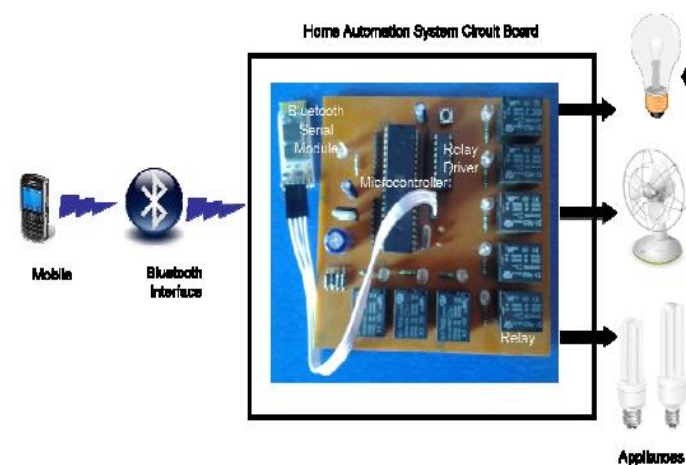


Fig.2: Experimental hardware setup

The loads are connected using driver circuits to operate from different voltage levels. These loads can be used as home appliances which are controlled using android specific application by Bluetooth communication as shown in fig.3.

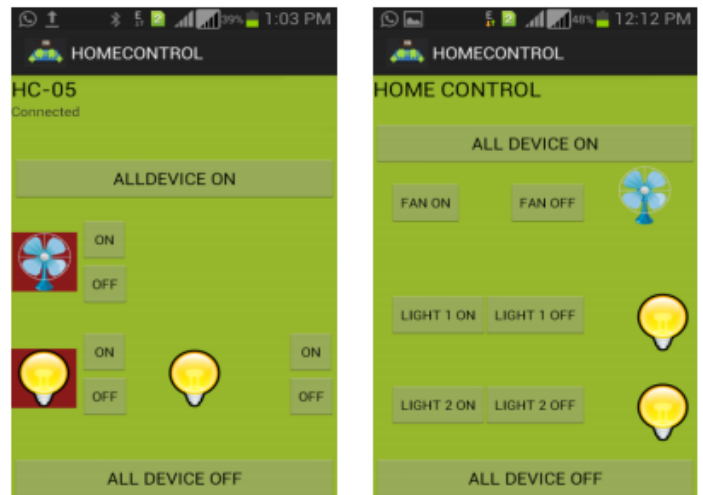


Fig.3: Snapshots of Home control Android application

ADVANTAGES

- It is a robust and easy to use system.
- There is no need for extra training of that person who is using it.
- All the control would be in your hands by using this home automation system.
- This project can provide the facility of controlling all the appliances within the communication range through Bluetooth.

CONCLUSION

The home automation system has been experimentally proven to work satisfactorily by connecting sample appliances to it and the appliances were successfully controlled from a wireless mobile device. The Bluetooth client was successfully tested on a multitude of different mobile phones from different manufacturers, thus proving its portability and wide compatibility.

The purpose of this is to use mobile phone's inbuilt Bluetooth, and Bluetooth serial module for automation of Home Appliances. The different hardware and

software section of our system is described. The application program is tested on various Android mobile phones which are quite satisfactory and responses received from the community in general are encouraging.

FUTURE WORK

This project can be further developed by integrating it with the internet to monitor your home while sitting in a remote area. By doing this, one can keep an eye on his or her home through an internet connected to the user's mobile phone or PC or laptop. Apart from controlling the home appliances through mobile phone, in our future work we are planning to monitor the activities around the home also. By expanding the automation of all other home appliances, we can remove the limitation for controlling only few devices. To monitor the activities around the home, Security cameras can be installed and controlled by the user.

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