BLUETOOTH BASED HOME AUTOMATION USING ARDUINO AND ANDROID

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Abstract- The world is moving fast towards automation. The home automation implementation using the latest technology gives us more convenience, security and safety. People have less time to handle any work so automation is simple way to handle any device or machine will work to our desire. This project aim is to develop and design a Home automation using Arduino with Bluetooth module. Home automation system gives a simple and reliable technology with Android application. Home appliances like fan, bulb, AC, automatic door locks are controlled by Home automation system using Arduino Uno with Bluetooth module. The project mainly focuses on the monitor and control of smart home by Android phone and provide a security based smart home, when the people does not present at home. This project motive is to control home appliances in smart home with user friendly design at low cost and simple installation by using Bluetooth technology.

Keywords- Bluetooth technology, Arduino, relay, Home Automation, Android.

I.INTRODUCTION

Electronic and Electrical environment with respect to this context is any environment which consists of appliances such as fans, television sets, air conditioners, motors, heater, lighting systems, etc. A remotely accessible environment is an environment in which each appliance can be remotely accessed and controlled using software as an interface, which includes an Android application and a Web application. Such remotely accessible systems are already available in the market, but have a number of drawbacks as well.

Home automation systems are implemented to increase user convenience in the control of home appliances either via wired or wireless communication [1]. The word "wired" means that the home appliances are physically connected to a server or central controller to the home automation system, while "wireless" means that home appliances are connected wirelessly to a server or central controller or remote control unit [2]. Light wave RF is a home automation systems company that utilizes a wireless connection between the remote control unit and home appliances. Home appliances such as TVs, DVD players, air conditioning and other devices come with their respective remote control units. When a home automation system is installed, there is the addition of at least one more remote control unit [3].
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II.TECHNOLOGIES USED

A. Android os
Android os is a open source mobile based operating system based on the Linux Kernel with a Java programming interface, designed primarily for the touch screen gadgets[4].The android has been in use since October 2008.The primary application store for the android is Google play with nearly 70,000 applications available for the android[7]. The android architecture consists of several layers. The applications have to be layered in order to

access the hardware ARM architecture is the main hardware platform for the android.

B.Bluetooth Technology

Bluetooth technology is used to control home appliances. It was used to provide remote controlled wireless access to the user. It is a low cost and enables the user to control appliances within the range of Bluetooth network [5]. Most Bluetooth applications are for indoor conditions, where attenuation of walls and signal fading due to signal reflections make the range far lower than specified line-of-sight ranges of the Bluetooth products. It is operated in the unlicensed industrial, scientific and medical (ISM) band at 2.4GHz to 2.845 GHz .The pairing uses two Bluetooth enabled devices known to each other. It has a range of 10 to 100, 2.4 GHz bandwidth and 3Mbps speed.

C.Arduino

Arduino is an open source computer hardware and software company that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical and digital world[8]. The project's products are distributed as open-source hardware and software, which are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), permitting the manufacture of Arduino boards and software distribution by anyone. Arduino board designs use a variety of microprocessors and controllers.The boards are equipped with sets of digital and analog   input/output (I/O) pins that may be interfaced to various expansion boards or Breadboards (shields) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers.

The microcontrollers are programmed using a dialect of features from the programming languages C and C++. In
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addition to using traditional compiler tool chains, the Arduino project provides an integrated development environment (IDE) based on the Processing language project.

III.PROPOSED SYSTEM

The   proposed system   makes use of a cell phone and Bluetooth technology.   It makes use of an Arduino Bluetooth board. An interactive C program is used in the cell phone to provide the user interface. The I/O ports of the Bluetooth board and relays are used for interfacing with the devices which are to be controlled. The Bluetooth is password protected to ensure that the system is secure and not misused by any intruders [6]. The app on the phone is portable. It is also a fast and cost effective system. There is a diagnostic system that can detect problems in the circuitry. A feedback system will report status of devices after every signal toggle. The block diagram of the proposed system is shown in the Fig.1.

The main drawback with respect to Bluetooth is that it takes a long time to discover and access devices in its vicinity. It does not provide energy conservation tips. Real time access cannot be achieved. Anywhere access to the devices cannot be achieved. Access is limited to within the Bluetooth range. The client is a PC that is connected via USB to the Arudino board which is connected to the Bluetooth module. Sensors and actuators are used to control the circuit.

The Bluetooth module that is connected to it will allow it to receive various commands via Bluetooth. Bluetooth devices can scan and detect other devices easily. It might also be possible to check whether devices are working properly or not. This system also suffers from the drawback of the range of Bluetooth being around 10 meters only. This system has the advantage of being able to fit on to an existing system.
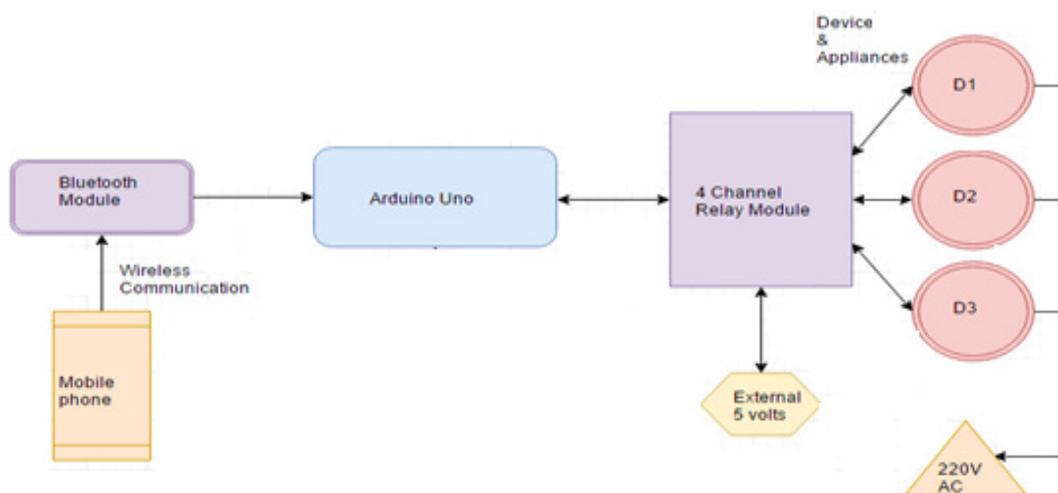

Fig.1 Block Diagram of Bluetooth based home automation system

IV. HARDWARE IMPLEMENTATION

This section describes the implementation of the controller. The controller is integrated using an Arduino ATMega-328 microcontroller, Bluetooth module HC-05, relays and other electronic components. The key components used in this project are:

A.ATMega-328MC

ATMega328P is high performance, low power controller from Microchip. ATMega328P is an 8-bit microcontroller based on AVR RISC architecture. It is the most popular of all AVR controllers as it is used in Arduino boards. It is a 28 pin chip most of the pins have more than one function.

B. Bluetooth Module HC-05

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. The HC-05 Bluetooth Module can be used in a Master or Slave configuration, making it a great solution for wireless communication. This serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. It uses CSR Blue core 04- External single chip Bluetooth system with CMOS technology and with AFH (Adaptive Frequency Hopping Feature).

The Bluetooth module HC-05 is a MASTER/SLAVE module. By default the factory setting is SLAVE. The Role of the module (Master or Slave) can be configured only by at commands. The slave modules cannot initiate a connection to another Bluetooth device, but can accept connections. Master module can initiate a connection to other devices. The user can use it simply for a serial port replacement to establish connection between MCU and GPS, PC to your embedded project.

C.RELAY

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

D. Electronic circuitry design

Electronic circuitry connects all the components together to perform   the task. The Arduino microcontroller is designed by integrating several components such as Bluetooth module relays. These components need to be well connected to ensure the controller functioning. The below Fig.2 shows the connections between the controller and home appliances.
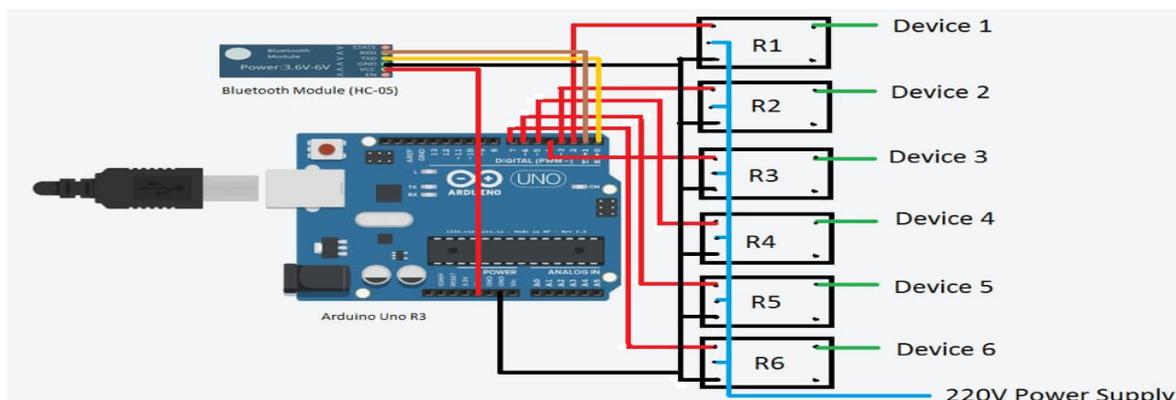

Fig.2 Connections between controller and device

IV. SOFTWARE DEVELOPMENT

This section describes Arduino programming and android application development. The microcontroller programmed in C using Arduino IDE. The android application is developed using Java and appears as GUI in mobile phone. Arduino Programming code is run using the complier Arduino IDE. The code is dumped into the hardware using the USB cable. The android application is used to connect between device and home appliances.

V. CONCLUSION

In this paper we have introduced design and implementation of a low cost, flexible and wireless solution to the home automation. The system is secured for access from any user. The users are expected to acquire pairing password for the Arduino BT and the cell phone to access the home appliances. This adds a protection from unauthorized users. This system can be used as a test bed for any appliances that requires on-off switching applications   without any internet connection. The full functionality of the home automation system was tested and the wireless communication between the cell phone and Arduino BT was found to be limited to <50m in a

concreted building and maximum of 100m range was reported to be applicable in an open range.

VI. FUTURE SCOPE

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. The Bluetooth client was successfully tested on mobile phones thus proving its portability and wide compatibility.

VII. REFERENCES

[1]N. Sriskanthan, F.Tan, and A.Karande.2002 Bluetooth Based Home Automation System. *Microprocessors and Microsystem.* 26:281–289.

[2]R.E.Rahim. 2010. Controlling Home Power Socket Using Bluetooth Enabled Device. Bachelor of Electrical Engineering (Electronic), Faculty of Engineering, University Technology Malaysia, Johor, Malaysia.

[3]P. Sánchez, M. Jiménez, F. Rosique, B. Álvarez, and A. Iborra. 2011. A Framework For Developing Home Automation Systems: From Requirements to Code. *Journal of Systems and Software.* 84: 1008–1021.

[4] J.Sarik and I.Kymissis. 2010. Lab Kits Using the Arduino Prototyping Platform," in *Frontiers in Education Conference (FIE), 2010 IEEE.*T3C- 1-T3C-5.

[5] R. A.Ramlee, D. H. Z. Tang, and M. M. Ismail.2012.Smart Home System for Disabled People via Wireless Bluetooth. *In System Engineering and Technology (ICSET), 2012 International Conference on* 1–4.

[6] J. Potts and S. Sukittanon. 2012. Exploiting Bluetooth on Android Mobile Devices for Home Security Application. *In Southeastcon, 2012* Proceedings *of IEEE.* 1–4.

[7]D.C.Hanson. Android Application Development and Implementation–3 Dimensional Tic-Tac-Toe.

[8] R. Grover, S. Krishnan, T. Shoup, and M. Khanbaghi. 2014. A Competition-Based Approach for Undergraduate Mechatronics Education Using the Arduino Platform. In *Interdisciplinary Engineering Design Education Conference (IEDEC), 2014 4th.* 78–83.