Automation System for Energy Conservation

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Abstract— Electricity is the most important resource in this century. Conservation of electricity is equally important or else the next human generations will face a huge problem of energy shortage. In present situation the most dominating problem is about wastage of electricity. It has become an human tendency today that is wasting the electricity resulting into power shortages in most of the rural areas as well as in urban areas. In country like India, where population growth is exploding year by year and so is the demand for electricity. To dodge the problem of electricity wastage at domestic level, an automation system will help out to cut the energy wastage. This paper focuses on the energy conservation by automation so as to save the energy with the help of smart system. The system so presented in this paper helps in saving electricity specially when implemented in big educational institutes, theatres, seminar halls, etc.

Key words: Microcontroller, Energy Conservation, Temperatures Sensor, Light Sensor

I. INTRODUCTION

Today electricity is the basic commodity to run the daily living, as such the electricity distribution companies are not able to fulfill the requirement of the consumers because of various reasons and hence for it is our moral responsibility to save the energy. In recent years, various methods has been developed in order to save energy like, by combining the energy management system and home automation system for controlling equipments. This equipment includes water heaters, lights fans, different motors etc in commercial use like office, college, stores, factories etc. The previous effort made by the researchers for the local systems has been found to be expensive because of controller's cost. This system has got very restricted operation and applicability and it cannot be changed as per the customer requirement.

Typically in summer and winter season the problem faced by the distribution companies is to reduce the consumer's demand for electricity. In India, during summer the atmospheric temperature is so harsh that it leads to more use of air-conditioning, coolers, fans etc. Likewise in winter season the use of heaters, heating coils also increases.

It has become a great work of interest for achieving more resourceful way of utilizing electrical power capabilities and refined control of electrical loads by consumers. Having knowledge of ecological impact and cost of inefficient use of resources, the consumers has become attentive in changing the usage methods of electrical energy. Some distribution companies have tariff plans which make the customers to limit the usage of electricity during peak load hours. The distribution companies force the customers to make use of electricity by the customers in off peak load duration.

II. LITERATURE REVIEW

Subhankar Chattoraj , Aditya Chakraborty [1] in there paper has mentioned that by counting number of people entering and at the same time the people who are exiting the hall, theatres etc can be counted with the help of Arduino. This said paper is used in understanding that how a master Arduino can be used.

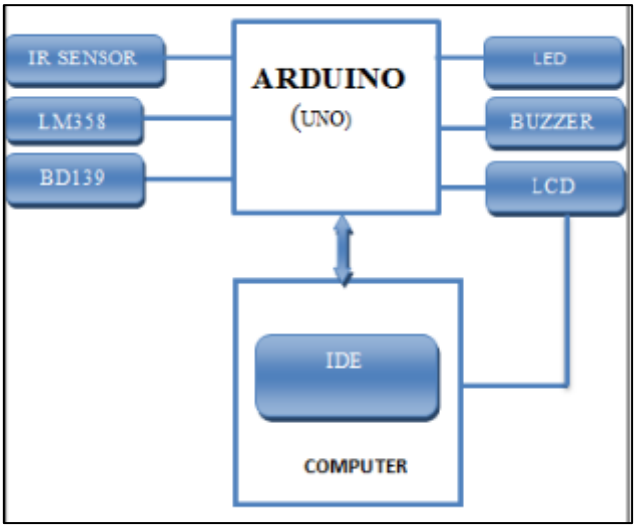

Fig. 2.1: Concept implemented for counting [1]

Tejani Dhiren, Al-Kuwari Ali & Potdar Vidyasagar [2] also mentioned that home automation system has proven a smart way of infrastructure. Implementing smart devices in daily routine are helpful for users to control various devices. The author also mentioned that various technologies are implemented towards energy conservation. Research in this field has increased the capabilities of the technology into areas such as remote *monitoring and control, power management, tracking & security systems and disaster warning systems* [3]. The management of power is of great concern and is of particular interest because it can be very much helpful for creating a greener future and cost saving can be achieved.

Martin Liska and Marian Ivanic in their research paper said that the Smart Home Energy Management System can be utilized for demand side management of low voltage grid with distributed sources [3]. The paper also focuses upon the energy management with base of smart grid reference architecture.

According to Abhay Kumar and Neha Tiwari, [4] there are some high energy consuming home appliances and heating and cooling appliances that make home important area for the impact of energy. They also suggest, with an implementation of an wireless technology for home automation the system can easily save a lot of money of consumer along with saving of energy.

Abhishek Bhati, Michael Hansen and Ching Man Chan [5] suggested that saving of energy is an very important topic due to its direct impact on climate changes and energy challenges globally. But the awareness of such an important issue is only restricted up to the concept stage. They also said that turning the view of people about energy conservation would be a huge challenge.

Skeledzija, Niksa & Ćesić et al [6] suggested that carbon footprint and energy consumption can be reduced effectively by implementation of smart automation system.

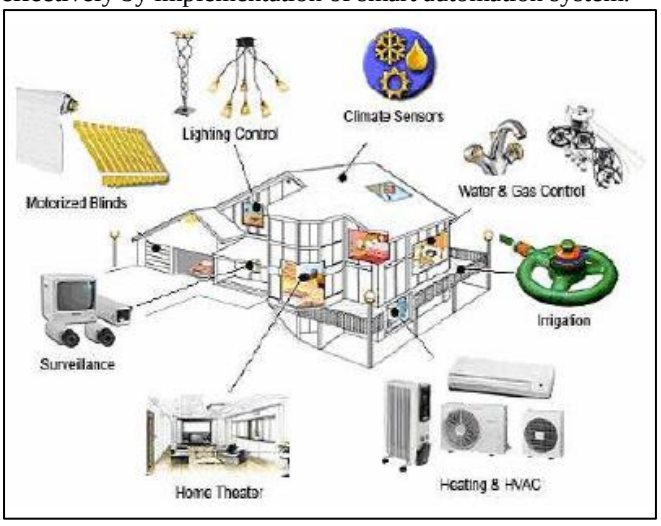

Fig. 2.2: Smart Home Integration services [7]

III. INTRODUCTION TO SMART ELECTRICITY SAVING SYSTEM

The below figure show the circuit diagram which is used for automation system. To understand the working of the planned circuit diagram, let us consider that the system is implemented in an educational institute. The basic idea about this circuit is to keep the control on the usage of fans and lights that are normally working in a big infrastructure. The person counter checks and counts the number of persons entering the room. This part of the circuit is implemented using two sets of IR transmitter and receiver. One set is placed at the outer side of the door and the other one is kept at the inner side of the door.

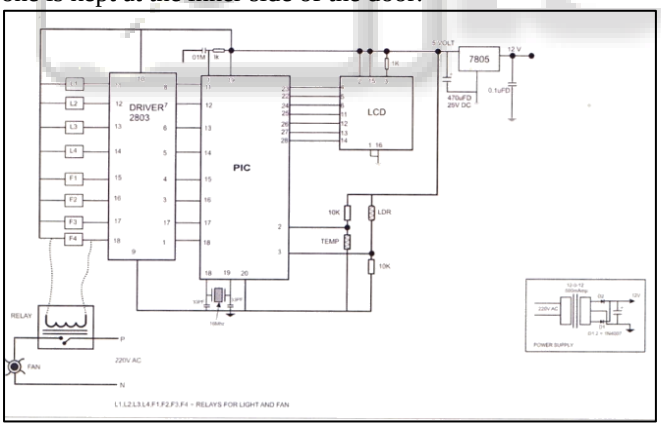

Fig. 3.1: Circuit diagram of the planned system

When a person enters the room, he crosses the first IR sensor and then after that second sensor. Reverse process occurs when any student or staff leaves the room. The micro controller counts the number of person inside the room, if it is not zero, the analog voltage output from temperature sensor and LDR circuit are measured to find the temperature and light. If these values are not in the required range, light intensity and fan speed are controlled accordingly using the relay control circuit.

Fig. 3.2: Hardware Setup

In this circuit IR sensors transmit IR signal t the receiver. The microcontroller continuously monitors the signal transmitted by IR sensors. When there is nobody in room counter will display "00" and all the relays will be OFF. The ON sequence of lights and fans will be as follows,

STUDENTS COUNT	NO. OF LIGHTS THAT WILL START
BETWEEN 1 TO 5	1 LIGHT
BETWEEN 6 TO 10	2 LIGHTS
BETWEEN 11 TO 15	3 LIGHTS
BETWEEN 16 TO 20	4 LIGHTS

As we know that during winter season the use of Fan is very limited. So in order to monitor temperature difference a temperature sensor. This sensor shows temperature less than 25 degree Celsius then it will not operate the fan.

IV. RESULT

Following results were found after running the planned system which is shown in figure 3.2. Whenever a person enters or leaves the room, the IR sensor placed near the door senses and the count is increased or decreased accordingly. The light and fan connected with circuit in that particular room will be ON.

Fig. 4.1: When 1 person enters room, 1 light and 1 Fan starts

Fig. 4.2: When 6 people enters room, 2 light and 2 Fan starts

V. CONCLUSION

ENERGY CONSERVATION ANALYSIS	
ROOMS WITHOUT SYSTEM	ROOMS WITH SYSTEM
Consider a class of 10 fans (60 Watt each) and 10 Lights (40 Watt each)	Consider a class of 10 fans (60 Watt each) and 10 Lights (40 Watt each)
Energy consumption for a month with 7 hours working is 210 KwH	Energy consumption for a day with 7 hours working is 108 KwH
Electricity usage bill (In Nagpur Rs 7 per unit avg cost) Rs 1470 Monthly	Electricity usage bill (In Nagpur Rs 7 per unit avg cost) Rs 756 Monthly
For around 50 rooms in the institute the monthly bill could be around Rs 73,500/-	For around 50 rooms in the institute with this system implemented the monthly bill could be around Rs 37,800/-

From above comparison it can be seen that a significant amount of energy can be saved by implementing above automation system in big infrastructures. Such system could be very beneficial for saving electrical usage tariffs.

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