

# Bluetooth Home Automation System Based on AVR Microcontroller

Simran Khokha, Ritu Gupta, K. Rahul Reddy

*Abstract-- A smart home covers a variety of theoretical and practical approaches that deals with methodology of living today and in the future [1]. Technology has influenced and changed the life of humans in many ways. To design a device that will be serviceable to others is a huge contribution to the society [2]. Today mobile phones (smart phones, android etc.) can preforms almost all the tasks that once only PCs used to handle. With these advanced features and thought of elderly in mind, a device is designed. This device provides a much more advanced and a safer home to us. Bluetooth Home Automation System is a complex technology that uses information technology to control the electrical appliances and monitors the environment. The design and implementation presented in this paper is of a device which will use bluetooth technology for basic home automation and a wireless home network is desirable which does not incur any additional cost of wiring. The advantages and disadvantages are also discussed, along with the future scope and application areas.*

*Index Terms: Bluetooth, Microcontroller, Home Appliance, Android, AVR, Atmega 8*

## I. INTRODUCTION

The idea of home automation was initially thought of to remotely turn devices on and off and thereafter with advancement the idea included provisions of complete access to devices while the user may be miles away from the home, may be elderly person or with a handicap. The implementation of home automation may utilize variety of technologies that may have come in market recently or have been in use over a longer period of time. The home automation is made for several reasons of ease, security and energy efficiency. Home automation is used to control electric appliance like air conditioner, fan, bulb, gate and door lock etc. it can be control appliance within home or anywhere. Home automation of appliance may be wired or wireless. For our convenient we generally use wireless automation because of increasing smartphones and tablets in recent years. The smartphone provide easy connectivity with other devices. Through smartphones we can easily control appliance through Bluetooth, NFC, WLAN, mobile internet etc. if we want to control appliance from hundreds of mile away, we use internet to control our appliance and within home we generally use Bluetooth or NFC.

**Manuscript published on 30 June 2016.**

\* Correspondence Author (s)

**Simran Khokha**, B.Tech Scholar, Department of Electronics, Atma Ram Sanatan Dharma College, Delhi University, Dhaula Kuan, New Delhi, India.

**Ritu Gupta**, Assistant Professor, Department of Electronics, Atma Ram Sanatan Dharma College, Delhi University, Dhaula Kuan, New Delhi, India.

**K. Rahul Reddy**, B.Tech Scholar, Department of Electronics and Communication Engineering, Sharda University, Greater Noida (U.P). India.

© The Authors. Published by Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP). This is an [open access](http://creativecommons.org/licenses/by-nc-nd/4.0/) article under the CC-BY-NC-ND license <http://creativecommons.org/licenses/by-nc-nd/4.0/>

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 available in many device like smartphone, tablet etc. Bluetooth technology is easy to use and understand. Hence it could be used suitably in a cost effective manner.

The embedded system is connected to appliance in home and it is ready to receive control through Bluetooth receiver. Any Bluetooth enabled device (generally we use smartphone) is connected to that embedded system and send command for controlling home appliance. Bluetooth enabled Smartphone which is connected to embedded system and send control through application installed in phone and which is easily available on internet.

## II. HARDWARE DESCRIPTION

The entire embedded system consists of two parts, one is android application and the other one is an electronic controlling circuitry. In the first part the android device is used for communicating with the controlling circuit through bluetooth channel. The android application required for this system can be easily downloaded and installed from Google Play or Play Store free of cost. On the other hand the electronic circuitry consists of a microcontroller, a bluetooth module, relay driver IC along with relays which will switch electrical loads on the circuit and to switch the power supply. The android device sends a command which is received by the receiver of the bluetooth module and forwards it through its USART serial interface to the microcontroller. After receiving the command, the microcontroller performs the necessary action. The microcontroller used in system is ATMEL's ATmega 8, a high performance; low power RISC architecture based 8-bit MCU. The operating voltage of this microcontroller is 5V. So voltage regulator (LM7805) is used to get the desired voltage.

Whereas the bluetooth module (HC-05) run on 3.3V. This technology is a replacement for cables and wire harness [3]. It is an easy to use bluetooth serial port protocol module, designed for wireless serial connection setup. The UART of both the devices are in TTL logic, so we can directly connect receiver of Microcontroller to the transmitter of the Bluetooth Module through a current limiting resistor. R1, R2 and R3 are the relays used to switch electrical load and power supply. Here relay IC is used because the microcontroller operates on 5V and cannot source sufficient current to drive the relays. All relays are rated 12V DC. The COM and NO pins of the relays are used to connect the loads to be controlled.

# Bluetooth Home Automation System Based on AVR Microcontroller

Fig 1. Circuit Diagram of controller device L1, L2, L3 and L4 are the appliances which can be controlled by the android phone using bluetooth. The status of the appliances will be displayed on a 16x2 LCD screen. The LCD gets data

update from the microcontroller and displays it. A light sensor is also used for detecting light. It is a small sensor which changes its resistance when light falls on it. It is used to determine the intensity of light in a room, hall etc.

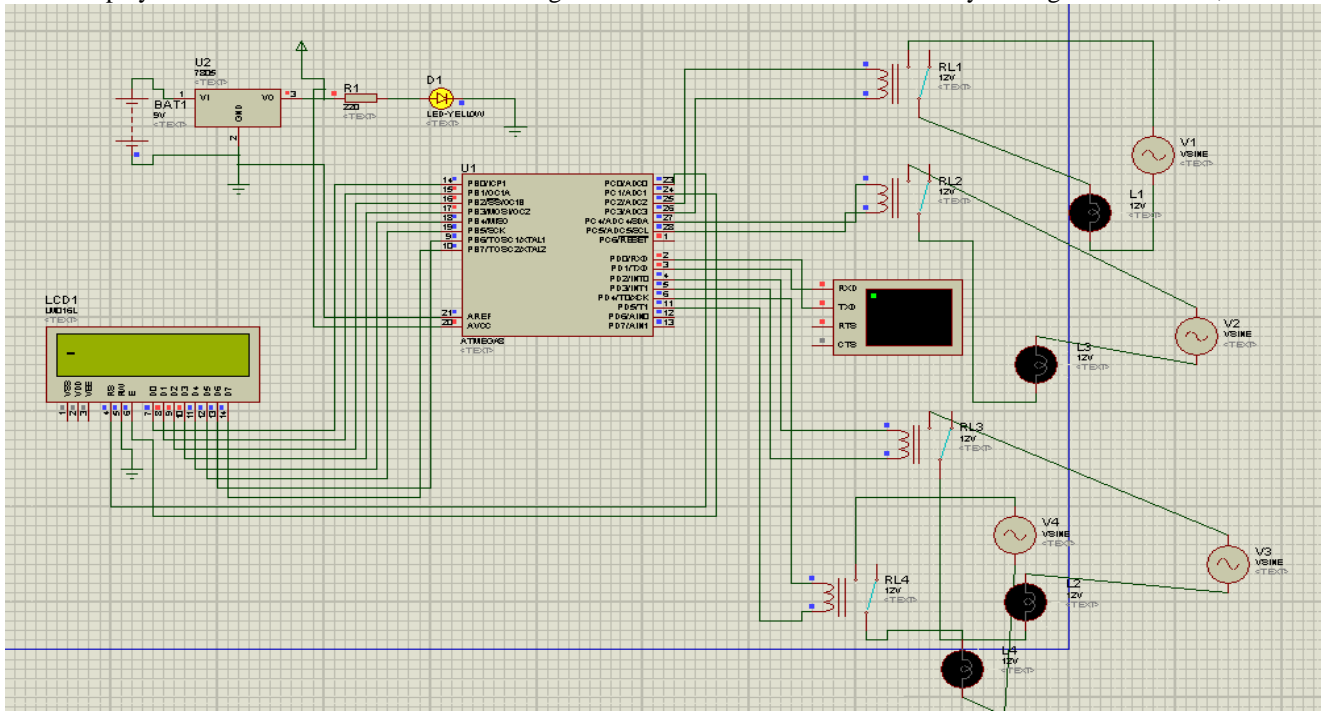


Fig 1 Circuit diagram

### III. FLOW CHART/ALGORITHM

The algorithm or flow for the working of the designed embedded system is as follows:-

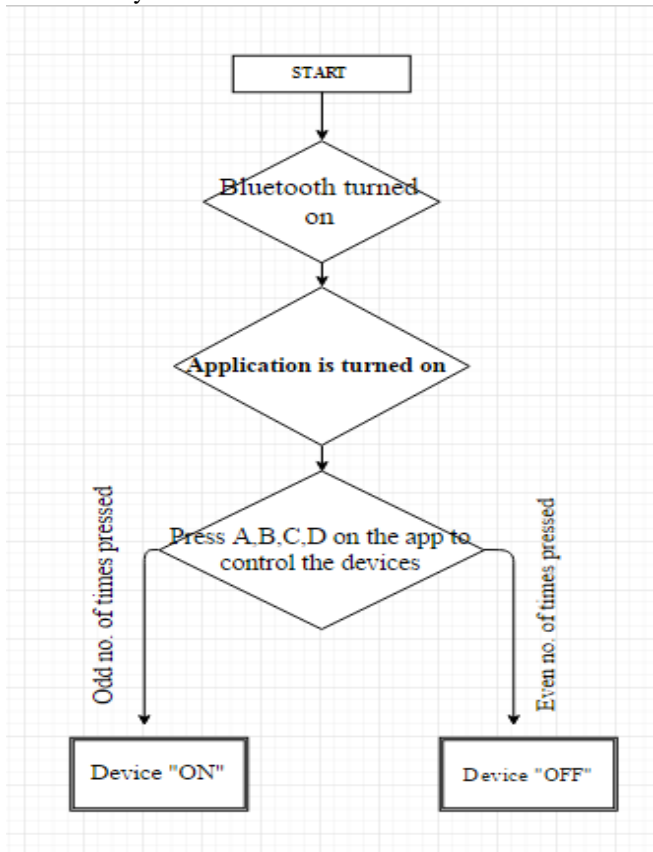


Fig 2 Flow Diagram

First of all we have to turn on the power of the device. When we turn on the power, the bluetooth connectivity of the phone is verified. If the bluetooth is not turned on the request for the same is issued. After the Bluetooth has been turned on or is already turned on, the home application on the smartphone is requested to display the list of devices under its control. Next appropriate keys are pressed according to the device selection. If the keys are pressed odd no. of times ( consecutively), the respective device is turned "ON". If the keys are pressed even no. of times( consecutively), the respective device is turned "OFF".

### IV. APPLICATION AREAS

There are numerous applications of smart bluetooth technology, some of these are described below:-

#### A. Industrial Automation

Industrial equipment's can now send key performance and safety information without the need of long and complex wiring. They can be directly connected to bluetooth smart ready phone, tablet or computers. It allows for higher flexibility and cut the cost down for machinery installation and the whole network can be easily integrated.

#### B. Healthcare and Fitness

Home health monitoring [4] will be considered to keep the elderly healthy and active. Much medical equipment can be easily connected to smart phones wirelessly through bluetooth. Few such examples are the iHealth gluco-monitoring system, electronic stethoscope model 3200 and the onyx II wireless pulse oximeter.



### C. Proximity and Anti-Theft Accessories

One easy way to keep an eye on our pets and kids is to tag them with a small bluetooth accessory which will generate an alert every time they sneak out of reach. Wallets, keys and luggage tagged with bluetooth can alert the smartphone if someone tries to steal them. There are applications such as FIND ME profile and Bluetooth also supports proximity which can seamlessly enable the above described applications.

## V. ADVANTAGES & LIMITATIONS

The main advantage of Bluetooth is that it is easily available and in reach of common people. It consumes very less battery power and requires less processing power for processing. The synced bluetooth devices does not need clear line of sight between them and the chances of other wireless networks interfering with bluetooth are very low. The disadvantage of bluetooth is that the battery usage during a single transfer is negligible, but if Bluetooth is kept on whole day, then battery loss is significant and because of this it inevitably eats into the battery of these devices, and lowers the battery life considerably. The other disadvantage of bluetooth is that the security in Bluetooth is good but it is much better in infrared technology.

## VI. RESULTS

The following are the result of the designed embedded system: -

When the system is switched on, a welcome message will be displayed on the LCD.



Fig 3 LCD screenshot 1

If the user has switched on the bulb, a message will be displayed on the LCD for the same.

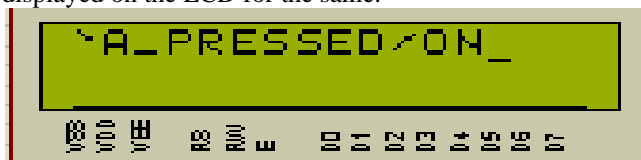


Fig 4 LCD screenshot 2

If the user has switched off the device, a message will be displayed on the LCD for the same.

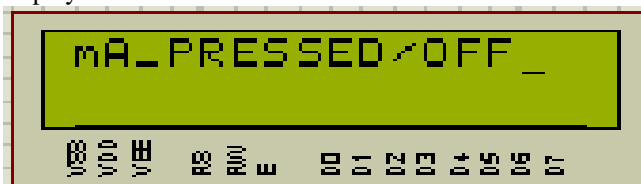


Fig 5 LCD screenshot 3

## VII. CONCLUSIONS AND FUTURE SCOPE

The goal of this paper was to outline the design and implementation of an embedded system which can easily interface with the existing home appliances and

communicate with a smart phone via bluetooth using serial interfacing. We intended to create a home which more or less acts as a rational agent [6]. This research shows many types of applications for implementing home automation. The applications are not limited to those discussed in this paper. The technology discussed could be used in wide variety of applications that requires sensors and appliances and can serve the society in a very instructive manner. Our goal should not be limited to smart home technology but in future we should move past smart homes that automate every task for us [7].

### Features of Proposed System:

- The system will consist of devices connected to the relays
- Micro controller based circuit design.
- The devices will be switched ON/OFF using application on the smartphone
- The wireless technology (Bluetooth) will be used to transfer and receive data

**Discussion:** The points mainly discussed in this research paper are:

### Existing System:

- Manual/Physical switching of devices.
- Manual switch based Device ON/OFF system.

### Limitations of exiting system:-

- Time consuming
- Not always suitable for elderly and handicapped.
- A lot of human resource is required.

### Advantages:

- Beneficial for elderly/ handicapped.
- Less time consuming.
- No human resource is required.

### Scope of The Project:

- This can be further implemented to have control room to regulate the working of the system. Thus becomes the user friendliness.
- This circuit can be expanded and used in industries and workshops to reduce the manpower
- Additional modules can be added without affecting the remaining modules. This allows the flexibility and easy maintenance of the developed system.

## REFERENCES

1. Dengler, Sebastian; Awad, Abdalkarim; Dressler, Falko, "Sensor/Actuator Networks in Smart Homes for Supporting Elderly and Handicapped People." Advanced Information Networking and Applications Workshops, 2007, AINAW '07. 21st International Conference on, Volume 2, 21-23 May 2007 Page(s):863 – 868.
2. Piyare, R and Tazil, M, "Bluetooth Based Home Automation System Using Cell Phone." IEEE 15th International Symposium on Consumer Electronics (2011).
3. Shepherd, R, "Bluetooth Wireless Technology in the Home." Electronics & Communication Engineering Journal 13 (2001): 195-203. IEEE/IEE Electronic Library. 15 Oct. 2007.
4. T. Tamura, T. Togawa, M. Ogawa, and M. Yoda, "Fully automated health monitoring system in the home," Med. Eng. Physics, 20, pp. 573-579, 1998.
5. Jiang, Li, Da-You Liu, and Bo Yang, "Smart Home Research." Machine Learning and Cybernetics (2004). 15 Oct. 2007.

## Bluetooth Home Automation System Based on AVR Microcontroller

6. S. K. Das, D. J. Cook, A. Bhattacharya, E. O. Heierman, III, and T.-Y. Lin, "The Role of Prediction Algorithms on the MavHome Smart Home Architectures," IEEE Wireless Communications (Special Issue on Smart Homes), Vol. 9, No. 6, pp. 77-84, Dec. 2002.
7. Yamazaki, T, "Beyond the Smart Home." Hybrid Information Technology, 2006. ICHIT'06. Vol 2. International Conference on, Volume 2, Nov. 2006 Page(s):350 – 355.