



EASY IOT BASED SMART HOME AUTOMATION USING ANDROID APP

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ABSTRACT

Home Automation industry is exponentially growing advancements in embedded technology fuelling to this field. The present work consists of a mainly user friendly software and ease and rugged hardware modules. It consists of two modules one is transmitter module and another one is receiver module. The transmitter module also called as controlled module which is generally any android smart mobiles. The receiver module consists of 8051 embedded microcontroller system and two channel relay circuit module connected to two appliances of the home. Transmitter module send the signals through inbuilt bluetooth of the smart phone to the receiver module. The receiver module receives the corresponding signals via HC-05 Bluetooth module and takes the appropriate action.

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INTRODUCTION

Wireless technologies are becoming more popular around the world and the consumers appreciate this wireless lifestyle. Now with the embedded Bluetooth technology, digital devices form a network in which the appliances and devices can communicate with each other. The device attached Bluetooth can be controlled both manually via the local switches and remotely via the server Bluetooth. Bluetooth technology is capable of transmitting data and voice at half-duplex rates of up to 1 Mbps without the use of cables between portable and fixed electronic devices. Today, home automation is one of the major applications of Bluetooth technology.

The terms “Smart Home”, “Intelligent Home” followed the concept of networking appliances and devices in the house. HASS becoming popular nowadays and enter quickly in this emerging market. (However, end users, especially the disabled and elderly due to their complexity and cost, do not always accept these systems). Due to the advancement of wireless technology, there are several differences of connections are introduced such as GSM, WIFI, ZIGBEE, and Bluetooth. Bluetooth is being chosen with its suitable capability. A Bluetooth master device is able to connect up to 7 devices in a “Piconet”. Without the switches on the wall, the designed system limited the control only at the GUI. This issue brings inconvenient to the people in the house. This designed system remains the physical switches with the modified low voltage activating method, in order to provide safer physical

control to the user compared to the conventional high voltage switches. This system is still performed with powerful remote functions to make our life at home become easier.

The home is becoming increasingly “smarter”, driven by the emergence of Internet-connected appliances that form part of the emerging breed of Internet-of-Things (IoT) devices. This enables consumers to remotely monitor and manage their home environment lighting systems can be controlled remotely.

LITERATURE SURVEY

K.P.Wack explains the appliances would operate at reduced modes of power consumption while still providing some services to the customer with minimum inconvenience [1]. I. Coskun *et al.* designed based on the Turkish telephone standards and connected to the telephone network just like any normal telephone sets. Any tone dialling dual tone multiple frequency (DTMF) telephone set or hand-held tone dialler may be used to send commands to the control unit, and remotely control. The designed circuit can also detect the user identification number for preventing non-authorized use of the control unit [2]. Koon-Seok Lee proposes a new control protocol, LnCP (Living network Control Protocol) is based on a multi-master system and uses a peer-to-peer communication model. The protocol assumed single bus therefore the appliances can be attached to the bus anywhere if the power lines are employed as the network bus. [3]. A.R. Al- Ali *et al.* explained the design is based on a standalone embedded system board integrated into a PC-based server at home Password protection is used to block unauthorized users from accessing the appliances at home. If the Internet connection is down or the server is not up, the embedded system board still

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can control and operate the appliances locally [4]. T. Saito *et al* designed a new method of home network formation using Bluetooth devices and a method to control/monitor networked home appliances with commands that are implicitly integrated within service contents offered by an application service provider to a user. [5]. A. Alheraish explained the M2M wireless communication of various machines and devices in mobile networks is a fast growing business and application area in industry, customer service, security, and banking areas [6]. U.Buhur *et al.* explained the communication between the devices is wireless. The protocol between the units in the design is enhanced to be suitable for most of the appliances. The system is designed to be low cost and flexible with the increasing variety of devices to be controlled [7]. Jonghwa Choi *et al.* describes a context-aware middleware providing an automatic home service based on a user's preference inside a smart home. The context-aware middleware use OSGi (open service gateway initial) as the framework of the home network. [8]. B.Yuksekkaya *et al.* explained the design and implementation of a home automation system where communication technologies GSM (Global System for Mobile Communication), Internet, and speech recognition have been used. All these techniques are successfully merged in a single wireless home automation system [9]. M.Van Der Werff *et al*, explained a mobile-based home automation system that consists of a mobile phone. The home appliance which operates according to the user commands received from the mobile phone [10]. R. Piyare *et al.* explained the design and implementation of a low cost but yet flexible and secure cell phone based home automation system. The design is based on a standalone Arduino BT board and the home appliances are connected to the input/output ports of this board via relays. The communication between the cell phone and the Arduino BT board is wireless [11]. Somak R. Das *et al.* explained with the help of mobile devices, HASEC operates and controls the home appliances, such as turning ON/OFF a television or microwave or altering the intensity of lighting around the house. HASEC has two main components interacting with each other: the iOS application that executes on the mobile device and server-side scripts that run in a cloud [12].

Block Diagram for Home Appliances

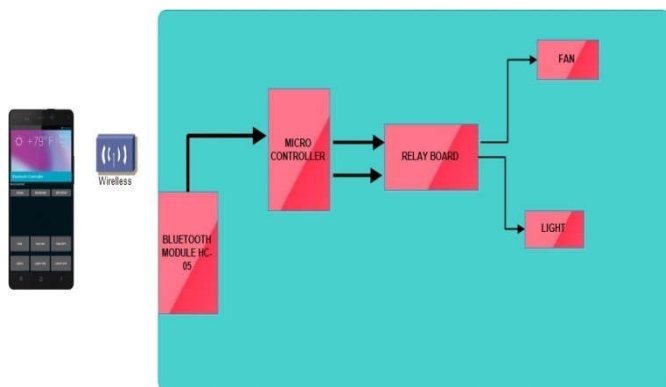


Fig 1 Block Diagram of a Easy IoT Based Smart home Automation Using Android App

Block diagram consists of two parts

Transmitter

Receiver

Transmitter

In this we use smart phone. Smart phone consists of “Bluetooth Controller” app which is pre-defined app and downloaded from the “Google play store”. By using this app we controls the Home Appliances i.e, fan, light. Etc.

Receiver

Receiver consists of four components:

1. Bluetooth (HC- 05)
2. Micro controller
3. Relay board (2channel)
4. Home Appliances (fan, light)

Hardware Implementation

Relay Module

Channel Relay Module



Fig 2 2-Channel Relay Board

- COM- Common pin
- NC- Normally Closed, in which case NC is connected with COM when INT1 is set low and disconnected when INT1 is high;
- NO- Normally Open, in which case NO is disconnected with COM1 when INT1 is set low and connected when INT1 is high.
- Terminal 2 is similar to terminal 1, except that the control port is INT2
- INT 1- Relay 1 control port
- INT 2- Relay 2 control port

Bluetooth Module (HC-05)

The HC05 Bluetooth Module can be used in a Master or slave configuration, making it a great solution wireless communication. You can use it simply for a serial port replacement to establish connection between MCU and GPS, PC to your embedded project. The HC05 Bluetooth Module has 6 pins VCC, GND, TX, RX, Key and LED. It comes pre-programmed as a slave, so there is no need to connect the key pin, unless you need it change it to Master Mode. The major difference between Master and slave modes is that, in slave mode the Bluetooth module cannot initiate a connection; it can however accept incoming connections.

After the connection is established the Bluetooth module can transmit and data regardless of the mode it is running in. If you are using a phone to connect to the Bluetooth module, you can simply use it in the slave mode. The default data transmission

rate is 9600kbps. The range for Bluetooth communication is usually 30m or less. The module has a factory set pin of “1234” which is used while pairing the module to a phone. The HC-05 module can build a connection to other modules. E.g. A Robot being a master and connecting to slave Bluetooth module or in slave mode to make a wireless bridge to a notebook.

Pin Configuration

- STATE: NAc (No connection)
- RX: TX of Microcontroller.
- TX: RX of Microcontroller.
- GND: Ground.
- VCC: +5V.
- EN: NC (No Connection).



Fig 3 Bluetooth Module Hc-05

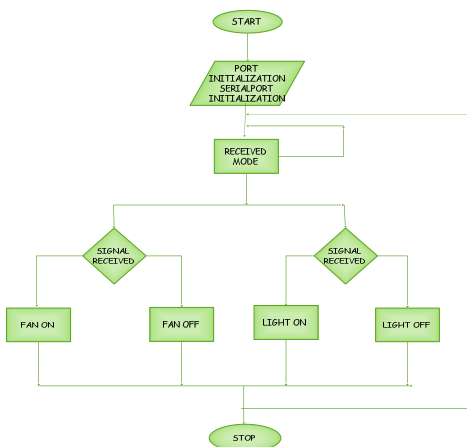
Working Procedure

- The communication between transmitter and receiver is wireless via blue tooth.
- On the transmitter side using the Bluetooth controller app to control the Home Appliances at the receiver side via Bluetooth (HC-05). The app sends the signals to the receiver, Bluetooth (HC-05) module, the modules receive the signals and sends to micro controller which in turn to control the appliances.
- The communication between controller and Bluetooth via serial port communication.
- The port of micro controller is connected to the two channel Relay board through the port-1.
- And, the relay board is connected to two Home Appliances by writing a suitable program, we are controlling the Home Appliances through the micro controller.
- The micro controller sends signals to the relay board through the port-1.

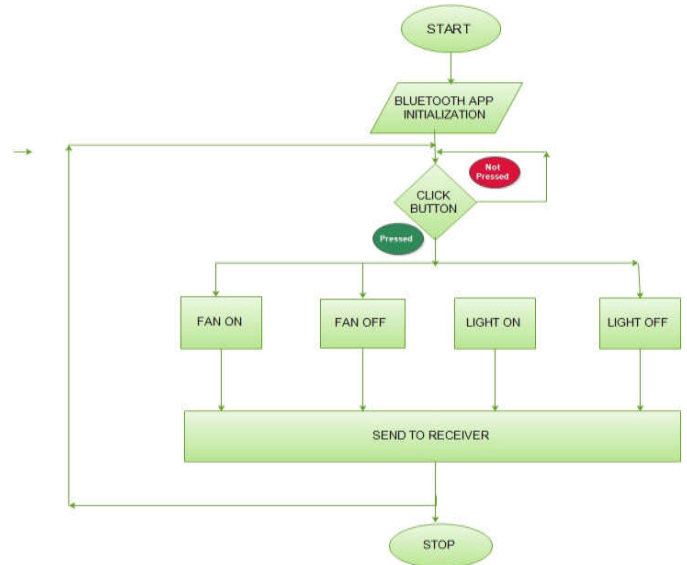
Software Implementation

Flow Charts

Flow Chart for Receiver



Flow Chart for Transmitter



Algorithm

Algorithm for receiver

- step1: start the Bluetooth controller app
- step2: configure the appliances button
- step3: press click button
- step4: send the corresponding button signal to the receiver
- step5: go to the step3
- step6: stop

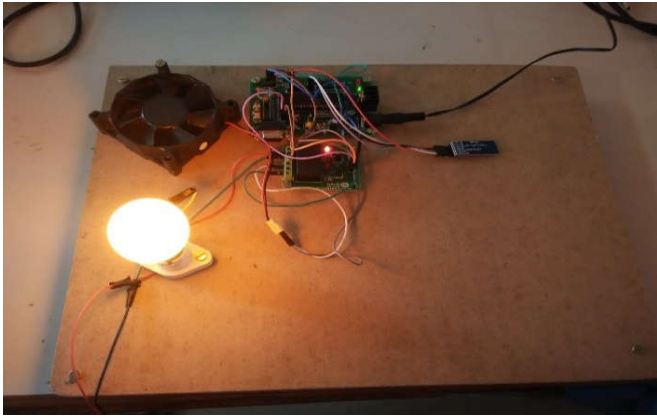
Algorithm for Transmitter

- step1: set the port initialization
- step2: set the serial port, Bluetooth module
- step3: go to the infinite loop for receiving signals
- step4: signal is 1, set the fan on
- step5: signal is 2, set the fan off
- step6: signal is 3, set the light on
- step7: signal is 4, set the light off
- step8: repeat the step4
- step9: stop

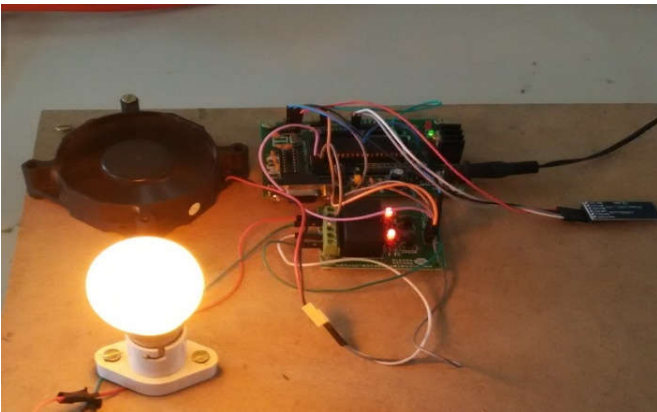
RESULT AND DISCUSSION



- When we send 1 to the relay board, through the port-1 fan goes to high i.e., fan is ON.
- When we send 2 to the relay board, through the port-1 fan goes to low i.e., fan is OFF.
- When we send 3 to the relay board, through the port-1 light goes to high i.e., light is ON.



When we send 4 to the relay board, through the port-1 light goes to low i.e., light is OFF.



Applications

- We can use this system in the automation of industries.
- Used for Industrial security purpose.

CONCLUSION

The present work “Easy IoT Based on Smart Home Automation Using Android App” has been successfully designed and tested. It has been developed by integrating features of all the hardware components used. Presence of every module has been reasoned out and placed carefully thus contributing to the good working of the unit. Secondly, using highly advanced IC’s and with the help of growing technology the project has been successfully implemented. Finally, we conclude that “Easy IoT Based on Smart Home Automation Using Android App” is an emerging field and there is a huge scope for research and development. In this work we are monitoring and controlling the home appliances by sending signal using BLUETOOTH technology. Further, we enhanced by placing PIR sensors for the security purpose. If any unauthorized person tries to enter into home sensor will activate and GSM modem will pass this information to the owner of the house. We can also use smart cards, RFID and finger print technologies for authentication.

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