Bluetooth Home Automation System

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Abstract- *Android operating system is one of the leading and most popularly preferred systems in smart phone. Smart phone affordability increases day by day due to their size and portability. Android GUI installed in smartphone. The operator has to touch on the screen of the phone to control the home appliances. The main objective of this paper is to develop a home automation system using an Arduino board with Bluetooth being remotely controlled by any Android OS smart phone. As technology is advancing so houses are also getting smarter. Modern houses are gradually shifting from conventional switches to centralized control system, involving remote controlled switches.*

Controlling home appliances using an Android phone gives user the ability to control the home appliances anywhere, anytime in their home and saves the time spent searching for the remote-control unit of home automation systems since the user's phone is usually kept close at hand. This project presents the design and implementation of alow-cost prototype of Bluetooth based home automation system using Android phone. With help of android application, we are able to connect and control household appliances and provide security to handicapped, old people. The idea of paper is to control home appliances like lights, fan. It also provides home security and emergency alerts to be activated. It is possible to save energy by auto off lights at night time. Our home automation works smartly by providing increased quality of life, and comforts to users.

Keywords- Bluetooth module, Home Automation, Android application. Bluetooth, Smartphones, Arduino Uno.

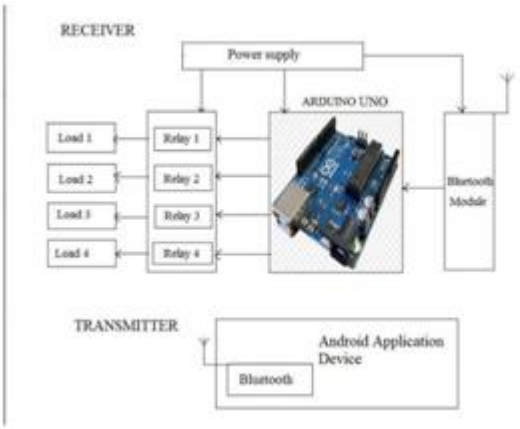
I. INTRODUCTION

Android operating system is one of the leading and most popularly preferred systems in smart phone. Smart phone affordability increases day by day due to their size and portability. Android GUI installed in smart phone. The operator has to touch on the screen of the phone to control the home appliances. This paper is an android application which possesses the capability to control any sort of electrical appliances providing remote access from smart phone using Bluetooth. Bluetooth technology is Wireless radio transmissions in a short distance providing a necessary technology to create convenience, intelligence and controllability. This generates personal area network in home environment, where all these appliances can be interconnected and monitored using a single controller. Home automation involves a degree of computerized or automatic control to certain electrical and electronic systems in a building. Busy families, individuals with physical limitation represent very attractive market for such networking. This system will also assist and provide support in order to fulfil the needs of elderly and disabled in home. A smart home control and monitoring system utilizing smart phone, Android app and embedded micro web server, having IP connectivity to access and control various devices and appliances remotely, has been implemented.

Automation is a technique, method, or system of operating or controlling a process by electronic devices with reducing human involvement to a minimum. The fundamental of building an automation system for an office or home is increasing day-by-day with numerous benefits. Industrialist and researchers are working to build efficient and affordability automatic systems to monitor and control different machines like lights, fans, AC based on the requirement. Automation makes not only an efficient but also an economical use of the electricity and water and reduces much of the wastage. Automation is another important application of wireless technologies like Bluetooth. The past decade has seen significant advancement in the field of consumer electronics. Various intelligent appliances such as cellular phone, air conditioners, home security devices, home theaters, etc., are set to realize the concept of a smart home. They have given rise to a Personal Area Network in home environment, where all these appliances can be interconnected and monitored using a single controller.

This paper demonstrates an automation system which contains a remote mobile host controller and several client modules (eg.Office, home appliances).The client modules communicate with the host controller through a wireless device such as a Bluetooth enabled mobile phone, in this case, an android based Smart phone. Although automation today is not a new thing but most advanced home automation systems in existence today require a big and expensive change of infrastructure. We have proposed an automation system that

can control appliances like TVs, Fan, Tube lights from an android mobile using Bluetooth. In this a low-cost secure cell phone based, flexible automation system is introduced. Devices are connected to the microcontroller-based switching circuit. The communication between the cell phone and the microcontroller board is wireless. Additional devices can be connected into the system with little modifications. The phone will be Android OS based phone. The switching circuit will be having microcontroller coding to control the electronics devices like fans and lights etc. 8-bit microcontroller board based on the ATMEGA328 and the HC-05Bluetoothmoduleisused.Itsupportswirelessserial



communication over Bluetooth. The ATMEGA328 can be programmed using the microcontroller's high-level interactive embedded C language. The Bluetooth antenna in our module picks up the packets sent from the cell phone. Subsequently, these packets containing the device status as commands are pipelined through ATMEGA328 microcontroller and the designed analogue circuitry according to the definition of each output.

Implemented design are considering few issues for smart home automation. They are: Easy setup, Easy to control and monitor, Low cost and efficient communication. Our paper presents Bluetooth based centrally controlled home automation system using smartphones and Arduino Uno board. Such a system will enable users to have control over lights, fan in his home with Bluetooth. All that the user needs are an Android smartphone, which is present in almost everybody's hand now a days, and a control circuit. The control circuit consists of an Arduino Uno microcontroller, which processes the user commands and controls the switching of devices. The connection between the microcontroller and the smartphone is established via Bluetooth, a widespread wireless technology used for sharing data.

II. PROPOSEDSYSTEM

The proposed system includes Controlling home appliances using an Android phone gives user the ability to control the home appliances anywhere, anytime in their home and saves the time spent searching for the remote- control unit of home automation systems since the user's phone is usually kept close at hand. By using this technique, we can access the home appliances by one touch. It is mainly developed to maintain and monitor our houses. It gives easy access and time reduced process. The Home Automation system is developed by using Arduino Uno, Bluetooth module, Relay drivers and Android software. The access any information at any time by using this mobile app.

III. WORKINGPRINCIPLE

The system consists of an Arduino Uno, Bluetooth module, Relay drivers, Android application.

- The Bluetooth module is used to connect the devices to operating the appliances within the range of Bluetooth.
- The Arduino Uno helps in interfacing and processing the signals.
- Relay drivers act as electro-magnetic switch used to ON and OFF the appliances.
- Loads are connected by those relays individually.
- These operations can be displayed on LCD screen.

IV. HARDWAREDESCRIPTION

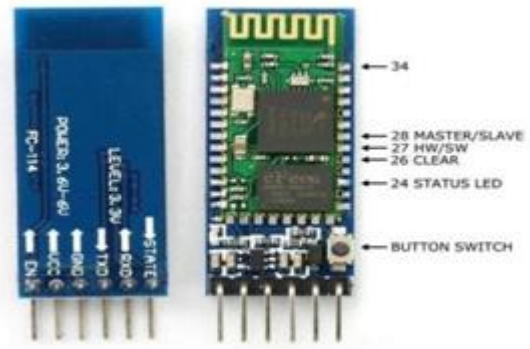
Arduino Uno

Arduino Uno is an AVR ATmega328P microcontroller- based development board with six analogue input pins and 14 digital input/output (I/O) pins. The microcontroller has 32kBofISPflashmemory,2kB RAMand1kBEEPROM.

The board provides serial communication capability via UART, SPI and 12C. The microcontroller can operate at a clockfrequencyof16MHZ.ThebigadvantageofArduino is that, the website of Arduino is well designed and well organized. It is easy to use tool for designers which serve Encyclopedia in this domain. The language of Arduino is high level programming language for med by blending with C language. It is easy to understand and user-friendly language. It contains automatic unit conversion capability.

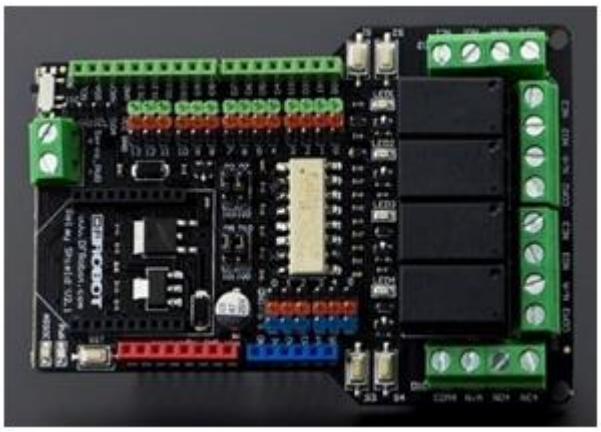
Bluetooth Module

For the communication between mobile phone and microcontroller, Bluetooth module (HC-05) is used. HC-05 is easy to use with Bluetooth SPP (serial port protocol) and perform operation at 1.8 V. Serial port Bluetooth module have a Bluetooth 2.0+EDR (enhanced data rate),3Mbps modulation with complete 2.4GHZ radio transceiver and base band. Using Bluetooth profile and android platform architecture different type of Bluetooth applications can be developed. If the module is set to be in slave mode, it cannot initiate a connection to another Bluetooth devices rather than the intended smart phone, but can accept connections. when it is in master mode, the module can initiate connection to other devices. The module contains 2 parts, the back plane and the main Bluetooth board. The implemented system is designed to operate in slave mode. Thus, the system can be connected to Arduino with smart phone directly. Accordingly, the smartphone transmits the set of instructions to the Arduino through which the Arduino generates the set of output signals which, in turn, controls different devices via drives.



Relay Board:

Relay is an electromagnetic device which is used to isolate two circuits electrically and connect magnetically. One circuit allow switching another one while they are completely separate. They are often used to interface an electronic circuit (working at low voltage) to an electrical circuit which works at very high voltage. For example, a relay can make a 5 VDC battery circuit to switch 230 VAC mains circuit. Thus, a small sensor circuit can drive, say, a fan or an electric bulb. A relay switch can be divided into two parts: input and output. The input section has a coil which generates magnetic field when a small voltage from an electronic circuit is applied to it. This voltage is called the operating voltage. In a basic relay there are three contactors: normally open(NO), normally closed(NC)and common (COM). At no input state, the COM is connected to NC. When the operating voltage is applied the relay, coil gets energized and the COM changes contact to NO. The application of relays started during the invention of telephones. They played an important role in switching calls in telephone exchanges. They were also used in long distance telegraphy. They were used to switch the signal coming from one source to another destination.



V. SOFTWAREDESCRIPTION

Arduino IDE

The software used here is Arduino IDE. The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OSX, and Linux. The environment is written in Java and based on Processing and other open source software. The Arduino Integrated Development Environment – or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuine hardware to upload programs and communicate with them. This software can be used with any Arduino board.

Bluetooth Connect App

Bluetooth Connect App is an intuitive, visual programming environment that allows everyone to build fully functional apps for smart phones and tablets. Those new to Bluetooth Connect App can have a simple first app up and running in less than 30 minutes. And what's more, our blocks-based tool facilities the creation of complex, high-impact apps in significantly less time than traditional programming environments. The Bluetooth Connect App project seeks to democratize software development by empowering all people, to move from technology consumption to technology creation.

VI. WORKING OF THESYSTEM

After installing the application on the smart phones, the user will access the system in the following way:

- User logs in to the system with the authentication id and credentials that is being coded in the program.
- The system will search for the discoverable Bluetooth devices.
- The system will pair the discovered Bluetooth device with the control board.
- Once the pairing is done, the user will send signals for controlling the home appliances(ON/OFF).
- The system will receive signals from the user and forward them to the appliances in the form of electrical signals.
- The appliances will get either turn ON or turn OFF, and will provide a notification to the user.
- After completing the operations, the user can terminate the connections by logging out of the system.

VII. APPLICATIONS

- Control home appliances like turn ON/OFF lights in every room and Turn off fan, turn it on LOW/HIGH speed within Bluetooth range from android Smartphone application.
- In terms of lighting control system, it is easy to AUTO OFF lights at night time by setting time for saving wastage of energy in residential passage.
- When user is in home or out of home activation of door security, when door opened by thief, buzzer started continues alarm tone for alert notification.

VIII. ADVANTAGES

1. It is robust and easy to use system.
2. There is no need for extra training of that person who is using it.
3. All the control would be in your hands by using this home automation system.
4. This project can provide the facility of monitoring all the appliances within the communication range through Bluetooth.
5. The schematic of Arduino is open source, for the future enhancement of the project board can be extended to add more hardware features.

IX. ACKNOWLEDGEMENT

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X. FUTURE SCOPE

Looking at current task, limitation to control only some devices can be removed by extending it to all other appliances. More security will be provided to home using security cameras, motion sensors for notifying authorized user. For door and window, Glass braking sensor can be used by setting more security. In smoke condition, will call owner to alert them and call fire department.

XI. CONCLUSION

Our paper has objective to develop smart home automation with help of Arduino and Bluetooth wireless technology. Our purpose to develop such application is not only for common man but will be boon for elderly and disabled. System allow user to monitor and control household appliances like lights, fan. It involves auto off lights at night by setting time. We can also able to see current temperature. It secures home by alerting people when smoke detected or gas is leaked. In terms of security, doors and windows are secured by setting alarm in case of any kind of thief movement. Our paper is feasible because the cost is very less as compared to other systems and easy to handle, freely available.

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