Home Automation Using IoT

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Abstract The main agenda of IoT is to enable us monitoring and controlling physical environment by collecting, processing and analysing the data generated by smart objects, which is an advancement of automation technologies, making our life simpler and easier. Nowadays Internet of Medical Things also became popular in which medical devices are connected and provides integration for taking care of patients and other aspects related to healthcare. Before the technologies like microcontrollers and smart phones are introduced, establishing home automation was a real burden with interference of electricians, installer and monthly maintenance costing. IoT is providing us home automation system using smart devices to get over this hindrance, which allows us to easily control the home appliances. The presented chapter introduces the home automation system using BASCOM, which also includes the components, flow of communication, implementation and limitations.

Keywords Smart devices · Automation · Microcontroller · Home appliances

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1 Introduction

IoT [1, 2] is an acronym for "Internet of Things" which is the combination of economic significance, technical, social and provides dynamic global infrastructure which has capabilities of self-configuration [3]. In IoT objects obtain intelligence by enabling context related decision and also by making themselves recognizable. The fact of IoT objects is that they can communicate and exchange information about themselves [4], whether it is wireless or wired. The main aim of IoT is to make the things smart by getting them connected at anytime, anyplace with anyone and anything which we call ubiquitous in nature. IoT is the next era of computing which is outside the domain of traditional desktop [5]. Sensors and actuator plays an important role in connecting the IoT objects. IoT provides several benefits. Some of them are mentioned here:

- Simplifies daily life
- Assist people with personal safety
- Security
- Health
- Provide ubiquity

In healthcare, IoT devices are connected and data is collected from various sources like temperature monitors, glucose levels in blood, health tracking, monitors and these are essential for the patients. In addition, these measures sometimes need an interaction with the health professionals which in turn requires the data to be delivered to the smart devices. This platform makes the patient and health professional interaction possible. As a part of IoT some hospitals are implementing the concept of "Smart Beds" which can detect the patient movement and can help patient to get up without help of nurses [6]. Healthcare can also be applied at home for example, by making smart toilets which can automatically takes the urine samples and send the data to the doctor if some disease found in that sample, through this preventive care can be taken at early stages. Healthcare and IoT are two major concerns nowadays which are in trend and giving benefits to more and more people adopting it.

So why there is an emergent need of home automation? There are several reasons for it, which are mentioned here: It is a fact that the main power to control, monitor and simplify everything within our daily life and homes, is in the hands of home automation system. There are so many devices and activities happening around us in day to day life and so many devices are used. With the help of home automation homeowners can fuse together their activities like, entertainment, lighting, temperature control and security. Home automation is one way to manage everything. It is easy to use and main idea behind home automation is to be able to control everything from afar and cut your energy costs. Therefore, the requirement of home automation becomes very important nowadays.

Home Automation is a system that simplifies our lives which enables us to control home appliances automatically and electronically. It transforms our normal

house into smart house and it is like "Giving your Home a Brain" which can reduce the power consumption [7]. Before this advancement interfaces like buttons and switches were used in the normal houses [8], now home automation replaces all these things with a central control system including the user friendly GUI on smart phones and is economically feasible.

Main aim of home automation or smart home is to monitor the activities of an individual within its own environment and it also monitors how a person interacts with devices. Based upon these observations and interactions, physical environment can be controlled using IoT [9, 10] technology and an improved living experience can be provided to an individual. Controls of all the day to day life aspects are included in it. Humans generally interact with the devices like bulbs, fan, AC, etc. With the help of IoT, environment settings can be made such that, it can respond to the human activities automatically. If such controlled environment can be made, it would be very beneficial. Even it becomes more useful when user itself can control these devices from their mobile phones and get the information. Nowadays demand of controlling devices through mobile phones is growing rapidly. Home automation is the most popular topic while talking about controlling devices through mobile phones.

Home automation system provides features [7] like:

- Security and fire
- Energy management
- Home appliances controlling
- Entertainment

Here we are introducing the concept of home appliance controlling using smart device in which previously Bluetooth was used to access and control the appliances. Due to some following drawback of Bluetooth the system is not sustainable.

- Less secure
- Low bandwidth
- Limited range (5–30 m)
- Only up to 7 devices can be connected at a time.

To overcome this inconvenience, we provide a solution using Wi-Fi which is having much larger range of 32 m indoors and 95-m outdoors [11]. By using this Wi-Fi module, we can have access to anything if we have a suitable microcontroller for interfacing that Wi-Fi module, for that we implemented the home automation system which can handle electrical components using the Android device through Wi-Fi. With advancement of wireless technology various different connections are introduced like GSM, Wi-Fi, ZIGBEE and Bluetooth. Each one of these has their own unique features and applications. Among these wireless connections, Wi-Fi has been chosen because of its suitable capability.

Wi-Fi capabilities are more than enough to be implemented in this system. Nowadays all devices like laptops, mobiles have facilities to connect to Wi-Fi. In recent years' home automation is becoming so much popular. It provides

interoperability: some limit can be set for temperature according to weather condition; lights can be switched on or off based on daylight. Home automation can also give facility to access and monitor the house with the help of your laptop or even mobile phones. It should also be able to extend and reduce if required, so it also provides benefits like saving energy and it is also expandable. Media is also concerned about topics related to energy conservation.

House equipped with these kind of system can provide comfort, flexibility, elegance, security, and the main benefit it provides is reduction in cost with the help of optimization of electricity consumption and heat. Example: turning on the sprinkler at the middle of night if it detects thieves. Home automation also employs sensors which can detect the presence of individual in a room, and it can also control the volume level of music based on different factors. Different technologies and standards are used in current home automation systems like Bluetooth, ZigBee, X10. We use Bluetooth only where there exists hardly any infrastructure to connect appliances. ZigBee can be a better solution than Bluetooth. In future ZigBee chips may exists in normal house. These things can make mornings easier as alarm clocks can communicate with coffee maker and order it to make strong coffee. GSM network is preferred due to its wide spread coverage for communication between the home appliances and people. These things make everything online for all time. There are many projects are available on the Internet that are Based on Bluetooth, Wi-Fi and ZigBee. And we can combine those projects and make one large project to control our Home.

The main thing in our project is how to make our home smart and better than the traditional houses. Smart House is an environment in which technology in enabled which allows device and system to be controlled automatically. Many Features that we can include making our Home Smart.

Lighting: We can make our lighting system smart by controlling it through our phone. To control it we have to create one Android or IOS application that control our home system. We can control it and change it according to our mood. If we want deemed light by giving the command through our phone we can deemed it. Change the traditional switching method to on or off the lights.

TV: We can change the channel according to our mood there is no need to do it by traditional way.

Refrigerator: To maintain the cooling automatically inside the refrigerator, if refrigerator wants to store some items the list of items will be generated automatically and it will send to super market stores computers and it will also send to your phone to get connected with your refrigerator

Structure of chapter is arranged as following: Sect. 2 introduces modules of the system, Sect. 3 presents the architecture of system, Sect. 4 include implementation flow along with output, Sect. 5 contains system limitation and future work followed by Sects. 6 and 7 which includes conclusion and references respectively.

2 Modules of the System

Here in this section you are going to learn about each of units that can be used to construct the home automation system. Following are the modules used in constructing the system:

1. Serial bot
2. Wi-Fi module
3. Bascom controller
4. Relay board
5. USB ASP loader
6. Bascom AVR-IDE

2.1 Serial Bot

It is an application made by Simon Hope Communication which gives access to any embedded device using Bluetooth or Wi-Fi. This application is easily available in play store. It is a Telnet/SSH client with integrated support for RS232 serial connections via Wi-Fi to Serial or Bluetooth to serial [12].

Serial bot can be used to connect to serial ports such as industrial equipment, router console parts and many other devices which have RS232 connections, from our android devices. It is a terminal app specifically designed to support serial ports via Wi-Fi or Bluetooth to serial adapters. Its size is 778 K and current version available is 1.8.1. In connection type options are given like local, telnet, SSH, Serial-Wi-Fi, serial-bot.

Select telnet as shown in Fig. 1 and write the IP address and port address of particular host. Here it is 192.168.16.254:8080. Through this you can easily send commands to the device connected to it.

2.2 Wi-Fi Module

Robodu UART Wi-Fi module by Hi-Link was used which is shown in Fig. 2. With the help of Wi-Fi module, the serial device does not need to change configuration and we can easily transmit data over Internet [12]. It supports network standards of wireless and wired like for wireless it is IEEE 802.11n, IEEE 802.11g, IEEE 802.11b and for wired it is: IEEE 802.3, IEEE 802.34. Wireless transmission rates are as follows:

For 11n: up to 150 Mbps
For 11g: up to 54 Mbps
For 11b: up to 11 Mbps

Fig. 1 Serial bot

Fig. 2 Wi-Fi module

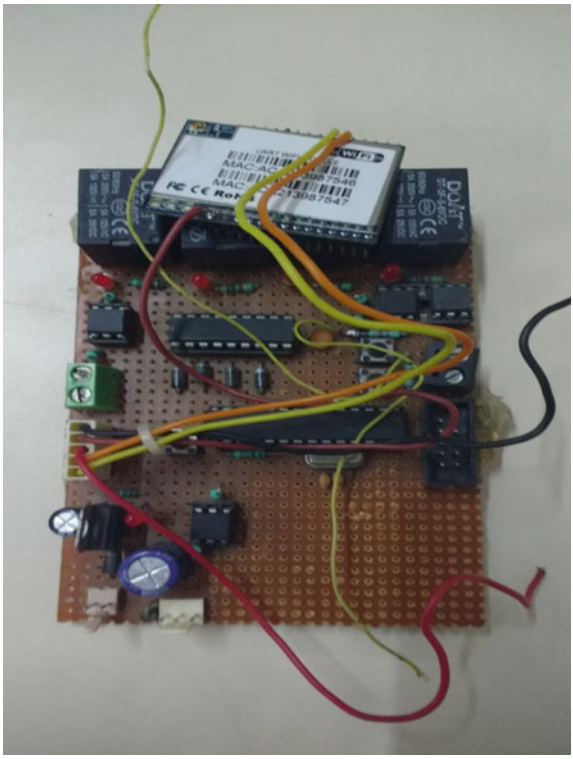

Fig. 3 Bascom controller

It provides 2.4–2.4835 GHZ frequency range. This Wi-Fi module provides good range and if we make some changes in it, it can work as a client router.

2.3 Bascom Controller

Bascom includes following components which are shown in Fig. 3.

1. ATmega 8 microcontroller—Atmel
2. Opto coupler (OC)
3. DC–DC relays
4. Relay driver-Toshiba ULN2803APG

2.4 Atmega8 Microcontroller-Atmel

Atmega8 microcontroller is a low-powered, 8-bit microcontroller which is based on AVR RISC structure. Designer can optimize the power consumption and increase

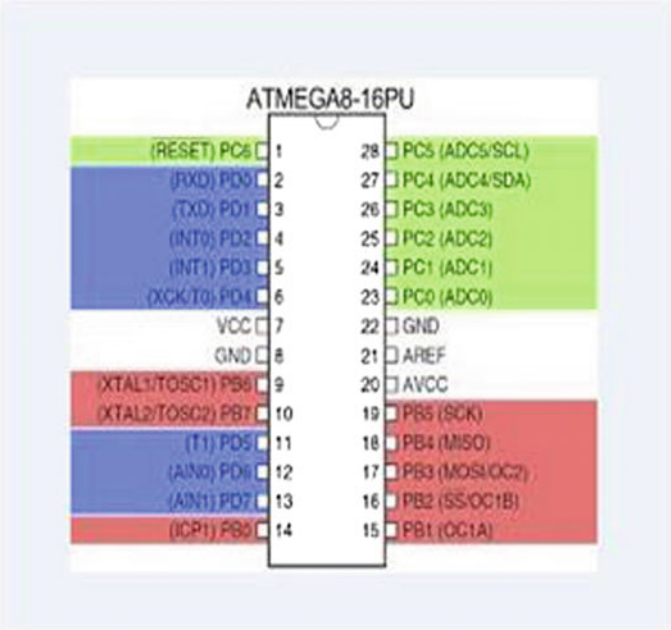

Fig. 4 Pin diagram

the processing speed with help of this microcontroller [13]. This microcontroller can achieve throughput of 1MIPS per MHZ and can also execute instruction in a single clock cycle.

Atmega 8 microcontroller provides following features:

1. High performance, low-power
2. Advanced RISC architecture
3. Special microcontroller features
4. 512 bytes of EEPROM
5. 1 Kbyte of SRAM

Pin diagram of Atmega8 microcontroller is shown in Fig. 4.

2.4.1 Memory

The Memory of ATmega8 microcontroller is 8 kb of flash program, EEPROM of 512 bytes and internal 1 KB SRAM.

2.4.2 I/O Ports

There are three ports and 23I/O lines can be obtained from it, PORT B, PORT C and PORT D are the names of three ports.

2.4.3 Interrupts

At PORT D there are two external interrupt source are located and internal peripherals generates 19 events that supports 19 different kind of interrupt vectors.

2.4.4 Timer/Counter

There are 3 internal timers are available, 2 timers are 8 bit and 1 timer is 16 bit, which supports internal or external clocking and offers different operating modes.

2.4.5 Serial Peripheral Interface/SPI

ATMega8 integrated with 3 communication devices one is serial peripheral interface.

2.4.6 USART

Most powerful communication solutions are USART and ATMega8, synchronous and Asynchronous data transfer scheme are supported by them. 3 pins are assigned for that.

2.4.7 Two Wire Interface/TWI

ATMega8 has another communication device named two wired interface. Designers can setup a communication between two different devices with the help of just two wires having a common ground connection. By means of open collector outputs TWI outputs are created, thus to makeup the circuit external resistors are required.

2.4.8 Analog Comparators

In the IC one comparator module is integrated which gives facility of two inputs of the analog comparators to get connected with the two voltages via external pins that are in turn attached to the microcontroller.

2.4.9 Analog to Digital Convertor

Input signal can be converted and analogue into digital data of 10-bit resolution using analog to digital convert.

2.5 Opto Coupler (OC)

It is a type of Optical Coupler. Opto Coupler is also known as photo coupler, optical isolator. With the help of light, it transfers electrical signals between two isolated circuits [14]. The main function is to protect the circuit from high voltage. There are different types of Opto Couplers. The most common size with maximum output we are using is 30, 70 and 80 V and the maximum output of the Opto Coupler is up to 80 kV.

Four general types of Opto Couplers are available; they have an infra-red LED source having different photo-sensitive device.

These four OCs are named as: Photo-transistor, Photo-Darlington, Photo-SCR and Photo-triac.

2.6 DC–DC Relays

Relays are like switches and because of their simplicity they are used in many applications. DC–DC contains sensing unit, the electronic coil, which is powered by DC current [15]. It is one type of electromagnetic device which used to isolate two circuits electronically and also connect magnetically [15]. It is separate circuit. Following are applications where DC–DC relays can be used:

1. Appliances
2. Security
3. Telecommunication
4. Motors
5. Industries

2.7 Relay Drivers

Relay driver is one type of electrically operated switch. The main aim of the Relay drivers is to directly control electric motor which requires handling high power and different loads [16]. In this project, Relay drivers can handle up to 240 V power supply. Relay drivers are comprised of eight NPN Darlington pairs with high voltage and high current. They contain following features:

- Input compatible with various types of logic.
- Output current 500 mA (maximum).
- APG-DIP-18pin.

Some applications are hammer, relay, lamp driver, display (LED) driver.

3 Relay Board

As shown in Fig. 5, relay board consists of 8 relay switches. It is an 8 channel relay interface board which can be controlled by Bascom AVR. The main functionality of relay board is to trigger the DC voltage to AC voltage, which is done through switches. Port for power supply and equipment for controlling the appliances are also there on the relay board. It can be directly connected with the microcontroller [17].

Red LED lights are also attached with it. It triggers 12 VDC–240 VAC. Internal circuit is working on DC to AC triggering and basically used for triggering AC voltage from PC. There are many Relay Boards is available. This boards are ideal for switching appliances, controlling the lighting switches and much more. This relay board uses 12 V relays to switch or control heavy loads, with each relay suitable for switching up to 10 V. Each relay output is controlled with +5 V TTL Signal.

Features of 8 Relay Board:

- 8 Relays for large connection
- High degree of isolation between control signal and output signal with the use of op-to isolator for isolation.
- Each relay has a LED to indicate the relay state.
- For cable connection PCB power terminals are included on relay board.
- Standard '0.1' headers are provided for easy connection to other control system or our development board.
- 12 V power supply is needed for relay oils.
- Ideal for use in industrial and commercial system.
- Board dimension: 205 × 66 mm.

4 USB-ASP Loader

For AVR microcontroller it is a USB boot loader. If a certain hardware condition is met, loader loads the data on USB. Mainly it is used for connection of micro-controller to pc and to dump a code for assembly language or hex file [18]. USB ASP loader is an one type of USB boot loader for AVR microcontroller. Each AVR has at least 2 KB boot loader section.

Fig. 5 Relay board

USB ASP loader is shown in Fig. 6.

5 Bascom AVR IDE

It is a window BASIC COMPILER IDE for AVR family. There are many microcontrollers available to write the code but we used Bascom AVR IDE which is very powerful and AVR-Eclipse is a plug-in for eclipse IDE which adds tool chain support, through CDT for the gcc compiler [19]. Here we used BASCOM AVR IDE for writing assembly language code for the microcontroller. For AVR family, Bascom is windows Basic compiler, which runs on WIN 7/WIN 8, VISTA, XP. Variables used here can be long as 32 characters. It is constructed with BASIC labels.

Instead of using interpreted code BASCOM AVR IDE uses fast machine code. It is a testing simulator. There are some key advantages, which are as follows:

- It is structured BASIC with labels.
- Contains structured programming with IF-THEN-ELSE-END-If, Do-Loop, WHILE-END, and SELECT-CASE.
- Fast machine code instead of interpreted code.
- Labels and variables can be as long as 32 characters.

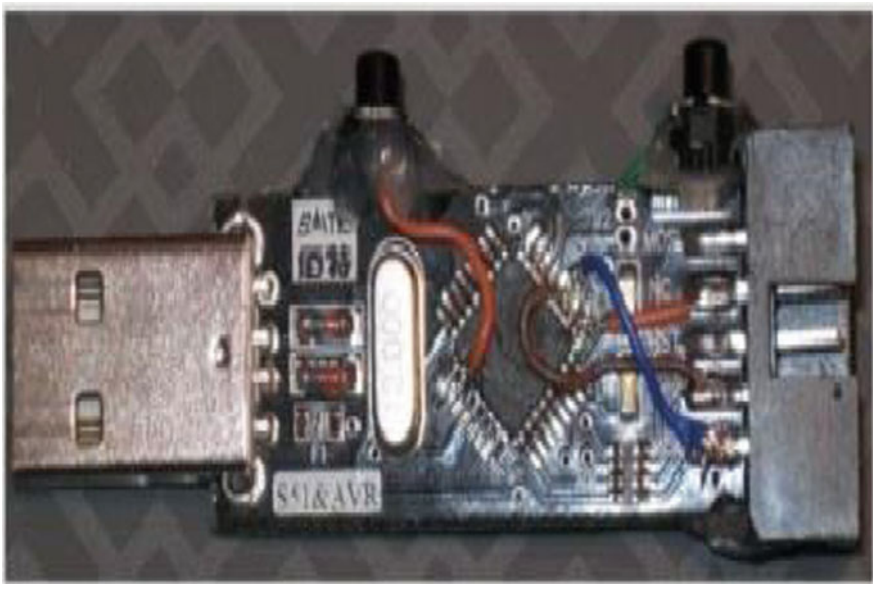

Fig. 6 USB-ASP loader

- All the compiled programs can work with all AVR microprocessors that have internal memory.
- Integrated simulator for testing.
- Local variables, user functions, library support.

In Fig. 7 the screenshot of the editor is shown, in which you can observe the coding written in code explorer.

Following are the steps by which you can make a program in BASCOM-AVR-IDE:

1. Write a program with BASIC.
2. Compile it to fast machine binary code.
3. With integrated simulator, test the results.
4. Now you can program the chip or hardware with this integrated programming.

6 System Architecture

6.1 Architecture

Figure 8 describes the overall system architecture of Home Automation. It starts with the serial bot application which was described in Sect. 2.1. When power supply is given through the adapter to the circuit the Wi-Fi module provides the Wi-Fi signals, and we can connect the serial bot application with it. Then after we need to enter valid IP 192.168.16.254 and port address 8080 as discussed in Sect. 2.1, it will check, if it is not connected it will give the message "Enter Valid IP and PORT", but if it is connected the output is provided to the relay board.

Fig. 7 Bascom AVR IDE

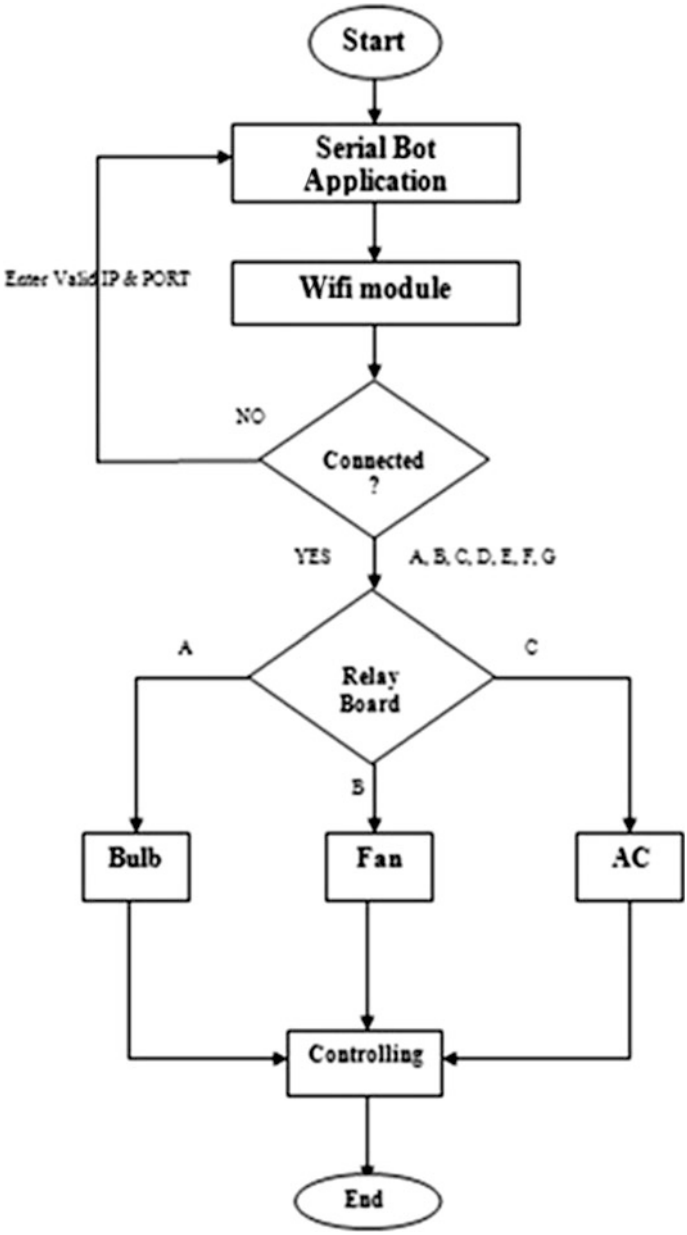

Fig. 8 Architecture

In this project, we have attached 8 switches on relay board and through this we can control various eight home components up to the 240 V. Serial bot application is already available on Google play store. We have to give the command using telnet.

On relay board 8 channel switches are there to which A, B, C, D, E, F, G ports are given, if we trigger 1st port it will send the signals to port A to which a bulb is attached and this way a bulb can be controlled. Similarly, if we trigger 2nd port it will send the signal to B to which a fan is attached, we can control a fan.

By using the same procedure, we can control all the appliances attached to the relays.

6.2 Controlling Circuit

After all these implementations we need to understand the final controlling circuit, through which controlling of home appliances can be done. To understand this, we need to focus on the small blue part of the relay board. At the bottom No, C and X are written, from which No and C are made common. C part of each is going to connect to the phase of each of the electrical appliances which is indicated as P in the figure.

As you can see in the Fig. 9 from each C part a connection is given to positive. No part is connected to the negative. Here it is neutral for the electrical appliances which are indicated as N in the figure. The electrical components such as bulb, fan are connected to P and N.

So the final controlling of these devices are done through these implementation, in which appliances gets connected to the circuit.

7 Implementation and Result

7.1 Implementation Flow Along with Output

Now let us understand how actual implementation is done. In figure implementation flow is given.

First we need to provide the power supply to Bascom circuit, which enables Wi-Fi module that provides the Wi-Fi signals. Now we can connect our android device with Wi-Fi and we can use serial bot application for sending the command. In serial bot application we need to select telnet option and write particular IP and Port address. Here it is 192.168.16.254:8080 where 192.168.16.254 is IP address and 8080 is port address, all this is shown in Fig. 10a.

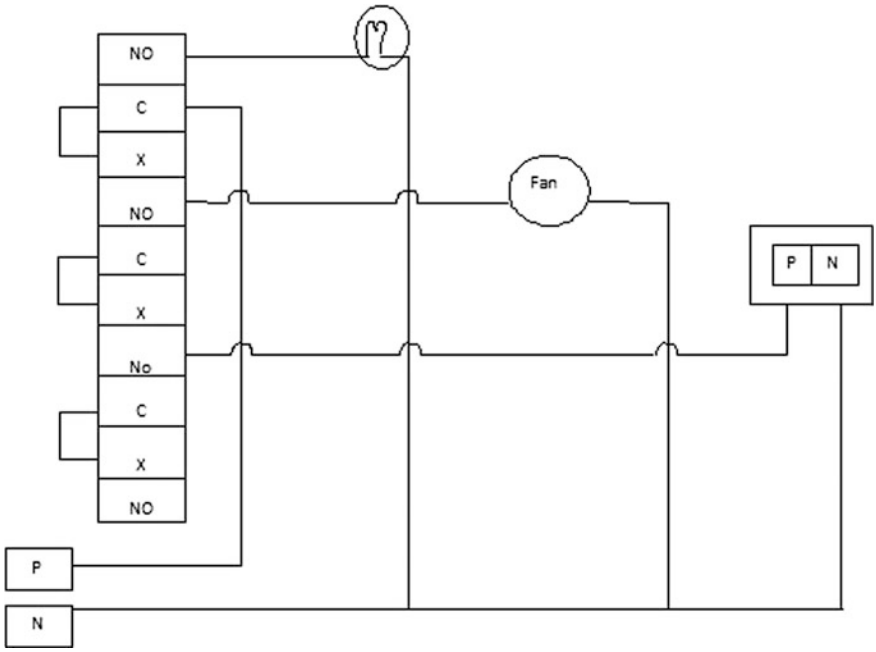

Fig. 9 Controlling circuit

Then after in Bascom controller the code that we have written in Bascom IDE is going to be implemented. With the help of USB ASP loader, we can dump this code into hardware. Now let us see the implementation flow and how it is working.

As you can see in the Fig. 10c, for each command port number is implemented which is in binary form. For X = "A" binary is given as 0100, for X = "B" binary port is 0110. Similarly, for X = "C" and X = "D" it is 0101 and 1000 respectively. This way for each port up to "G" binary value is given. From the Bascom controller the command which we have triggered is sent as an output of Bascom to relay board. In relay board as we have discussed earlier 8 channel switches are there. The current provided as input to the relay board is DC current and home appliances are running on AC current so we need to convert this DC current into AC current. For this DC–AC relays are attached. Relay is one small switch is given, its main function is to trigger the AC current.

Whenever DC current is provided this switch is triggered which finally enables AC current. Here we have used (12 VDC–240 VAC) relay which means it can take up to 12 V DC and can trigger up to 240 V. So finally the devices connected to the controlling circuit which is explained in previous section can be controlled. If A is given as input then it will control the device connected to the first relay, here bulb is attached, so we can control bulb. For B fan is attached so we can control fan. Similarly, for each relay and port, one device is connected. Here 240 VAC is given

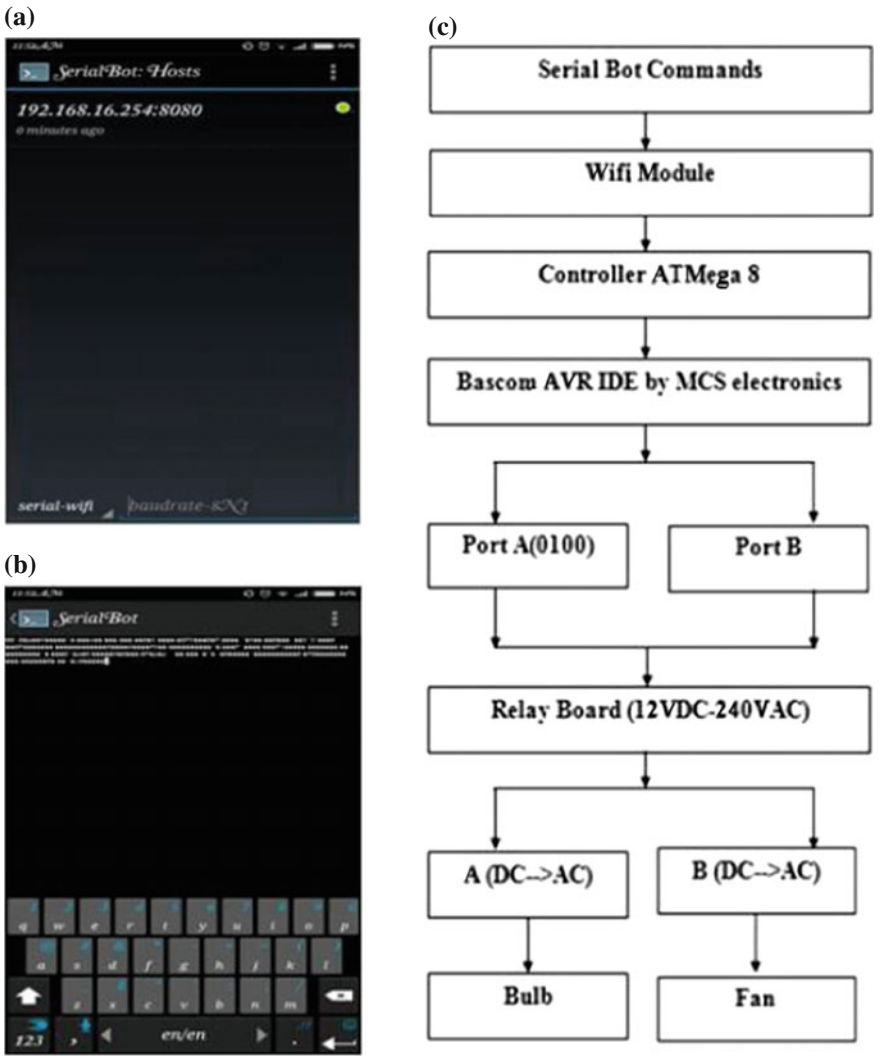

Fig. 10 **a** IP address and PORT no. **b** Wi-Fi command, **c** flow diagram, **d** final connection

(d)

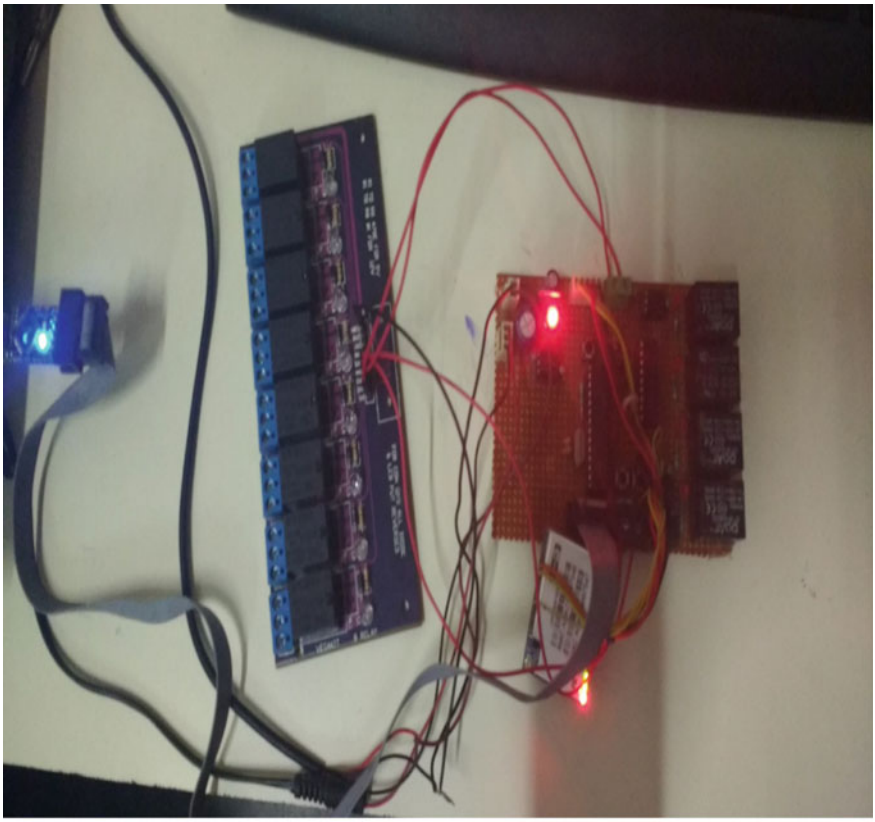

Fig. 10 (continued)

which indicates that we can control all the home appliances which are running on 240 V.

As a result, the implementation of the home automation system is done which is show in Fig. 10d.

In this project we make one circuit in which we used capacitor, resistors, LED, microcontroller, Wi-Fi, ROBODU, 4 switches and I/O ports. To connect all these devices, we used single core cable. On relay board we used seven relays so that we can control different Home equipment.

8 System Limitation and Future Work

There are many projects available on Home Automation using Bluetooth. But in this project range is provided and it is basically work in specified Bluetooth range. To overcome this limitation and Bluetooth range problem we use Wi-Fi in our project which provide better range than Bluetooth.

Every system has its pros and cons. There are some limitations of the system. In this section we are going to learn the limitations of the system and how the system can be extended to the next level in near future.

8.1 Limitation

Following are the limitations of the system:

- The system runs on Wi-Fi signals so if the Wi-Fi strength is weak it might cause a problem of connecting the serial bot with it.
- If the signal strength is weak or some hardware problem is there.
- There are chances of delay in the output, so we can say it might restrict the speed of implementation.
- Another problem with the system is that instead of going into microcontroller, signals are sometimes bounced back to the serial bot application.
- The system can only control the appliances which are running on 240 V AC.
- It will work only in Wi-Fi connected range.

8.2 Future Enhancement

- In future this system can be extended up to controlling all the devices of the house by adding more relays using an android device.
- High voltage appliances which are running beyond 240 VAC will be controlled using this system.
- Full controlling of the electrical components of home will be implemented in very near future.

This implementation will make our lives easy and makes it easy to access and control the home appliances.

8.3 Future Ideas

Health Care and IoT: Growing awareness about the health among people nowadays has led to the disciplines like “Health Advisor” and “Self- Healthcare”

[20], which made realized people to live a healthy lifestyle and plays an important role in bringing the care point from hospitals to patient's home. Enabling technology related to health care requires capturing data related to individual's health and various other parameters.

IOT (Internet of Things) provide such facilities to not even capture but also to analyse and share with different connected environment. This will help to make the cost of care low. This innovation in healthcare will increase the efficiency and can make healthcare affordable.

How IOT will help in Healthcare: Some of the examples can easily explain how IoT will help in healthcare field. They are as follows:

- **Disease Management**: Patient's physiological conditions like glucose level in blood for diabetics and blood pressure for hypertensive patients can be monitored and observed by the IoT devices and these devices can send periodic data and through which various important analysis can be done.
- **Preventive Care**: Health supervision is necessary to observe and take preventive actions on time. For this reason, IoT wearable technology is been introduced which made supervision easier.
- **Clinical Monitoring Remotely and Assisted Living**: IoT enables medical providers to monitor and transfer routine assets on personal level while saving cost.

IoT Prospects in Healthcare:

IoT changes the direction to where health care can be forwarded, how quality outcomes can be produced, increment in efficiency and how these new technologies can be made affordable to the individuals. Analysts can predict the health responsibilities which a patient can take for himself. Healthcare related technologies, systems, services, applications, software, medical devices in terms of the IoT are listed as follows [21]:

Technologies:

- Cellular
- NFC
- BLE
- Wi-Fi
- ZigBee

Healthcare related services:

- Maintenance
- Support
- Integration of systems
- Professional services

Applications related to healthcare:

- Inpatient monitoring
- Management of medication
- Telemedicine
- Workflow management
- Connected imaging
- Clinical operations
- Others

Healthcare on the base of users:

- Research laboratories
- Diagnostic labs
- Defence and government institutions
- Hospitals and clinics
- Surgical centres

Medical devices required for healthcare:

- Stationary devices
- External wearable devices
- Implanted devices

Today's healthcare environment requires focusing on individual's health, patient protection, availability of medicines at lower rates, and personalized care to individuals. With the help of IoT all these things can be made possible and can also provide ultimate facilities to the people who actually needs to focus on their health and confused about their health issues.

Patients and providers both will get benefit from IoT's presence in healthcare environment. Some other use of IoT is medical applications, wearable devices. Hospitals use IoT technology to keep track on location of medicines and patients.

Smart Lighting: Using only one button that turn on/off all the lights of a room it and by double tap it can switch off all the lights. If there is a dark outside the room the light will automatically turn on there is no need to turn it on by switch. When there is no one in the room and the room has been empty for some amount of time, motion sensors in particular areas can signal the automation system to perform switch on or off operations. This automated system can also provide facility to turn off all the lights by pressing one single button.

At sunset landscape lightning can turn on and off again at sunrise. If natural lights is present in the room the lights will automatic get deemed. When there are shades or on cloudy day in the middle of summer this will help.

Smart Music: In Our generation music is important in our daily life and we can make it smart or better. In each room some dedicated keypads are placed which can help playing stream music in every room. We can play music according to our mood, and also can play our favourite playlist.

To activate particular zone of music we can tap one single button accordingly, it can change the LED lights and assign the colour for each family member with their own playlist setting. Music will automatically start when we on the shower and double tap on volume button to increase and decrease the volume. To control music streaming in the shower, we can install a touch screen behind the waterproof wall mount having a shower. You can program your own setting and control it also with your smart phone application.

Nowadays TV is in home of every individual, after coming from work we can automatically tur on favourite channel. At night the lights in each bedroom flashes a warning an after 10 min TV will switch off and remote control and keypads gets disabled.

Smart Lock: We can also make our home locks smart, we can control it with our phone and we can also lock and unlock it with our smart phone application. It will also helpful to protect our homes from thieves.

When the bell rings, we can see who's at door by automated bedroom system. When someone press the doorbell the identity of that person will play through speaker, and the security camera rotates to the front door. When some door is open it will notify in your phone and pop-up will be displayed on your and gives you alert message to close the door. From anywhere in the world, we are able to access security videos.

When any unwanted motion is happened with your home's lock or some other person try to open it, the message will automatically send to your phone and gives you an alert message. You can also create one temporary access code for your guest, which they can punch into your home through smart locks when you are not at home and want to give them access, notifying you of their arrival.

If you forget to lock your door then set some predefined time after that the door will automatically locked, so there is no need to take tension when you forgot to lock your door.

9 Conclusion

This was our first attempt to develop a home appliance controlling application on Bascom and from which we have concluded that, it gives us basic understanding about IoT's latest research and project. Results of the project is achieved by creating a hardware which can be used to control the basic home appliances like fan, bulb, etc. with use of serial bot application through which a user can easily access or control the devices of home. Through this system we can easily control the home appliances using Wi-Fi which overcomes the range problem of Bluetooth in previous work. The goal of making a handy system with easiest control is achieved and it satisfies the true meaning of the tag "Brain of Home" because it actually works as a brain which has all the ability to handle home appliances. Here we have used Bascom. You can also use Arduino or Raspberry Pi to implement this system or similar kind of projects and can build your own hardware using simplicity of IoT.

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