



Polymorphing Control of Electrical Loads with IoT

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ABSTRACT: All the electrical load cannot be controlled using occupancy sensors in buildings/home especially in large public building, this results need for manual control on supervisory manner due to importance of the load or the service requirement. This requires switch box to be fixed on wall/nearby close to the load. To operate the same the person has to travel to the switch box. As the technology keeps growing to serve the mankind the expectation keeps on increasing There is no limit for sophistication .This paper intended to demonstrate web based control for Electrical loads in combination with the wireless sensor network based switch box which provides local mobility to control the load and also the same function can be done through internet . We introduce the wireless sensor network based mobile switch box for sophistication along with embedded web server based control the user can use the wsn switch box or internet to control the electrical load. The load status can be monitored in the web page .We also introduce the concept called polymorphing control by which one mobile switch box designed for one location can be used to control the electrical load in other location .We use open standard embedded controller Arduino mega with Ethernet and zigbee nodes. The switch box operates at 3V which more safe and saves the wiring cost partially. Also the power to room completely cut off when the loads were in off condition by fixing the controller outside the room which increases the fire safety. This flexible operation brings energy efficiency.

KEYWORDS: WSN, Microcontroller

I. INTRODUCTION

Home automation provides you control of lighting, heating, ventilations, air conditioning appliances, roman blinds, curtains, security locks of doors and other systems by single touch on your smart phone. The primary objective of this project is to design and implement cost effective but yet flexible, adaptable and secure Home automation system. The main objective of Home Automation is to help man who want to enable & control the home appliances This system support wide range of security, multimedia applications, and telecommunication device. Home automation systems are generally separated into two categories: Locally controlled systems and remotely controlled systems. Locally controlled systems comprises of an In-house controller to achieve home automation. It allows users the complete coverage of their automation system from within their home via a stationary or wireless interface. Remotely controlled systems use an Internet connection or Integration with an existing home security system to allow the user complete control of the system linked appliances from their Mobile device, Personal Computer etc. This paper is intends to demonstrate the real time implementation of wireless sensor based switching in with option to control the same through internet in real time using open standard Arduino based web server cum controller with zigbee nodes made to function as switch boxes with the help of terminal.

This wireless switch box provides local mobility and need not to travel to switch off. The web based control brings the sophistication to control from anywhere. A maintenance person can view the loads which were on/off from web page and he can switch of the loads from internet and whenever the load required to be on the other person/user uses the wireless switch.



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II. LITERATURE REVIEW

“BLUETOOTH BASESED HOME AUTOMATION SYSTEM”, IEEE 15th InternationalSymposium pp.192 – 195 June 2011.

In this paper they discussed about 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. This system is designed to be low cost and scalable allowing variety of devices to be controlled with minimum changes to its core. Password protection is being used to only allow authorized users from accessing the appliances at home. Internet of things is a technology which encounters remote monitoring and controlling of devices which being connected to it wirelessly, here the concepts of wireless sensors networks and Ethernet protocols are made of use. The subsystem 1 consists of zigbee and pc and rs232 for communication in and around the field. The main system will take in the information from first subsystem communicating through Zigbee and will be transmitted to the Router through Zigbee from where the data will be displayed on to a lcd with arduino. Internet of things (IOT) will provide seamless connectivity between the things in virtual world with real world thereby ensures anytime, anywhere, anything communications. It helps people to make better decisions such as taking the best routes to work or choosing their favorite restaurant. IoT intends to address challenges of society such as remote health monitoring for elderly patients and pay-as-you-use services. In the future era of networked infrastructures for household appliances IoT will act as a catalyst in the evolution of a new generation services that will have a great impact on the social and technological eco-system. IoT will help the user to approach various applications in a smarter way which might be a smart home, smart agriculture, smart industries or enterprise.

“A ZIGBEE-BASED HOME AUTOMATION SYSTEM” ,IEEE May-2009.

In this paper they discussed about significant contribution to the development of a home gateway. However, the existing network infrastructure within the home environment has not been taken into consideration when selecting the networks for integration with the respective home gateways. Moreover, the existing research has focused on the provision of remote connectivity and has largely neglected investigating the integration of existing local networks.

The adoption of home automation technology by consumers has been limited. We propose that, from the home automation domain analysis, the problems limiting wide spread consumer adoption can be grouped into five general categories. Firstly, complex and expensive architecture the existing systems Architectures generally incorporate a personal computer for the purposes of network management and provision of remote access. This adds additional complexity to the system, hence increasing the overall fiscal expense. Secondly, intrusive installation, the majority of systems requires varying levels of physical wiring in their architectures. This, in some cases, is due to the expense of the alternative wireless technologies. Hence, these systems require intrusive and expensive installations. Thirdly, lack of network interoperability both home networks and the home automation systems which utilize them have been developed and adopted in an unplanned and ad-hoc manner. This has lead to a home environment consisting of a complex maze of heterogeneous networks. These networks and the systems that utilize them normally offer little interoperability; leading to three potential problems

- Duplication of monitoring activities, due to lack of interoperability
- The possibility of interference, between co-existing networks
- The potential for two simultaneous, autonomous actions on co-existing networks, interacting and resulting in an undesirable outcome.

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“DEVELOPING A VOICE CONTROL SYSTEM FOR ZIGBEE-BASED HOME AUTOMATION NETWORKS”, IEEE May-2010.

In this paper they discussed about design and implementation of a voice control system for Zigbee-based home automation networks. In this system, one or more voice-recognition modules have been added to the Zigbee-based networks. The recognized control messages are sent by these modules then be routed to the target device, and finally be carried out by controlling circuit. In our work, SI-ASR (Speaker-Independent Automatic Speech Recognition) has been used; making it requires no training of recording. This speech recognition control system uses human-computer interaction to realize multiple menu choose function. Home automation designates an emerging practice of increased automation of household appliances and features in residential dwellings, particularly through electronic means that allow for remote controlling. Many new communication technologies such as GSM/GPRS networks, wireless sensor networks, Bluetooth, power line carriers and the Internet have been applied to home automation. In this paper, they propose a novel application of smart home automation: voice control system for Zigbee-based home automation networks. Our work applies speech recognition technology to Zigbee-based wireless sensor and actuator networks, which can easily control all of the home appliances in the networks. When speech recognition modules are deployed reasonably, users can give voice orders at any position of the house.

III. BLOCK DIAGRAM

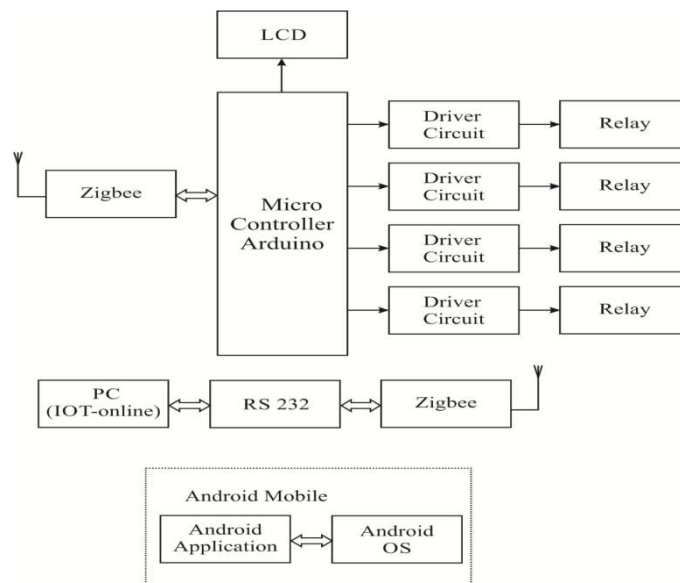


Fig 1 Block Diagram

EXPLANATION

Arduino is an open-source electronics prototyping platform based on flexible, easy-to-use hardware and software. It's intended for artists, designers, hobbyists, and anyone interested in creating interactive objects or environments. Arduino can sense the environment by receiving input from a variety of sensors and can affect its surroundings by controlling lights, motors, and other actuators. It is loaded with the huge collection of in-built libraries. It is very much suitable for multitasking application as well as for the function programming and works very well with Master slave environment. This application will provide an interface between users and the actual appliances which wishes to control. By designing entire embedded system with the help of the controlling, receiver modems and the devices we would prepare an actual model of the home automation system which will be cheap and easy enough to implement in our homes and other places. There will be wireless communication between the mobile and central controlling device whereas there

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will be wired communication between the controlling device and also the systems in the Home. Some directions to the appliances will be given by central microcontroller and others will be given by the central controller itself without any conscience of the mobile.

At user side there will be an Android enabled Mobile phone which will communicate with the central controlling device. In order to send signals to the central controlling device wireless communication in form of zigbee will be used. This wireless communication will take place serially via zigbee in form of transmission of characters in form of Bytes, as transmitted serially through an application on pc. The application has here created by visual studio for both transmit and retrieve the commands as per the server allotted to this project. At receiver side the Module will serially communicate with the microcontroller Board and do the necessary task by prompted by user. The zigbee module will deliver the output serially in form of Bytes of characters it receives at the input. These characters will be verified by the controller's code and based on the logic written in the code successive operations will be performed by the controller.

The controller will be connected to different systems, to which it will give directions by adopting an electromagnetic relay .this will help us to switch the various power system module remotely. All the command direction from sub system one to main will be controlled by enabling respected button in android application menu. In which enable of button in the menu at that time command will set into the server and it automatically updated in the sub system and transferred to the main system via pc application to zigbee. The relays are work according to the command received from the server.

IV.CIRCUIT DIAGRAM

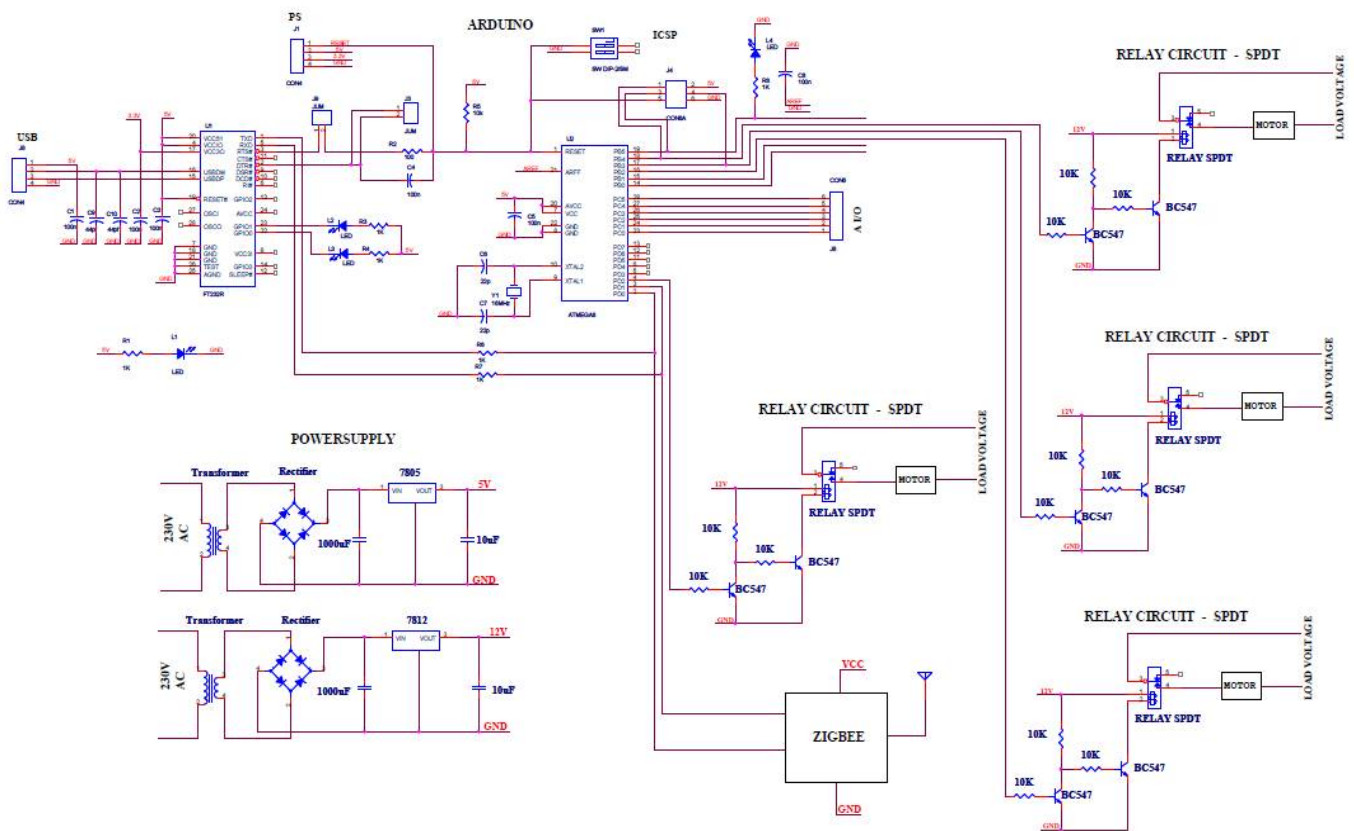


Fig 2 Circuit Diagram



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POWER SUPPLY UNIT

Power supply is an integral parts a vital role in every electronic system and hence their design constitutes a major part in every application. In order to overcome mal-operation which results due to fluctuations in the load and discontinuity in the supply proper choice of power supply is indeed a great need in this hour.

The present chapter introduces the operation of power supply circuits built using filters, rectifiers, and then voltage regulators. Starting with an ac voltage, a steady dc voltage is obtained by rectifying the ac voltage, then filtering to a dc level, and finally, regulating to obtain a desired fixed dc voltage. The regulation is usually obtained from an IC voltage regulator unit, which takes a dc voltage and provides a somewhat lower dc voltage, which remains the same even if the input dc voltage varies, or the output load connected to the dc voltage changes.

A configuration fig containing the parts of a typical power supply and the voltage at various points in the unit is shown in fig. The ac voltage, typically 120 V rms is connected to a transformer, which steps that ac voltage down to the level for the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation. A regulator circuit can use this dc input to provide a dc voltage that not only has much less ripple voltage but also remains the same dc value even if the input dc voltage varies somewhat, or the load connected to the output dc voltage changes. This voltage regulation is usually obtained using one of a number of popular voltage regulator IC units.

Power supply components employed in this section includes

- Transformer , Fullwave rectifier ,Voltage regulator ,Filter circuit

ARDIUNO:

The Arduino microcontroller is an easy to use yet powerful single board computer that has gained considerable traction in the hobby and professional market. The Arduino is open-source, which means hardware is reasonably priced and development software is free. This guide is for students in ME 2011, or students anywhere who are confronting the Arduino for the first time. For advanced Arduino users, prowl the web; there are lots of resources. The Arduino project was started in Italy to develop low cost hardware for interaction design. The Duemilanove board features an Atmel ATmega328 microcontroller operating at 5 V with 2 Kb of RAM, 32 Kb of flash memory for storing programs and 1 Kb of EEPROM for storing parameters. The clock speed is 16 MHz, which translates to about executing about 300,000 lines of C source code per second. The board has 14 digital I/O pins and 6 analog input pins. There is a USB connector for talking to the host computer and a DC power jack for connecting an external 6-20 V power source, for example a 9 V battery, when running a program while not connected to the host computer. Headers are provided for interfacing to the I/O pins using 22 g solid wire or header connectors.

The Ardino programming language is a simplified version of C/C++. If you know C, programming the Ardino will be familiar. If you do not know C, no need to worry as only a few commands are needed to perform useful functions. An important feature of the Arduino is that you can create a control program on the host PC, download it to the Arduino and it will run automatically. Remove the USB cable connection to the PC, and the program will still run from the top each time you push the reset button. Remove the battery and put the Arduino board in a closet for six months. When you reconnect the battery, the last program you stored will run. This means that you connect the board to the host PC to develop and debug your program, but once that is done, you no longer need the PC to run the program.

ZIG-BEE

The explosion in wireless technology has seen the emergence of many standards, especially in the industrial, scientific and medical (ISM) radio band. There have been a multitude of proprietary protocols for control applications, which bottlenecked interfacing. Need for a widely accepted standard for communication between sensors in low data rate wireless networks was felt. As an answer to this dilemma, many companies forged an alliance to create a standard which would be accepted worldwide. It was this Zigbee Alliance that created **Zigbee**. Bluetooth and Wi-Fi should not be confused with Zigbee. Both Bluetooth and Wi-Fi have been developed for communication of large amount of data

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with complex structure like the media files, software etc. Zigbee on the other hand has been developed looking into the needs of communication of data with simple structure like the data from the sensors.

LCD (LIQUID CRYSTAL DISPLAY)

LCD(Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on. A **16x2 LCD** means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD. Click to learn more about internal structure of a LCD.

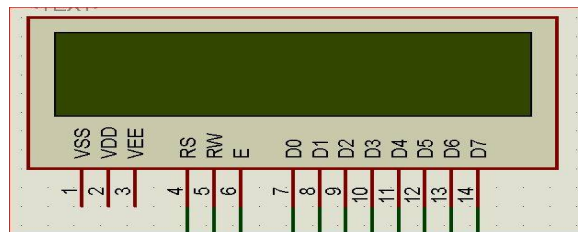


Fig 3 LCD Display

VI. RESULTS AND DISCUSSION

In the fig 4 shows the relay 1 connected with power sockets. In this proposed method the relays are controlled by either Mobile Application or PC (Computer). The sockets may connected with bulb or some electrical appliances. it will be either switch on and off by toggle buttons on mobile android application. the following images are represent task nearly completed as per the command proceed by the user.

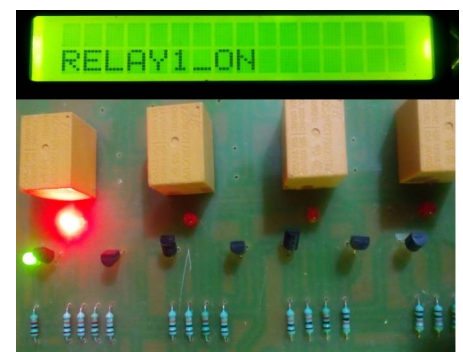
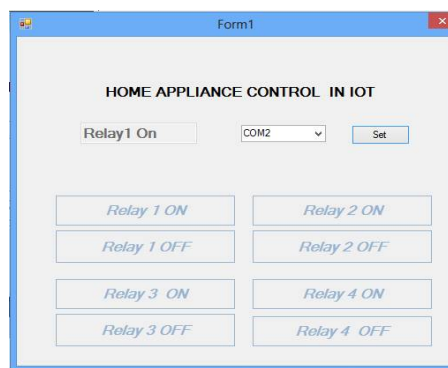


Fig Relay 1 – Turned on to control home appliance using IOT

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In the fig 6 shows the relay 1 off condition.the appliances are turned off by Mobile application or PC.

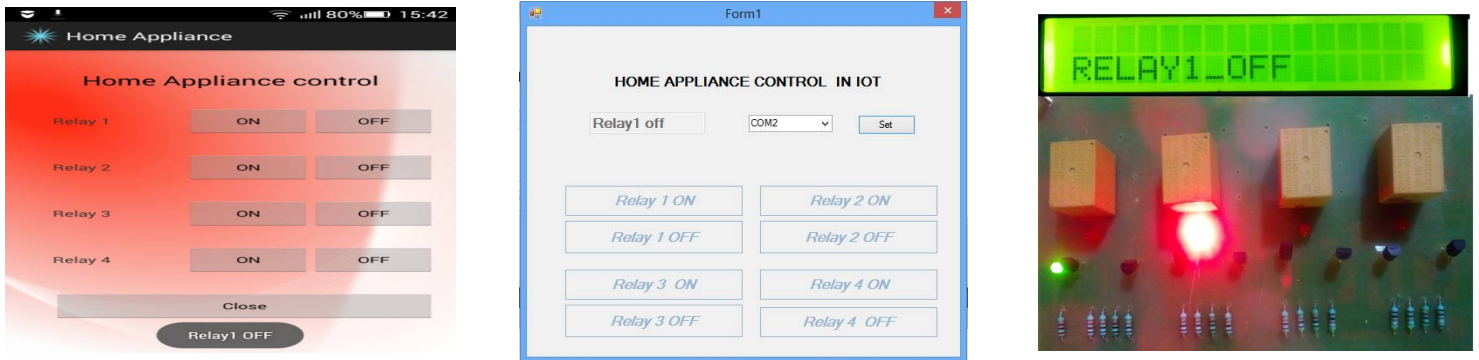


Fig Relay 1 – Turned off to control home appliance using IOT

ADVANTAGE

- This project have implemented with zigbee protocol which allows us to communicate in the range of around 50m.
- Remote monitoring and control

APPLICATION

- Large public buildings /campus
- Large halls/rooms
- Computer labs
- Security assistance
- Customer service centre etc
- Hospitals

VI.CONCLUSION

This paper gives basic idea of how to control various home appliances using Android phone. This project is based on Android and Arduino platform both of which are FOSS(Free Open Source Software). So the overall implementation cost is very cheap and it is affordable by a common person. Looking at the current scenario we have chosen Android platform so that most of the people can get benefit. The design consists of Android phone with home automation devices. User can interact with the android phone and send control signal to the Arduino which in turn will control other embedded devices. We have discussed a simple prototype in this project but in future it can be expanded to many other areas.

REFERENCES

- [1] R.Piyare, m.tazil".Bluetooth based home automation system Using cell phone" Consumer Electronics (ISCE), IEEE 15th InternationalSymposium pp.192 – 195 June 2011
- [2] Khusvinder Gill, Shuang-Hua Yang, Fang Yao, and Xin Lu "A ZigBee-Based Home Automation System " IEEE transactions on consumer Electronics Vol 55 No 2 pp.422 - 430
- [3] Fan Shiqi, Hu Siping "Real time acquisition system using wireless sensor network" international conference on computational and information science pp1656 - 1659 2013
- [4] Fan Shiqi, Hu Siping "Real time acquisition system using wireless sensor network" international conference on computational and information science pp1656 - 1659 2013
- [5] Xudong Ma, Ran Cui, Yu Sun,Changhai Peng, Zhishen Wu "Supervisory and Energy Management System of Large Public Buildings "Proceedings of the IEEEInternational Conference on Mechatronics and Automation pp 928-933 August 4-7, 2010
- [6] Malatras, A. Asgari, A. ; Bauge, T."Web Enabled Wireless Sensor Networks for Facilities Management "IEEE systems journal, vol. 2, no. 4, pp 500-512 december 2008
- [7] Wolfgang Kastner, Georg Neugschwandtner, Stefan Soucek, and H. Michael Newman "Communication Systems for Building Automation and Control" proceedings of the IEEE, vol. 93, issue no. 6, pp 1178-1203 june 2005



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(An ISO 3297: 2007 Certified Organization)

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- [8] Reinisch, C. ; Kastner, W. ; Neugschwandner, G. ;Granzer, W. “Wireless Technologies in Home and Building Automation “ IEEE International Conference on Industrial Informatics vol 1 pp.93-98 June 2007.
- [9] Neugschwandner, M. Neugschwandner, G. ; Kastner, W.” Web Services in Building Automation: Mapping KNX to oBIX “IEEE international conference on Industrial Informatics, 2007 Volume: 1 pp.87-92
- [10] Wenqi (Wendy) GUO, Willam M. HEALY and Mengchu ZHOU “Wireless Mesh Networks in Intelligent Building Automation Control: A Survey international journal of intelligent control and systems “ VOL.16, issue NO.1 pp.28-36, MARCH 2011