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Home Automation using Bluetooth Control Technology

Mr. B. P. Kulkarni[1], Miss Sayali S. Mokale[2], Miss Poonam M. Edake[3], Miss Rutwija R. Haripurkar[4], Miss Ashwini V. Shendage[5]

[1]*Associate Professor,* [2, 3, 4, 5]*UG Students, Department of Electronics and Telecommunication Engg, P. V. P. Institute of Technology Budhgaon, Sangli*

Abstract: ***The intent of this paper is to design an efficient and cost effective Arduino based system that can be used in small scale industries, hospitals and in homes to control electrical devices. It is flexible and secure cellphone based home automation system. The design is based on Arduino Uno board and home appliances are connected to the output port of this board via relays. There is wireless communication between smartphone and Bluetooth module. This is a very low cost system. In this system password protection is being used to only allow authorized user. After implementing the components on the circuit board and programming the microchip, the system worked as expected.***

Keywords: Arduino Uno board, relays, Bluetooth Module HC-05, Jumper wires, Electrical devices, smartphone

I. INTRODUCTION

Nowadays, we have remote controls for our television sets and other electronic systems, which have made our lives easy. The "Home automation" concept has existed for many years. The term "Smart Home", "Intelligent Home" followed and has been used to introduce the concept of networking appliances and devices in the house. Home Automation system represents a great research opportunity in creating new fields in engineering and computing. Home Automation systems includes centralized control of lighting appliances, security locks of gates and doors and other systems to provide improved comfort, energy efficiency and security system. Home Automation system becoming more popular nowadays and enter quickly in the emerging market. However, end users, especially the disabled and elderly due to their complexity and cost, do not always accept these systems.

This system is super cost effective and can give the user, the ability to control any electronic device without even spending for a remote control. This project helps the user to control all the electronic devices using his/her smartphone.

Time is a very valuable thing. Everybody wants to save time as much as they can. New technologies are being introduced to save our time. To save peoples time we are introducing Home Automation system using Bluetooth. With the help of this system you can control your home appliances from your mobile phone. You can turn on/off your home appliances within the range of Bluetooth.

Due to the advancement of wireless technology, there are several different of connections are introduced such as GSM, WIFI, and Bluetooth. Each of the connection has their own unique specifications and applications. Among the four popular wireless connections that often implemented Home Automation System projects. Here Bluetooth is being chosen with is suitable capability. Bluetooth Technology has ability to transmit data serially up to 3 Mbps within a physical range of 10m to 100m depending on the type of Bluetooth device.

The proposed method presents the design and implementation of robust, low cost and user friendly home automation system using Bluetooth technology. The design of proposed method based on Arduino board. Bluetooth module HC-05 is interfaced with Arduino board and home appliances are connected with Arduino board via relays. Smartphone application is used for serial communication between smartphone and Bluetooth module which is further connected with Arduino board. Proposed method has ability to not only remotely control the appliances but it also monitors the sensors. Nowadays most of the conventional Home Automation Systems are designed for elderly, handicapped people or for any special purpose.

Bluetooth for communication medium and a mobile phone as the control terminal have been chosen in the proposed system. Bluetooth is a low cost short range wireless technology works without the need for an infrastructure. Bluetooth can control the home appliances and the mobile phone without wire and we believe it will become a standard feature for a cellular phones in the near future. Bluetooth works over 2.4 GHZ ISM band frequency range up to the range of 10m with 1Mbps speed, providing a safe and efficient solution for controlling home application. Android provides the platform for the development of the mobile applications for the communication of different android devices.

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II. SYSTEM OF HOME AUTOMATION THROUGH BLUETOOTH CONTROL TECHNOLOGY

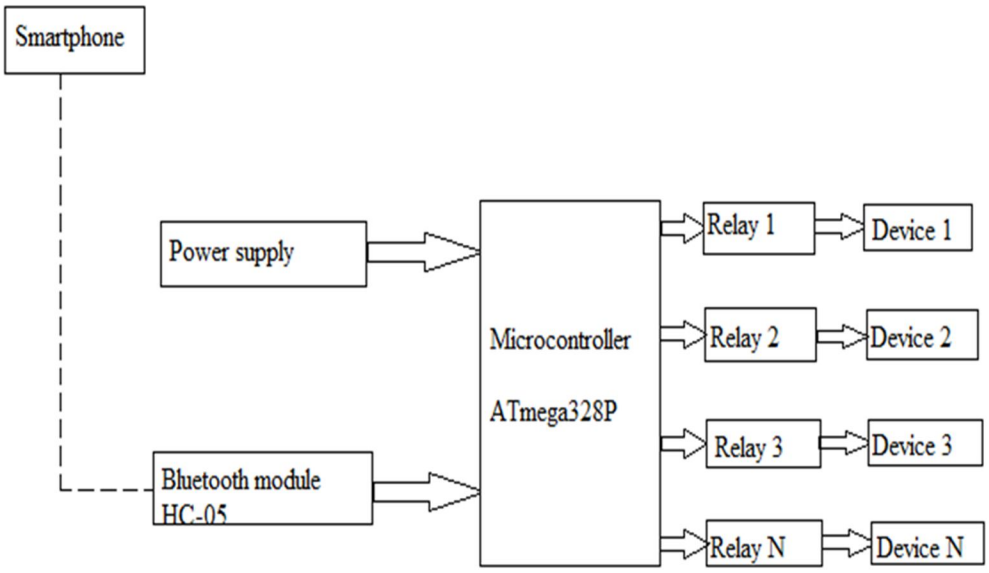


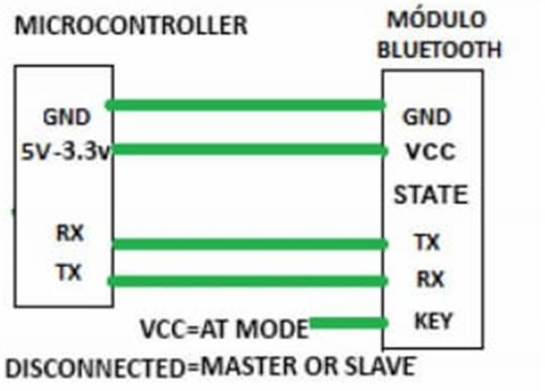
Fig.1- System of Home Automation Through Bluetooth Control Technology

The block diagram in fig 1, shows all the major components that is required for the system. The controlling device for the whole system is a microcontroller ATmega328P. Bluetooth module is interfaced to the microcontroller. The dada received by the module from the phone is fed as input to the controller. The controller acts accordingly on the relays to switch connected electrical appliances. In achieving the task the microcontroller is loaded with embedded c language. For controlling devices of home or offices, firstly Bluetooth connection of mobile and Arduino board will be done. The devices will be connected to Arduino Uno board using relays or simply resistors. The person who wants to switch ON/OFF particular device will send the signal from mobile to controller through Bluetooth. Then as per our requirements controller will operate devices. Relays are connected to the microcontroller ATmega328P and the electrical devices such as bulb, fan are connected to the relays. So in this way electrical devices will operate using android app.

III. DESIGN AND IMPLEMENTATION

A. Hardware Design

1) Arduino to Bluetooth Module Interface: The main point is interfacing HC-05 Bluetooth module with Arduino Uno. It can be done by UART port of Arduino board. Pin numbers 0 and 1 are used for those purpose. But we should always keep in mind that it connect TX of Arduino with RX of HC-05 and RX of Arduino with TX of HC-05. Jumper wires are used for connecting the Bluetooth Module to Arduino Uno Board. Jumper wires are male and female. Ground pin of Bluetooth module is connected to ground of Arduino Uno board and Vcc of Arduino Board is connected to the VCC of Bluetooth module.



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2) *Arduino Uno Board:* Arduino is an open source programmable circuit board that can be integrated into a wide variety of makerspace projects both simple and complex. This board contains a microcontroller which is able to be programmed to sense and control objects in the physical world. By responding to sensors and inputs, the arduino is able to interact with a large array of outputs such as LEDs, motors and displays. Because of its flexibility and low cost, arduino has become a very popular choice for makers and makerspaces looking to create interactive hardware projects.

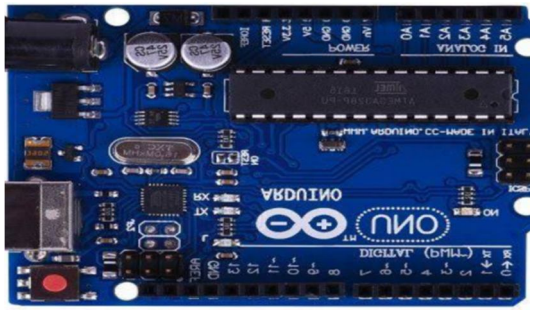
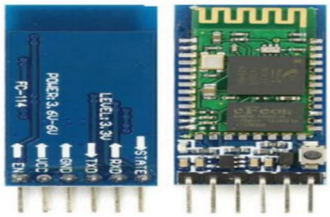


Fig: Arduino Uno

3) *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 a wireless communication. This serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps modulation with complete 2.4 GHz radio trans receiver and baseband. It uses CSR blue core 04-External single chip Bluetooth system with CMOS technology and with AFH (Adaptive Frequency Hoping feature).



4) *Relays:* Relay is 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.

5) Bluetooth Module to Arduino and Arduino to Bluetooth Module connection

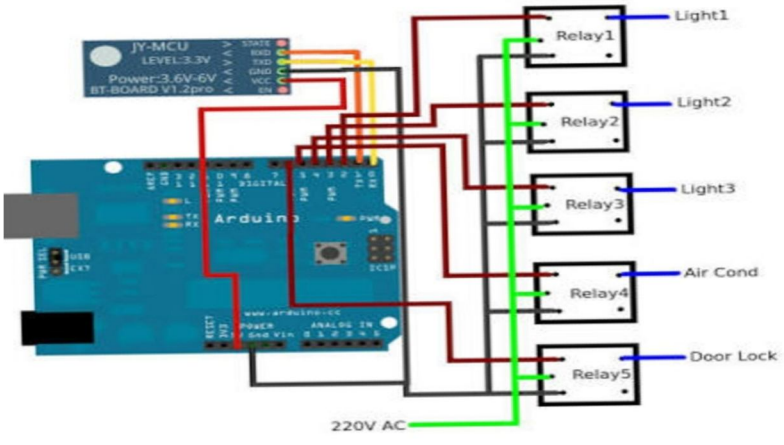


Fig: connection with Arduino Board

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IV. HARDWARE IMPLEMENTATION



Fig: Hardware Implementation

V. SOFTWARE DESIGN

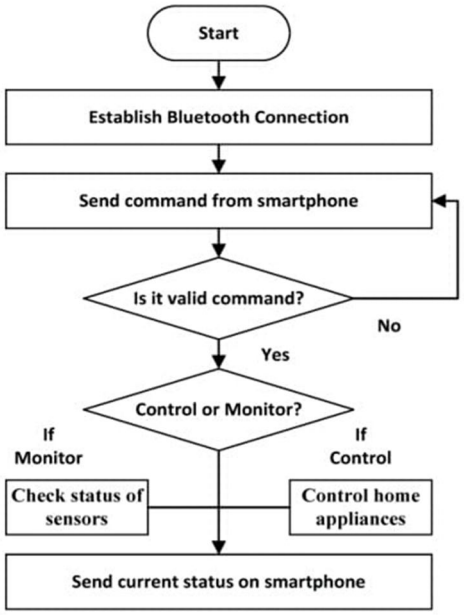


Fig 5 – Flowchart

The flow chart, Fig, shows the sequence of events in implementation of the program. First we start the power supply needed for run the hardware. Then open the Bluetooth in your android phone on which created Bluetooth app is installed. Then open the app. Then send command from smartphone. If the command is valid then electrical devices will be on. this is the flowchart of the project.

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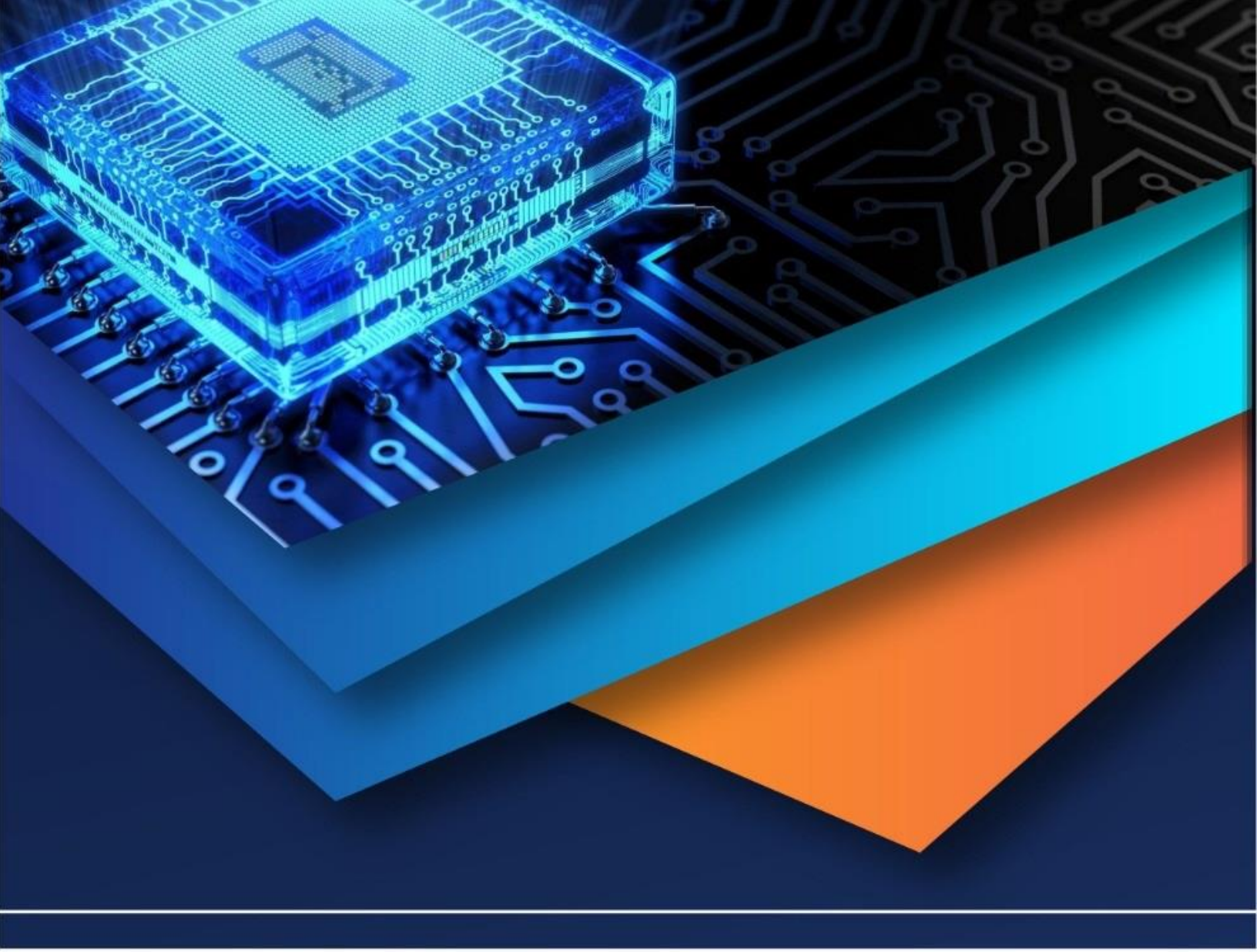
VI. CONCLUSION

In this project a low cost and user friendly design for home automation system is presented. It has better performance than existing Bluetooth based conventional home automation systems, it provides general approach for home automation which is not only suitable for elderly and handicapped people but it also beneficial to reduce human labour and save energy with the help of sensors.
The system as the name indicates, 'home automation' makes the system more flexible and provides attractive user interface compared to other home automation. In this system we integrate mobile devices into home automation systems. This project proposes a low cost, secure, auto configurable solution.
We can conclude that the required goals and objectives of home automation system have been achieved. The system design and architecture were discussed, and prototype presents the basic level of home appliance control by android app has been implemented. Finally the proposed system is better from the scalability and flexibility point of view than the commercially available home automation systems.

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