Automatic Control of Electrical Appliances in Domestic Building

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Abstract

The purpose of home automation system using wireless sensor networks are to monitor, control the home appliances based on parameters like illumination, temperature. The home automation system is intended to control all lights and fans in a domestic buildings using data from sensors. The main objective is to reduce the unnecessary energy consumption of a domestic buildings. It is meant to save the electric power and human energy by providing the user with remote control of various lights, fans, and appliances within their home. The system will automatically change on the basis of sensors' data. This system is designed to be low cost and expandable allowing a variety of devices to be controlled. The proposed system consists of two main components; the first part is the transmitter module which includes sensor nodes to sense temperature and illumination, arduino board for data collection and control and a zig bee transmitter for transferring collected data. Second part is receiver module, which provides appropriate interface to sensors and actuator of home automation system including the appliances to be controlled based on data received. The proposed system is better from the scalability and flexibility point of view than the commercially available home automation systems. A wireless network approach to this communication and control provides an easy, cost-effective and scalable solution to home automation. The home automation systems provide mutual interoperability between various electronic and electrical devices as well as interactive interface for people to control their operation. These features are very helpful to optimize and

to economize energy consumption whereby saved energy during some few years could make more money than home automation systems implementation cost. These technologies make peoples' life also easier, especially for elderly persons and persons with disabilities.

Keywords: *Domestic Building, Zig bee transmitter, Electrical Appliances*

I. INTRODUCTION

Energy saving measures becomes a major part in this hectic scenario of demand in energy. Interest in increasing energy efficiency of buildings involves optimal usage of energy and optimal building envelope. The usage of loads may be electrical and non-electrical. The energy consumption must be based on various parameters like environmental conditions, habitation, and number of persons and so on. The consumer may be interested in reducing the electricity bill by lessening the usage of electricity consumption. And also when the consumption of conventional power is reduced, global warming and environmental problems can be gradually reduced.

Hence the main aim of the proposed project is to build a model which will optimally select the loads under different circumstances. Multiple solution would be provided for optimal usage of energy consumption. A controller is to be developed for non-linear building model considering the flatness property.

The major problem that leads to develop such a project of smart home system is because of our humans' bad attitude that is laziness to turn OFF/ON home appliances which is a common problem among us. Percentage of wastage of high electricity is increasing year by year. A better smart home system is able to overcome such a serious problem. Older people are incapable to control home appliances by moving all over their house especially if double storey house. Definitely they will suffer to control their home appliances if the control of the appliances are by switches.

Furthermore in developing world everyone feel happier in a comfortable and secure home environment. Constructing an intelligent and safe home environment is one of the important and most attractive issues for many researchers and engineers.

Thus this becomes the key factor for usage home and building automation systems more and more now a days. On the one hand, they provide increased comfort especially when employed in a private home. On the other hand, automation systems installed in commercial buildings do not only increase comfort, but also allow centralized control of heating, ventilation, air condition and lighting. Hence, they contribute to an overall cost reduction and also to energy saving which is certainly a main issue today.

Buildings of the 21st century will become more and more self-controlled and automated due to the comfort it provides, especially when employed in a domestic buildings. An automation system is a means that allow users to control electric appliances of varying kind to construct intelligent environment by installing intelligent sensors and devices.

Several industries and research have attempted to develop such system to provide services for user by integration of all these sensors, devices by wireless network .Integration of smart devices as well smart network in residential area can be making it smart and also helpful to manage energy appropriately, effectively. Such a smart home provides various advantages with Wireless Sensor Network includes remote monitoring, continuous data recovery, energy consumption tracking, management of temperature and humidity, motion detection, understanding and observation of the people's environment.

Smart home system is an intelligent home network together with advanced communication technology and sensing control technology to carry out effective control and information exchange. They are gradually being used in the home for energy management services likes lighting is automatically controlled through information such as the resident's movement or the intensity of illumination gathered by controller and consumer devices are monitored and controlled by controller installed in the home. The Home Automation system provides mutual interoperability among the different electronics and electrical devices. This system also provides interactive interface for people to control their operation and this will very helpful to optimize and economize energy consumption.

Home automation is upcoming trends that people looks for residential houses, apartments, commercial uses. People want to live in more intelligent living spaces to

make their life easier, safer and more enjoyable.

II. ZIGBEE MODULE

Zig Bee is a wireless communication technology for short coverage, low data rate, less complication, low power and low cost. It's widely used in the field of auto-control and remote control. ZigBee is based on IEEE802.15.4 standard and it co-ordinates thousands of tiny sensors. These sensors send the data from one sensor to another through radio waves and consequently provide high telecommunication efficiency.

In brief, ZigBee is a low cost, low power, short coverage wireless network communication technology compare with the other existing technology such as WiFi, Bluetooth, IR, etc.

In general, a complete ZigBee network contains 3 major parts:

- ZigBee Coordinator
- ZigBee Router and
- End Device.

Zigbee Coordinator

The coordinator is the central unit of a Zigbee network. The generation of network beacon, controlling the formation of network topology and coordinating the communication and flow rate of the devices in the network.

Zigbee Router

The transmission of data, coordination of flow rate of some devices in the network, sending and receiving commands and data, and permitting subsidiary device comes under the supervision of router. It also helps to extend the coverage of ZigBee network that's why it is also called as repeater.

End Device

End device present at the bottom of network topology, which supervise sending and receiving data and execute commands. Generally, there should not be hand over data to other devices.

III. ARDUINO

Arduino is a tool for making computers that can sense and control more of the physical world than your desktop computer. It's an open source physical-computing platform based on a simple microcontroller board, and a development environment. Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs. The Arduino

programming language is an implementation of Wiring, a similar physical-computing platform, which is based on the Processing programming environment.

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital Input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

IV.HARDWARE IMPLEMENTATION

The project contains two sections

- Transmitter Section
- Receiver Section

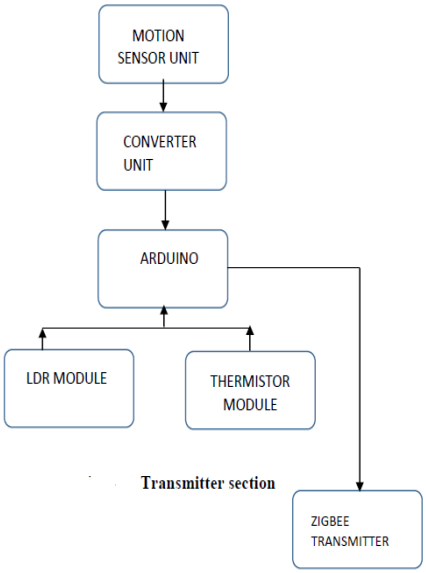
Transmitter Section

As shown in figure it is mounted outside the domestic building which collects the parameters like illumination, temperature from the environment

The motion sensor is activated only when it detects motion of a person. If there is a presence of a person the input is transferred to the converter unit.

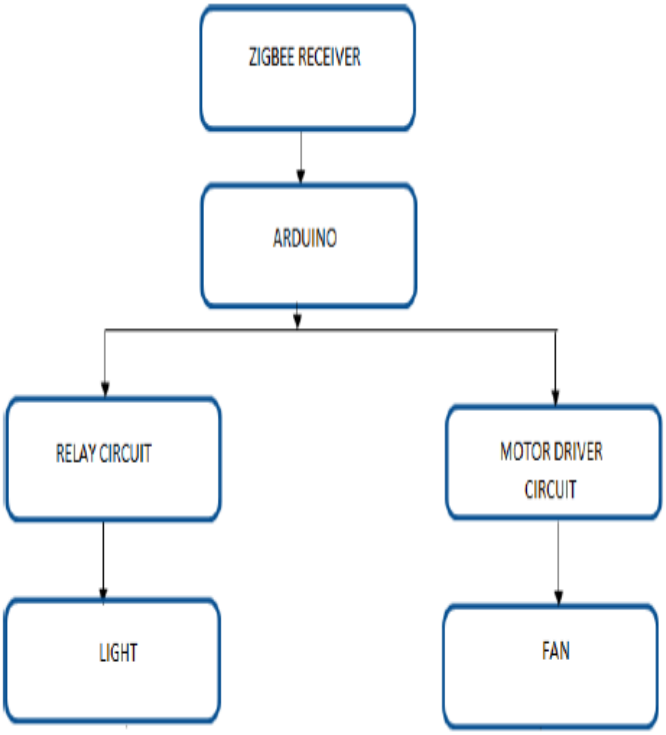
The converter steps down the 230V input voltage into 12V through a step down Transformer. The bridge rectifier converts it into constant 12V DC. This powers the arduino and other sensors.

The data collected is transmitted to the other section through ZIG BEE module



Receiver Section

The data is received through ZIG BEE module and is processed in the controller ie the arduino. Then based on the data received the appliances are operated by sending the signals to the relays and driver circuit.



Receiver Section

V. CONCLUSION

At the end of the design, implementation and testing, a satisfactory automation system has been developed by which the home can be automated with the help of sensor data. Based on the data collected from sensors the appliances were operated successfully. The system is tested on different environmental conditions. The cost of implementation is relatively cheap. Hence, the machine will be welcomed by general public given its performance, affordability and simplicity.

Thus a low cost and simple home automation system is developed. This system reduces the power consumption as a whole. The use of DC appliances improves the efficiency. So we can save the electrical power.

The project is advantageous as

- In recent years, wireless systems like Zig Bee have become more and more common in home networking. Also in home and building automation systems, the use of wireless technologies gives several advantages that could not be achieved using a wired network only.

- Reduced installation costs: First and foremost, installation costs are significantly reduced since no cabling is necessary. Wired solutions require cabling, where material as well as the professional laying of cables (e.g. into walls) is expensive.

- System scalability and easy extension: Deploying a wireless network is especially advantageous when, due to new or changed requirements, extension of the network is necessary. In contrast to wired installations, in which cabling extension is tedious. This makes wireless installations a seminal investment.

REFERENCES

I. S. Seshadhri, S. Mallikarjun, B. Subathra, J. Vain and U. Kotta, "Learning Based Personalized Energy Management Systems for Residential Buildings", Accepted for publication in Buildings and Energy

II. EIA, Annual Energy Review 2010, Annual report, The World Business Council for Sustainable Development, October 2011

III. Liping Wang, Julie Gwilliam, Phil Jones "Case study of zero energy house design in UK" Elsevier-Energy and Buildings 41, (2009) 1215–1222

IV. M. Wigginton, J. Harris, Intelligent Skins, Architectural Press, Oxford, 2002

V. J. Wong, H. Li, S. Wang, Intelligent building research: a review, Automation in Construction 14 (1) (2005) 143–159

VI. Energy Management Group. State-wise electricity consumption and conservation potential in India. National Productivity Council; 2009

VII. ChanghaiPeng, Lu Huang, Jianxun Liu, Ying Huang, "Design and practical application of an innovative net-zero energy house with integrated photovoltaics: a case study from Solar Decathlon China 2013 "Architectural Science Review, 2015 Taylor & Francis

VIII. CSN. (2007). EN 15232: Energy performance of buildings—Impact

of building automation, controls and building management

IX. Ian G. Hamilton, Alex J. Summerfield, David Shipworth, J. Philip Steadman, TadjOreszczyn, Robert J. Lowe , "Energy efficiency uptake and energy savings in English houses: Acohort study" ,Energy and Buildings 118 (2016) 259–276

X. Census Info 2011. Housing, household amenities and assets database (ver. 2.0). Census of India; 2011. Ministry of Home Affairs. Government of India.

XI. The World Bank Residential Consumption of Electricity in India. World Bank publication: July 2008

XII. S. Nadel, V. Kothari S. Gopinath. Opportunities for Improving End-Use Electricity Efficiency in India. American Council for an Energy-Efficient Economy. Washington DC; 1991.

XIII. UNDP India. Energy efficiency improvements in commercial buildings. Global Environment Facility Project Document

XIV. Ministry of Power. Energy Conservation Act. Government of India. New Delhi; 2001

XV. Energy Planning Commission. 10th Five Year Plan (2002–07). Government of India.New Delhi; 1997

XVI. Bureau of Energy Efficiency Energy Conservation Building Code (ECBC).Ministry of Power. Government of India; 2006. Planning Commission. 10th Five Year Plan (2002–07). Government of India. New Delhi, 2002

XVII. Sirsath N. S, Dhole P. S, Mohire N. P, Naik S. C &Ratnaparkhi N.S Department of Computer Engineering, 44, Vidyanagari, Parvati, Pune-411009, India University of Pune, "Home Automation using Cloud Network and Mobile Devices"

XVIII. DeepaliJavale, Mohd. Mohsin, ShreerangNandanwar "Home Automation and Security System Using Android ADK" in

International Journal of Electronics Communication and Computer Technology (IJECCT) Volume 3 Issue 2 (March 2013)

XIX. CharithPerera, Student Member, IEEE, ArkadyZaslavsky, Member, IEEE, Peter Christen,andDimitriosGeorgakopoulos, Member, IEEE "Context Aware Computing for The Internet of Things: A Survey". IEEE COMMUNICATIONS SURVEYS & TUTORIAL

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XXI. http://www.cbri.res.in/