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DESIGN AND IMPLEMENTATION OF HOME AUTOMATION USING POWER ELECTRONIC SWITCHES

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Abstract— In this paper, we describe the technologies and techniques used in a home automation based on 6LoWPAN. This is IP-based protocol which has the advantage that there is no extra layer or any logic is required for the communication with a node inside or outside of the network. The remotely controlling of home automation system and the home appliances has been an area of interest ever since the beginning of the concept of Personal Area Networks (PAN). With the advent of IoT (Internet of Things) and mobile applications, it has become more smart, automated devices are entering into our personal space. Numerous standard wireless protocols for this application also are available in the industry today. The problem has been always been a cost-effective comprehensive solution for an entire environment of the house and interoperability between various home appliances. In this project, we are targeting these two aspects of home automation system by shifting these focus away from adding smartness to the home appliance, to the place from where the appliance is powered(the switches). We provide alternative power electronic switch replacements for these switches and finally interface them to the wireless module to enable home automation and control of different home appliances through the internet/intranet. A working model of the home automation along with the smart power electronic switches and a model prototype of the complete home automation solution is presented.

Keywords— Home Automation, 6LoWpan, cc2538, Internet, Wireless, RF Communication.

I. INTRODUCTION

The objective of the proposed system is to develop a cost effective solution that will provide the controlling of the home appliances remotely and enable house or home security against the intrusion in the absence of homeowner. The system provides availability because of the development of the low cost system. Now it is a necessity to control all the devices more effectively and efficiently at anywhere from anytime Khusvinder et al [1], Mahesh et al [2], Sathya Narayanan et al [3], Naresh et al [4]. The "Home Automation system" concept has existed for many years. HASs which include centralized control of lighting, appliance to provide improved comfort, energy efficiency and security system. However, end users, the disabled and elderly due to their complexity and cost, do not always accept these systems. 6LoWPAN provides the features of a mini computer, additional with its GPIO pins where other components and devices can be connected. It presents the design and implementation of automation system that can be able to monitor and control home appliances via PC.

II. SYSTEM ARCHITECTURE

2.1 Block Diagram of Controller

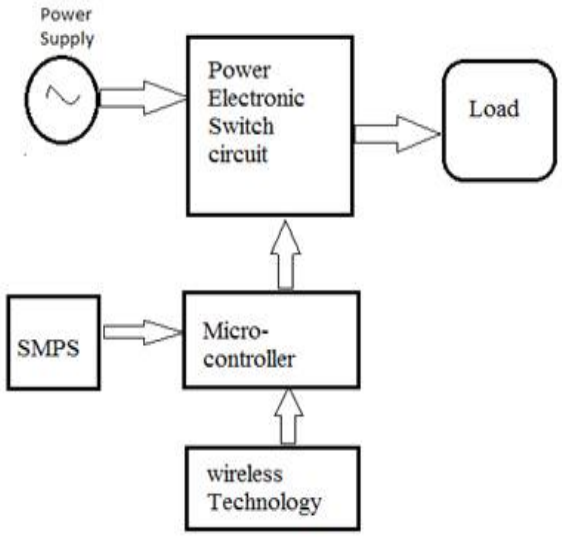

Fig 1: Block Diagram

2.2 Power Electronic Switch Design

In most of the cases the power electronic devices which are mainly requiring the various type of system that trigger the power semiconductor device through the gate signal. Here we provided with the microcontroller port to the signal for the powered circuits where lights and fans are automatically switched ON/OFF/DIM based on the requirement of the user which is shown in Fig.3.1 and Fig.3.2.

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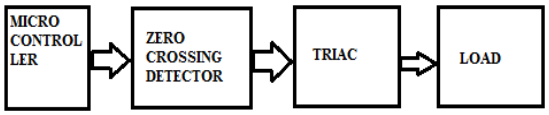

Fig 2: ON/OFF CONTROL

For the on/off control we are mainly using microcontroller for the control operation thus the signal is given to the TRIAC and switching process is done by triggering the switching device to make the control operation of the load.

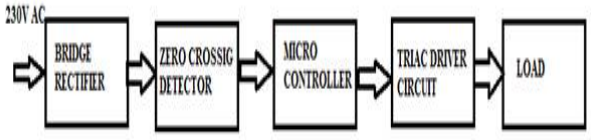

Fig 3: SWITCHING OF LIGHTS /FANS with DIM

Bridge rectifier used to generates rectified output from applied AC input. ZCD it generates short duration positive and negative pulses when AC waveform crosses zero mark. It is used as reference to chop AC waveform applied to motor Microcontroller generates pulses whose width can be varied (PWM) and it changes firing angle of TRIAC through DIAC. DIAC-TRIAC phase angle control circuit – it applies chopped AC waveform to motor and varies speed of AC motor

So the circuit varies speed of AC motor by changing firing angle of TRIAC by applying PWM generated, the firing angle of TRIAC changes and motor speed changes

III. WIRELESS TECHNOLOGY

The communication between the user and the system is established by the wireless technology medium. User commands which are transferred to the home automation server (which is mainly done by a PC) through one of these three alternatives. In the home automation server the incoming commands are processed, then digitized and sent to the relevant unit which has to be processed. In each unit there are consisting of separate low-cost microcontrollers device to receive the commands from the transceiver and which apply these to the appliances that they are attached to it.

These devices have also the capability to send their status back to the transceiver node which is connected to the home automation server so that they can be monitored in real time. After receiving the feedbacks from the appliance nodes, the home automation which server interprets them and performs the various necessary tasks.

Contiki is an open source operating system that runs on tiny low-power microcontrollers and makes it possible to develop applications that make efficient use of the hardware while providing standardized low-power wireless communication for a range of hardware platforms.

Contiki is used in numerous commercial and non-commercial systems, such as city sound monitoring, street lights, networked electrical power meters, industrial monitoring, radiation monitoring, construction site monitoring, alarm systems, remote house monitoring, and so on.
This "out-of-the-box" guide will go through the process of deploying a BeagleBone Black as 6LoWPAN router and bridge 6LoWPAN devices to the IPv4/IPv6 Internet

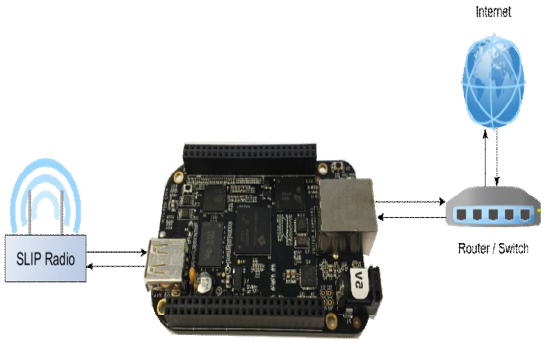

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Fig 4 : Contiki-6LOWPAN-BBB

IV. CC2538 MICRO CONTROLLER

The CC2538xFnn is the ideal wireless microcontroller System-on-Chip (SoC) for high-performance ZigBee applications. The device combines a powerful ARM Cortex-M3-based MCU system with up to 32KB onchip RAM and up to 512KB on-chip flash with a robust IEEE 802.15.4 radio. This enables the device to handle complex network stacks with security, demanding applications, and over-the-air download.

The multiple low-power modes with retention enable quick startup from sleep and minimum energy spent to perform periodic tasks. CC2538xFnn ROM includes a utility function library and a serial boot loader. Combined with the robust and comprehensive Z-Stack software solutions from TI, the CC2538 provides the most capable and proven ZigBee solution in the market.

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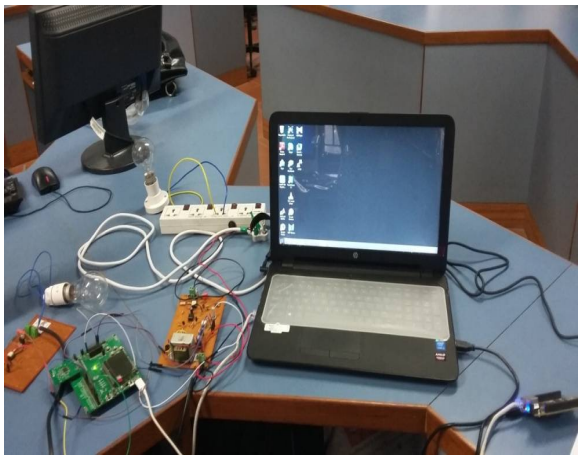

Fig 5: The hardware setup of the Home Automation

V. CONCLUSION

The primary goal of the project is to convert the contemporary manual switch in a house into a smart switch to be able to control from a remote location. The switches are categorized into two types namely for ON/OFF application and for the dimming application. These two switches are realized with power electronic components and the prototype is verified with manual control. As a further step, these two switches are interfaced to a RF-Microcontroller SoC (cc2538) to make them controllable from a remote location. The microcontroller connects to a 6LoWPAN network gateway and the command from a PC connected in the same LAN network as the gateway is able to control and actuate the switch, thereby controlling the load. This prototype is a proof-of-concept for a cheap solution for smart switches. It is shown that the smart switches are capable of accepting the control input both manually and remotely through a controller interface.

References

[1] M. Young, The Technical Writer's Handbook. Mill Valley, CA: University Science, 1989. 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, MAY 2009.

[2] Mahesh N. Jivani , "GSM Based Home Automation System UsingApp-Inventor for Android Mobile Phone", Vol. 3, Issue 9, September 2014.

[3] Sathya Narayanan1, S. Gayathri, "Design of Wireless Home automation and security system using PIC Microcontroller", International Journal of Computer Applications in Engineering Sciences", ISSN: 2231-4946Volume III, Special Issue, August 2013.

[4] D.Naresh, B.Chakradhar, S.Krishnaveni, "Bluetooth Based Home Automation and Security System Using ARM9",International Journal of Engineering Trends and Technology (IJETT) – Volume 4 Issue 9-Sep 2013.

[5] Faisal Baig, Saira Beg and Muhammad Fahad Khan " Zigbee Based Home Appliances Controlling Through Spoken Commands Using Handheld Devices", International Journal of Smart Home Vol. 7, No. 1, January, 2013.

[6] Rajesh K R, C A Bindyashree,"",International Journal of Innovative Research in Computer and Communication EngineeringVol. 3, Issue 4, April 2015.

[7] S.P.Pande, Prof. Pravin Sen, "Review On: Home Automation System For Disabled People Using BCI", *International Conference on Advances in Engineering & Technology – 2014*

[8] R.Piyare, M.Tazil "Bluetooth Based Home Automation SystemUsing Cell Phone", IEEE 15th International Symposium on Consumer Electronics,2011.

[9] Deepali Javale, Mohd. Mohsin, Shreerang Nandanwar, "Home Automation and Security System Using Android ADK, International Journal of Electronics Communication and Computer Technology" (IJECCT) Volume 3 Issue 2 (March 2013)