

Intelligent Energy Saver System Using Priority Based Load Shedding

Vinu Vinayan
Department of Electronics ,
P.V.P.P.C.O.E
Mumbai, Maharashtra

Roshan Khandare
Department of Electronics ,
P.V.P.P.C.O.E
Mumbai, Maharashtra

Utsav Kathpalia
Department of Electronics ,
P.V.P.P.C.O.E
Mumbai, Maharashtra

Abstract- Nowadays every load (light, fan, etc) has same priority which is controlled by humans. Hence we can use any amount of power as per our wish and there is no limitation on it. Amount of power cannot be controlled as per the requirement which leads to a huge amount of power loss. Also there is an increase in human intervention in current system. Government has introduced time based load shedding which is an act or process of disconnecting the electricity for a stipulated period of time for units (society, town, city, etc) when the demanded power consumption becomes greater than the supply in order to reduce energy consumption.

Objective of proposed system is to design a wireless energy saver system that can modulate power of individual loads (light, fan, etc) inside a unit (home/office, building, society, town, city, etc) using load priority based algorithm. If sufficient power is not available, the load shedding automatically shuts down or limits the current to low-priority loads. It enables to restore the balance between available power and power consumed, enabling uninterrupted operation of high-priority loads. This can be achieved by creating a mesh network of motes (or Xbee enabled sensors) and Nodes for regulating power, depending on priority algorithm.

Thus our system will help to save energy by introducing priority based load shedding. This system will help to put a restriction on the energy consumed thus making it available for the coming generation.

Index Terms- XBees, Passive Infrared (PIR) sensor, Infrared (IR) sensor, Temperature Sensors, LDR's, Power Modulation Circuit, Microcontroller.

1. INTRODUCTION

The utilization of electrical power progressively increasing now-a-days. The demand for the electrical power is also increasing over the entire world, particularly in India the demand for electrical power is increasing more and more because of the increase in population. The people utilize the power higher than their requirements because of their sophisticated needs in the day to day life. The major part of electrical power is consumed by the urban areas than the rural areas. The people lived in the urban areas wants to make their life luxurious with the use of more power for their home appliances.

The power conservation is more important to reach the demand of the electrical power, there are several methods available for the conservation of electrical power. Every system is automated in order to face new challenges in the present day situation. Automated systems have less manual operations, so that the flexibility, reliabilities are high and accurate. Hence every field prefers automated control systems. Especially in the field of electronics automated systems are doing better performance increasingly.

The use of modern technologies is to achieve the power conservation not only through the proper design of respective devices and other parameters in the power system but also to do all the requirements automatically. To introduce the concept of priority based load shedding instead of time based load shedding to conserve energy. The proposed system is able to solve all these problems.

II. SENSORS USED

The proposed system uses various sensors to detect human presence in a room, the amount of light available in a room and room's temperature. The sensors are placed in the room which is interfaced along with xbees for this purpose. Different types of sensors used in the proposed system are:

a. PIR Sensor

It is passive infrared sensor which detects the motion with the variation of infrared radiation. It consists of multiple facets with each part containing Fresnel lens. Fresnel lens condenses light providing a large range of IR to the sensor. It provides single bit digital output and is compatible with all microcontrollers. The motion of person can be detected with this sensor.

b. IR Sensor

It consists of two sections-transmitter and receiver. Transmitter continuously sends the IR signal and receiver receives the reflected light from the obstacle. So, it has been used as the human detector in the proposed system. To get precise output, LM339 comparator has been used. Whenever receiver receives reflected IR signal LED glows indicating human is detected on its path

c. Temperature Sensor

LM35 has been used as a temperature sensor in the system. It is a precision IC temperature with its output proportional to the temperature (in °C). With LM35, temperature can be measured more accurately than with a thermistor. It also possesses low self heating and does not cause more than 0.1 °C temperature rise in still air. The operating temperature range is -55C to 150C . In the proposed system, it has been used for finding the value of room temperature..

d. LDR

It is light dependent resistor which changes its resistance according to the light incident on it. In the proposed system it is used for finding the intensity of light in the room.

III. BLOCK DIAGRAM

The block diagram of the proposed system consists of sections. First section consist of mote to node communication and other is node to load communication.. The block diagram is shown in the figure 1.

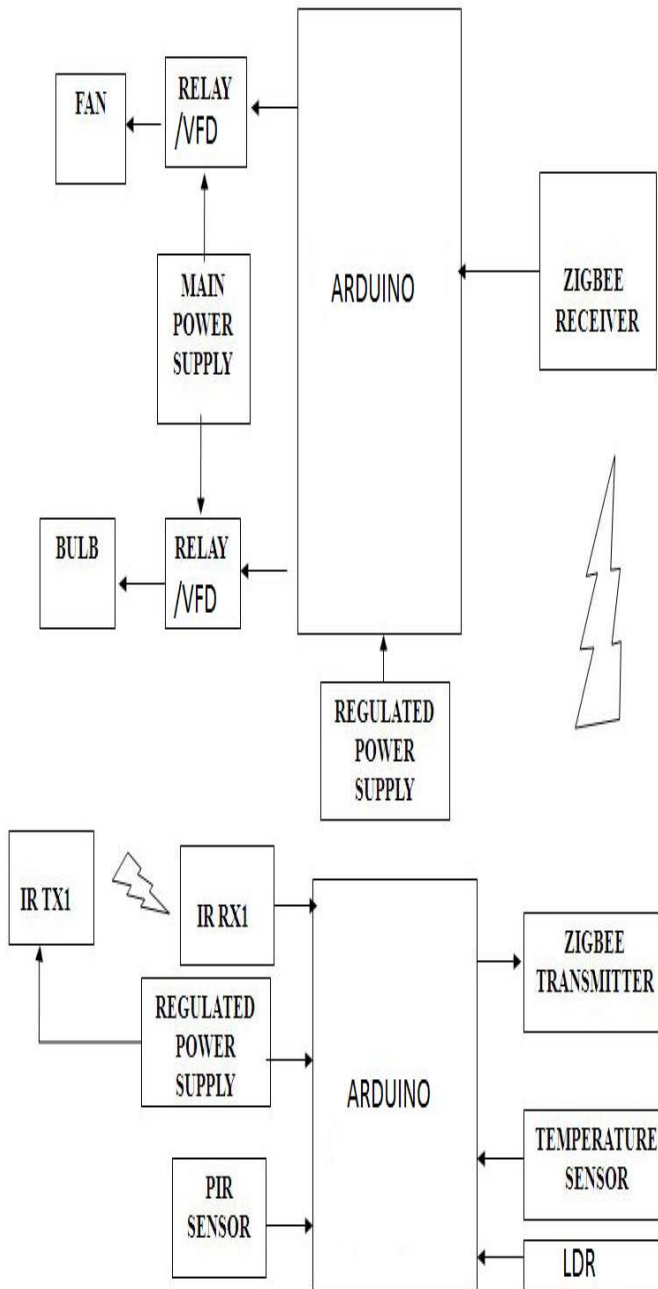


Figure 1:Block diagram of proposed system

a. Arduino

An Arduino board consists of an Atmel 8-bit AVR microcontroller components that facilitate programming and incorporation into other circuits. An important aspect of the Arduino is its standard connectors, which lets users connect the CPU board to a variety of interchangeable add-on modules known as Shields.

Microcontroller	5v
Operating Voltage	Atmega328
Input Voltage	7-12V
Digital I/O pins	14
Analog Input pins	6
SRAM	2KB
Flash Memory	32KB

b. Zigbee

Zigbee is a specification for a suite of high-level communication protocols used to create personal area networks built from small, low-power digital radios.

- 3.3V @ 40mA
- 250kbps Max data rate
- 2mW output (+3dBm)
- 400ft (120m) range
- Built-in antenna
- Fully FCC certified
- 6 10-bit ADC input pins
- 8 digital IO pins
- 128-bit encryption
- Local or over-air configuration
- AT or API command set

The software components used are:-

- a. Embedded C- for interface programming.
- b. Arduino Software:- for choosing the way a specific device connects to PC and selecting the COM port to used and the baud rate and also for controller programming.
- c. XCTU:- For configuring Xbees.

IV. WORKING PRINCIPLE

The Sensors will be interfaced with xbees, These xbees will transmit the values to another xbees that is being interfaced with controller.

Depending on the values that the controller gets, the power is modulated. For example:- if the temperature value is low then the speed of fan is decreased. Similarly if the intensity of light is high in the room then the light is kept off.

V.RESULTS AND DISCUSSION

To test the functioning of the system, it was equipped with sensors and xbees. People were made to move within the room, the temperature of room was increased and decreased and the intensity of light was varied and it was noticed that the power was modulated accordingly.

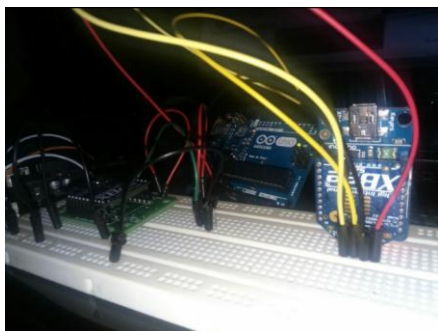


Figure 2. Prototype of proposed System

AUTHORS

First Author –Vinu Vinayan, B.E., Electronics Department, P.V.P.P.C.O.E, Mumbai, Maharashtra, India.

Second Author –Roshan Khandare, B.E., Electronics Department, P.V.P.P.C.O.E, Mumbai, Maharashtra, India.

Third Author –Utsav Kathpalia, B.E., Electronics Department, P.V.P.P.C.O.E, Mumbai, Maharashtra, India.

VI. CONCLUSION AND FUTURE SCOPE

The project Development of “Intelligent Energy Saver System Using Priority Based Load Shedding” is an effective system for controlling home and office appliances. The system is small, simple and good for appliances control.

The System “Intelligent Energy Saver System Using Priority Based Load Shedding” will help constrain power consumption without human intervention. It will help to restrain electricity bill (threshold can be decided by the user). Using this system energy consumption data can be monitored and audited for devising future power consumption strategies. System can be controlled from a remote location due to internet connectivity.

This idea can be extended to loads connected in multiple rooms even up to the entire building. This system can be made applicable in Smart Cities where systems are controlled from a remote location. This system will help us to maintain the database of energy consumption in different units. This will be major step in automation and will have tremendous future scope of development and applications.

REFERENCES

[1] Nausheen Belim; International Journal of Innovative Research in Computer and Communication Engineering
Vol. 1, Issue 1, March 2013

[2] Chinnam Sujana; Addanki Purna Ramesh; P. Gopala Reddy.; Sri Vasavi Engg College, Tadepalligum. Automatic detection of human and Energy saving based on Zigbee Communication, International Journal on Computer Science and Engineering (IJCSE)

[3] Building wireless sensor networks-Robert Faludi

[4] http://www.ebay.in/itm/Soft-Start-of-Induction-Motor-by-ACPWM-DIY-Do-It-Yourself-Kit-/271385785856?pt=LH_DefaultDomain_203&hash=item3f2fda7600&_uhb=1