Pre-Programmed Multiroom Operation and Power Curtailment Using Bluetooth

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Abstract- with the rise in demand of advance technology and items, human mind crave for more comforts. The following idea portrays the thought of smart house into reality. This paper gives the idea to control over an entire house. The circuit is implemented in a way such that it does not render the AC supply wiring useless. The control board is provided with a manual override to switch between the normal and automated house. Arduino mega with Atmega 328 as microcontroller is programmed to communicate with Bluetooth Module (HC 05) and respond as per user requirement. A simple yet effective android application is designed that communicates with the controller. The application designed also has a special feature of power saver that adjusts the lightning and temperature in room by judging the surrounding conditions unless specified by the user. The application has an inbuilt security feature that does not allow stray users to interfere in the module functioning. Thus a single application on an android device connected via Bluetooth can simply allow the user to talk to the appliances not only in a particular room but in the other rooms as well and the ultra-power saver can be used for curtailment of energy.

Keywords- Smart home, Arduino, Automation, Bluetooth Module, Manual override, Power Saver.

I. INTRODUCTION

In today's developing world, human requires a luxurious and comforting life. This project is based on bringing human more close to materialistic comforts. With the unexpected growth in the field of technology one desires to put this technology for one's own benefit. This increased craze for technology has led to the development of pre-programmed home appliances such that a few lines of code can be used to do the boring and tedious job. The term Smart is used for such appliances and devices.

With the increased development in the Embedded in few years we are here with the concept of Smart Home. The process is as interesting and fascinating as the concept. We are in the era of smart systems such as smart TV, smart phones, and smart refrigerators and now is the time to move on from appliances to our own house. Let's consider a case of an aged man who is unable to switch on a fan manually due to certain reasons now what if you could have the control of your fan on your smart phone or tablet what if you can have the control on all your electrical and electronic appliances just a click away what if we could control appliances all over the house from any place within the house. Thus bringing up the concept of pre-programmed houses.

Pre-programming or automation is basically a method where the control of your appliances is transferred on to your mobiles or tablets using just a few lines of codes and a microcontroller as a master to control and monitor the wireless commands given through Bluetooth or any IR device. One can think of many ways in IR communication such as RF Module which allows the communication in a specific range of frequencies and GSM module which allows the user to communicate with the appliance using mobile networks [1]. Among all these modes Bluetooth comes out to be the easiest and the cheapest way to achieve the goal [5].

The main objective of this work is not only to design an automotive environment for just one room but for Multiroom automotive environment where one can control appliances in a number of rooms simultaneously. With the increase in the energy consumption a number of steps are taken to preserve our resources and to use the energy efficiently [2]. Therefore this work also focuses on the energy preservation. Since a lot of efforts are being made to conserve energy resources because no one knows what the future holds and we all know that the consumption world's natural resources have been greatly increased in a decade or so. Thus to not only reduce our electricity bill but also reduce power consumption an ultra-

Saving mode is provided which can take care of our carelessness and takes care of the appliances that are kept plugged in for hours and not even used or use of lights even in daylight. An automated system is installed in the room using LDR's and temperature sensors which keep a check on the power consumption in the room ([6], [7]).

Fig. 1 shows the basic system of the automated environment in the room with its controller i.e. Arduino Board with Atmega 328. [3] The Main power supply is bypassed using an override mechanism that is installed for the user to switch between manual and the automatic. Any appliance in the house gets its electric power either by the relay switches via microcontroller or directly. This override mechanism is build just to ensure that the previously used switches do not get wasted in the process of automating a well-constructed house.

Fig. 1 Block representing automated environment.

II. CIRCUIT IMPLEMENTATION

Fig. 2 shows an elaborate structure of the process used for the automation system. This system acts as a bypass to the previously build electrical system. Thus there is a manual override control mechanism provided for a user to switch between the automated and the manual system. The manual override mechanism is nothing but a switch which helps the user to switch to manual or the general wiring during a fault or accordingly.

This control switch is placed in the beginning of the house wiring directly below the main fuse circuit in the house. This mechanism also has PCB consisting of a setup which provides the power to the bypass setup. The bypass works entirely on DC voltage hence safer than the original 220 volts switches. It is to be noted that the AC switches are useless once the automatic mode is active. The control ones fixed to automatic the control jumps to the microcontroller which then acts as a brain to the electrical wiring system. If the mode is selected to manual mode the DC mode or the microcontroller mode is turned OFF and the 220 volts wiring is restored back. The process of these two paths is clearly shown in Fig. 2.
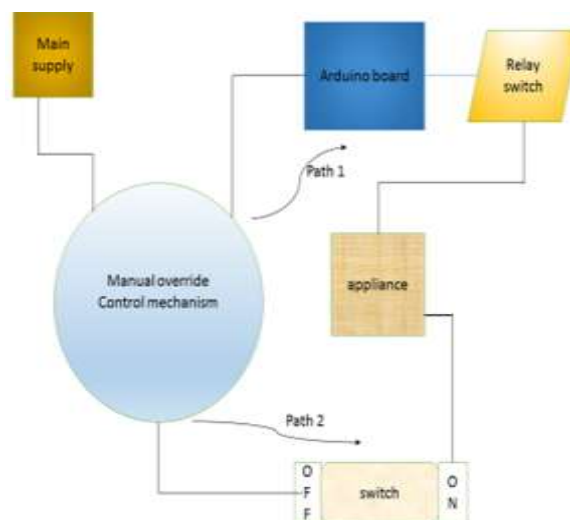

Fig. 2 Path flow of automated circuit.

The ultra-power saving mode provided works in a way as shown in the fig. 3. The room is setup with LDR's and temperature sensors which monitor the optimum power requirements for the room at any time. At any time when ultra-saving mode is powered ON then it stabilizes the light intensity as well as the temperature in the room according to the need of the user. User can set his choice from the phone. The ultra-power when on adjusts according to the atmosphere required by the user the temperature is automatically adjusted in the room using the fans and Air Conditioner (if required). Except Fans and Lights user has control of all the other appliances in the room .
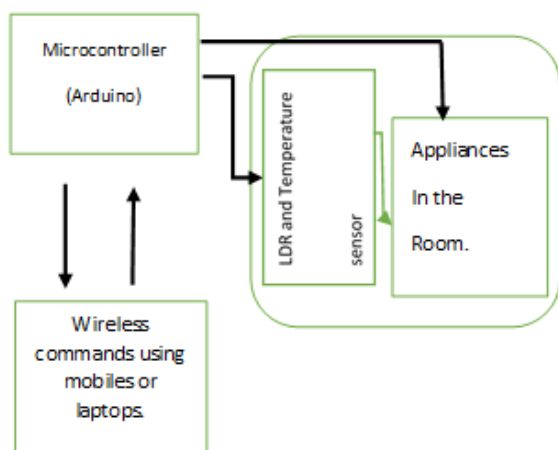
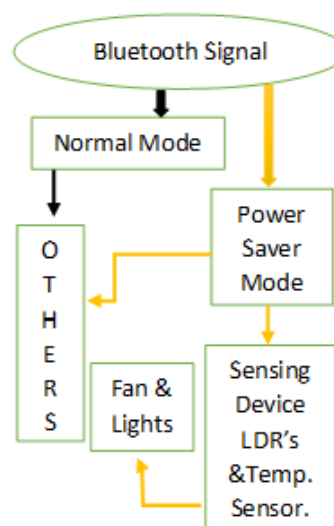**Fig. 3 Ultra power saver circuit diagram**   **Fig. 4 a general procedural flow chart**

III. WORKING

The connection is done according to the circuit as shown in Fig. 5. The main supply is bypassed using a manual override control switch. This switch is completely manual. It is provided so that one can switch in between manual and automatic control in the house. A Step-down Transformer is provided to bring down the voltage range to 18 Volts AC which is then converted to 12 Volts DC supply. Thus the bypass system completely works on DC.

Arduino mega is connected to this supply which controls all the relay switches that are used to drive the appliances. A Bluetooth Device HC-05 is also connected to Arduino Board which transmits and receives the data send by the user to the Arduino Board [4]. The Bluetooth device receives the command through an android mobile with an application designed specifically for this purpose.

When the manual override switch is off i.e. Automation is ON all the AC switches stop functioning and the relay switches are activated. User need to connect an android phone using phone's Bluetooth with the Bluetooth device HC-05. This device acts as a medium to transmit the wireless signal from the mobile to the microcontroller which interprets the signal and acts accordingly.

There are two different modes in which the automation can be done. One is normal mode and the other is ultra-mode. If the user selects normal mode then user can ON-OFF any relay connected device using the phone. In this mode the automatic temperature sensing and light intensity monitoring device remains OFF. Thus providing user to on-off any device at his/her command.

In ultra-mode the fans and the lights are controlled on the basis of the temperature and the light intensity. The LDR's present in the room measure the light intensity and switch on and off the lights accordingly. The temperature sensor (LM-35) installed measure the temperature balance in the room. User can specify the type of atmosphere needed in the room thus the fans and Air Conditioner are automatically controlled by measuring the temperature in the room and the temperature required by the user. All other appliances except fans and lights can still be controlled using Bluetooth in the mobile.

Figure 4 shows the two different modes of the automatic operation. The devices are divided in two groups one containing fans and lights and the other containing other appliances. The black arrow shows the reach of the normal mode on the devices while the golden arrow shows the reach of the ultra–mode on the devices. It is clearly visible that the ultra-mode can control only fans and the lights while other appliances are not affected by ultra-mode.

The connections between the relays and the appliances shown in figure. The microcontrollers connected with the Bluetooth module (HC-05) using it's receiver (Rx) and the transmission (Tx) lines while the relays are connected on the digital pins. The Bluetooth module is powered by the Arduino board while the Board and the relay switches are powered using the 12volts DC supply. The neutral wire is directly connected to all the appliances while the live wire is connected via override switch. This switch can be used to control the room automatically or manually. The automation circuitry is connected in a way such that the AC wiring of the house is not rendered useless.
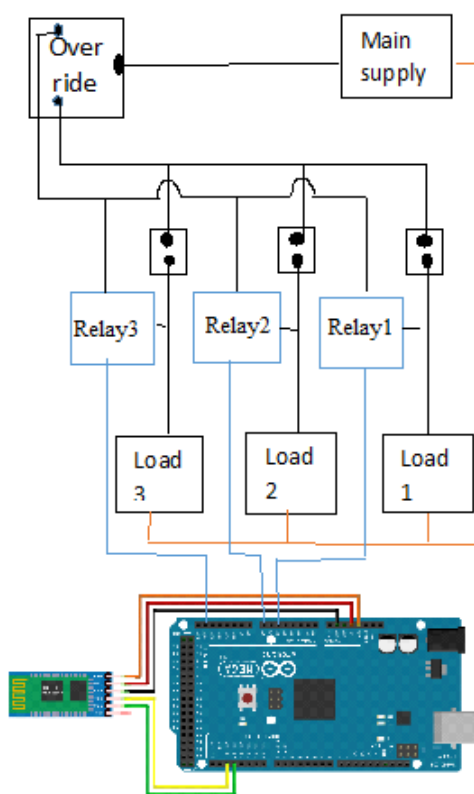
Fig. 5 Circuit Diagram.

IV. APP DESIGNING

The Microcontroller receives the commands from the user through an android mobile via Bluetooth module. The interface to handle the requests of the user is provided in the app which communicates with the Bluetooth module wirelessly. The trial version of this app is designed using MIT App Inventor [8] which is an online site for the construction of any android app. The interface of the app is exactly similarly to the app generated using java.

The app is secured using a password which needs to be known to the user for connecting with the Bluetooth module. This is done to prevent any unknown user to connect with Module and disturb the automation in the house. User can also change and modify the password according to his/her suitability.
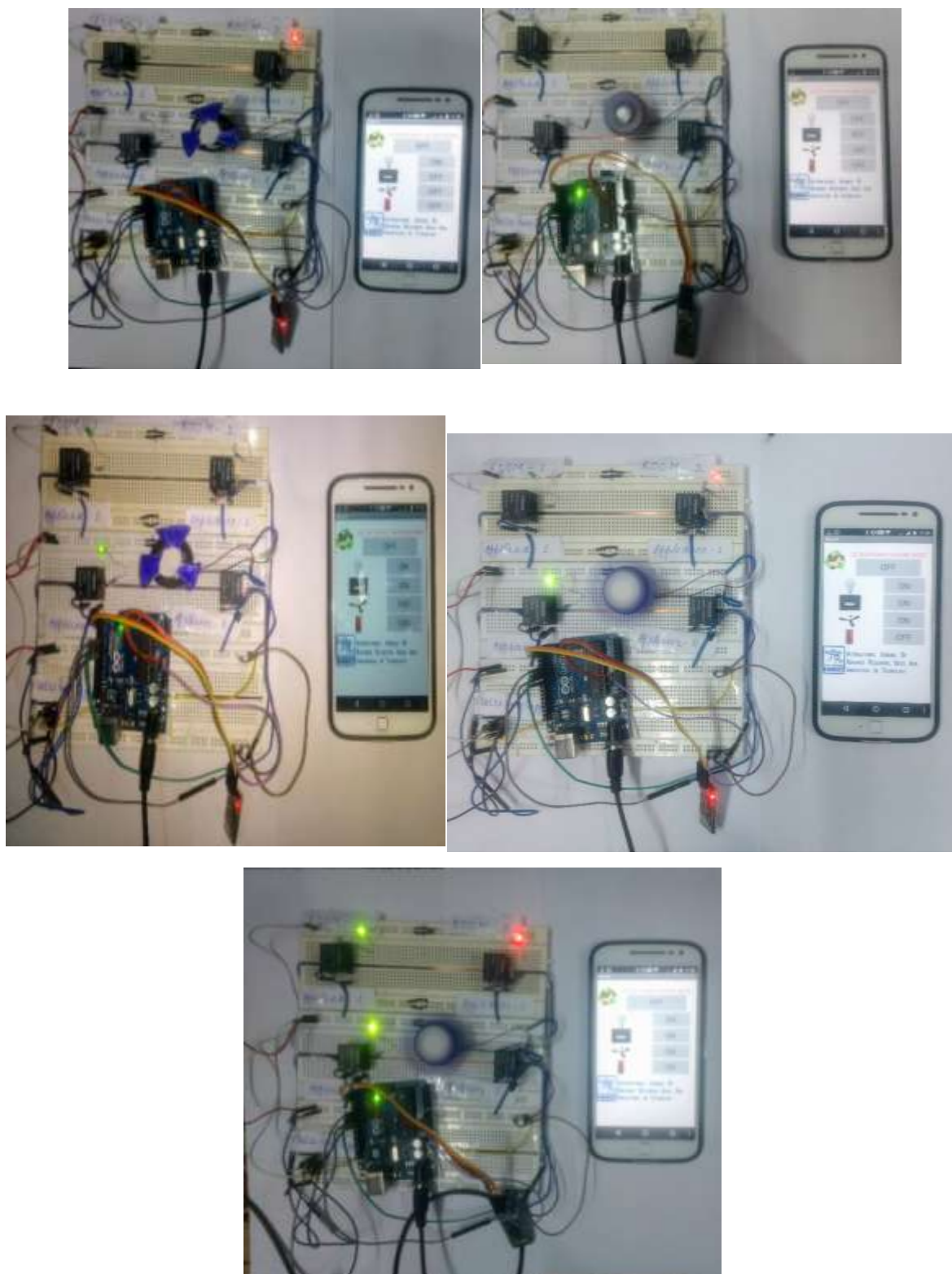
Once the user has entered the correct password the Bluetooth devices installed in the house are visible and the connection can be established. The home screen is also provided with certain additional elements which enhance the handling of the app and it's addictiveness towards different users. Some of the main elements that make the app easy to use are its control and the graphics on the buttons that can help an amateur to use the app and control the appliances over the house.

The app is provided with four default rooms i.e. guest, dining, bedroom and kitchen. Once connected with the module one can go to any of the rooms just by selecting the room. If suddenly it is required to adjust an appliance in other room using back button we can switch to other room.

The ultra-mode settings can also be changed using a button provided at the home screen. Here the lights and the temperature of the rooms can be adjusted according to user's will. The temperature in the room will adapt according to the present weather conditions outside the house, like if it is hot outside the automation will tend to bring down heat inside the house.

V.PRACTICAL IMPLEMENTATION

The fig.6 shown below are the implementations of the test app using a DC Fan and LED's. The connections are adjusted in a way to operate it using from one room only. Arduino Uno is used instead of Mega since fewer connections were required.

Fig.6 Practical Implementation of Automation Using Led's and a Dc Fan Using Bluetooth Module-Hc-05

CONCLUSION

The above mentioned project is a fine example of a simple and energy conservative way to live an extravagant life. The undertaking is successfully tested with its performance on single room as well as multi room. Its interface and the app is designed in a manner so that it can prove its worth to both normal and an amateur android user. The idea of controlling it both manually as well as automatically provides a better advantage among all similar ideas. It achieves its communication with user through Bluetooth which is the best and cheapest way to exchange data in a short range. Another interesting feature provided in the project is its ultra-power saver mechanism which can control the light intensity and temperature in the room according to user's requirement, thus energy conservation can also be achieved. The Multiroom feature allows a user to maintain a better control over the entire house. A safeguard is build-in so that the normal AC switches work in case the automation fails due to any reason. The trial version of the app is designed on MIT App Inventor which makes it less bulkier and faster. The future modified can be done

by introducing the concept of Internet of Things. This would help in controlling the appliances through the internet thus giving a better control on the house over a large range.

ACKNOWLEDGMENT

REFERENCES

[1]H. Ardam, I. Coskun, "A remote controller for home and office appliances by telephone", *IEEE Transactions on Consumer Electronics*, vol. 44, no. 4, pp. 1291-1297, 1998.

[2]Dhiren Tejani, Ali Mohammed A. H. Al-Kuwari, and Vidyasagar Potdar (2011), "Energy conservation in a smart home" ,*Digital Ecosystems and Technologies Conference (DEST), 2011 Proceedings of the 5th IEEE International Conference* , (pp. 241-246), 2011

[3]Arduino Mega. [Online]. Available: https

[4]Bluetooth Module H.C 05. [Online]. Available:http://www.electronicaestudio.com/docs/istd016A.pdf

[5]B Murali Krishna, J Sri Varshini ,A Narayana Murthy, N Anil Santosh, G Sai Pavan Kumar, B Sai Venkateswara Rao (2015), "Rf Module based wireless secured home automation system using fpga", *Journal of Theoretical and Applied Information Technology* ,July 2015, vol.77 no 2 .

[6]Temperature sensor LM-35. [Online]. Available:http://www.ti.com/product/LM35/datasheet

[7]Light Dependent Resistor. [Online]. Available: https

[8]M.I.Tapp inventor. [Online]. Available:http://ai2.appinventor.mit.edu/?locale=en#4570139760787456