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Sensor network based energy distribution system for corporate area

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Abstract
Energy requirements for developing countries like Bangladesh will increase day by day. As the climate changes, so the use of electricity is growing faster. Not only domestic use but also for the corporate use energy requirement is getting higher and higher. So energy distribution is getting challenging day by day within its limited resources. So this kind of countries needs to use all of its energy resources wisely. Energy saving is one of the most important criteria for this country. This paper aims to develop a proper energy distribution system based on the sensor network. This system can be implemented in the corporate area of Bangladesh to distribute energy based on need and save stop the unnecessary use of electricity.

Keywords: sensor network, energy distribution system, PIR sensor, Arduino mega, temperature sensor

1. Introduction
The whole world is moving toward its fourth industrial revolution. So the requirement of electricity is getting higher day by day. To full-filled the energy requirements with limited resources is a huge challenge. Proper utilization and use of energy need to be assured. Setting up a new power plant or discover a new energy source is far harder than saving energy. There are many places in the world where energy gets wasted. So there is no proper use of electricity. In a country like Bangladesh, there are many places like corporate area or domestic is the cause of waste electricity due to lack of awareness. This kind of thing makes a shortage of electricity in the summer season. Best way to face this kind of situation to save electricity. That's why this paper aims to develop a system where energy will be distributed based on need. Where there are a passive infrared ray sensor, temperature sensor, and a counter circuit. Based on the presence of human lighting system of the meeting room may control. Based on temperature and human presence, Room temperature was controlled by controlling fan and AC. A summarized outline of the paper is as follows. Section II depicts the architecture used in this system to perform automated agricultural tasks. Section III explains the steps to accomplish the project along with the description of components used. The logical working flow of the system is presented in the form of a flowchart in section IV. The result of this project i.e. the findings are discussed in section V. Finally the paper is concluded in section VI where an overview of the system is reviewed and the future scopes are discussed.

2. Literature review
In [1], Authors have designed an energy management system to save energy. They have used PLC as microcontroller and also used an LDR sensor to sense light intensity, a thermistor for detecting temperature. They have used load driver to control loads like fan and light.
Authors of [2], have make a comparison on sensor based switching model. They have tried to make an effective comparison between existing appliances and five star rated appliances.
In [3], have designed IoT based energy security system. They have used image processing technology. They have used PIR sensor and Raspberry pi cam as input. Raspberry pi was used as microcontroller.
In [4], Abbas Javed, Hadi Larijani, Ali Ahmadinia, Rohinton Emmanuel, Mike Mannion, and Des Gibson have designed and implemented a random neural network based decentralized smart control with intelligent sensor nodes for HVAC. Where they have used two most exciting techlogy like wireless sensor network and another is internet of things (IoT).
In [5], Claudia Chit ¸u, Grigore Stamatescu, Iulia Stamatescu and Valentin Sgarciu have designed a wireless system for occupancy modelling for smart building. They have used pir sensor and image processing for the security purpose.

3. System architecture
System architecture of the proposed system is designed below. Which consist of three major part. Field data collection, data processing and load controlling.
In field data collection part there are three major sensor at work. Those are Temperature sensor, PIR sensor and LDR sensor. Depending on these three sensor data output data may process in Arduino mega. Where a pre-installed programme was operating. Depending on programme logic the process may occurred.

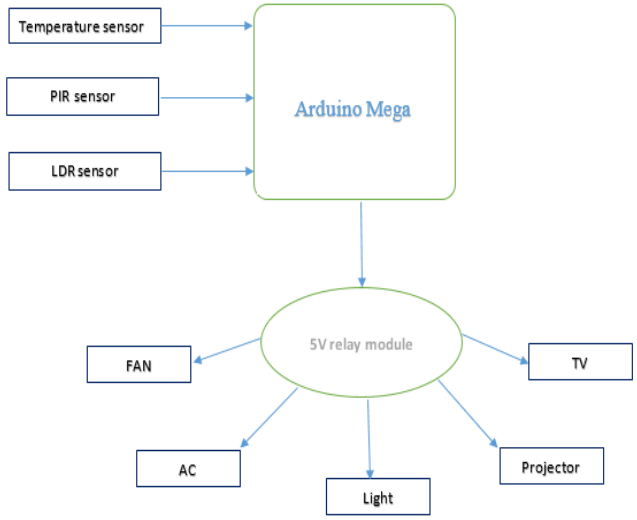

Fig 1: Block diagram of proposed system

In third and final part of this project is load controlling. In this part 5v relay is operating based on logic provided by arduino mega.

A) Hardware Requirements
   1) Arduino mega
   2) LDR sensor
   3) PIR sensor
   4) Temperature sensor
   5) Mini portable Fan
   6) Mini AC
   7) 40W Incandecent Lamp
   8) Mini projector
   9) Mini CRT TV
   10) 5Vdc/250Vac relay Module
   11) Power supply

B) Software Requirements
   1) Arduino IDE

Work flow chart of the proposed project is in below. Where all the equipment's are shown including three major part.

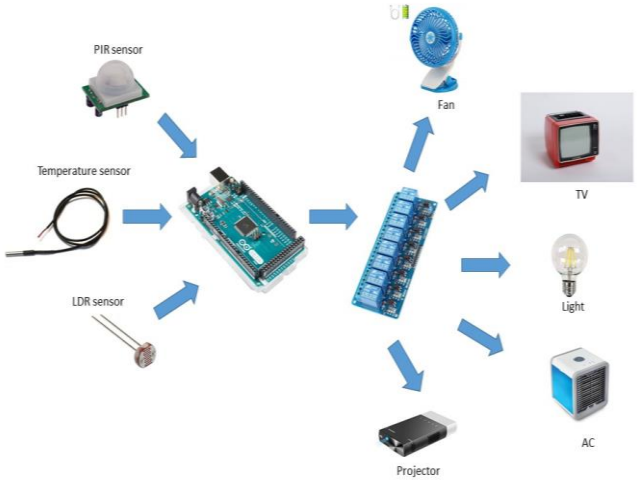

Fig 2: Work flow chart of proposed system

At first all the input sensor is connected to the Arduino mega and then Arduino mega is process. After that Arduino mega gives output according to the programme and send the logical value to the relay module. Finally relay module control the loads.

4. Results

Different sensor value from Arduino is represented in graph below.

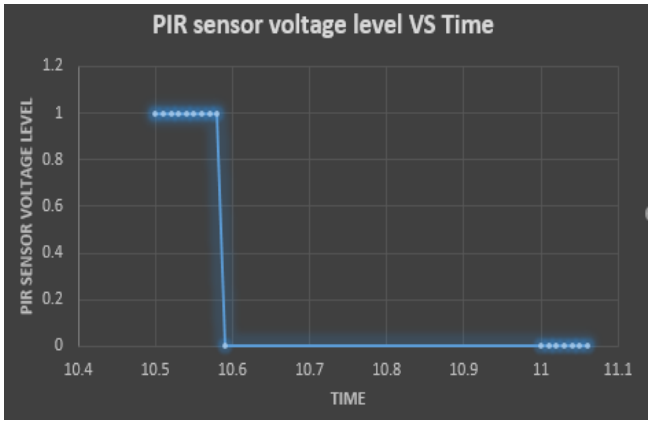

Fig 3: PIR sensor value

In "fig. 3." Voltage level of PIR sensor was shown. If there is any object movement then PIR sensor is giving high logical value and if there no object movement then it's giving low logical voltage.

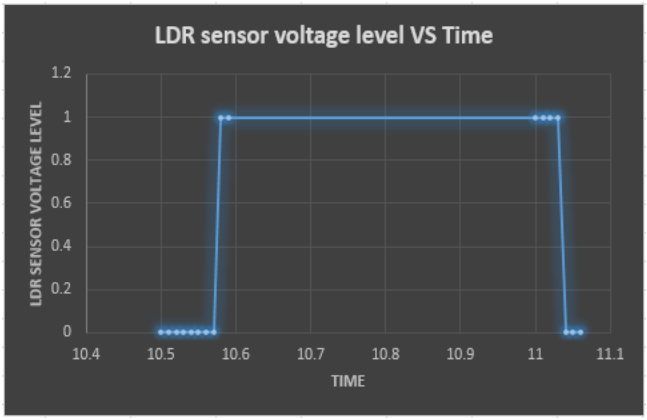

Fig 4: LDR sensor value

LDR sensor value is represented in "fig.4.". Microcontroller is programme in that way is there is 60 lux of light it will give high logical voltage and if the light intencity is less than it will give low logical voltage. Depending on LDR and PIR sensor value light is operating.

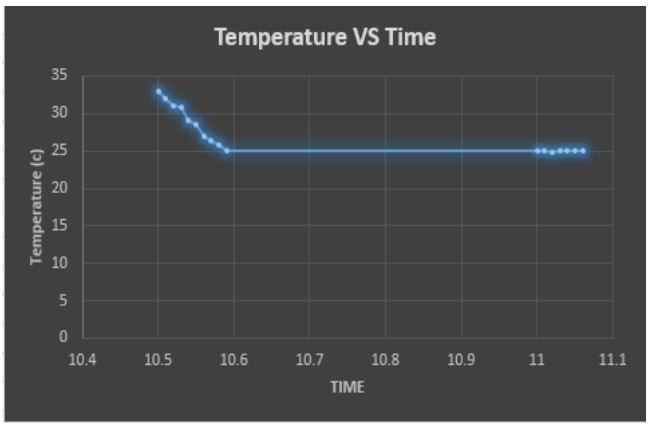

Fig 5: Temperature sensor value

Temperature sensor value is represented in "fig.5.". where

initial enviromental room temperature is high. After PIR sensor sense the presence of any object and if the temperature is higher than 25℃ then fan and AC will start operating. It will operate till the temperature at 25℃. It will maintain 25℃.
If there is no presence of object, loads will not operate.

Table 1: Operating voltage level for the loads

Elements	Voltage level	
	ON	OFF
FAN	220Vac/ 12Vdc	0V
LIGHT	220Vac	0V
AC	240Vac/12Vdc	0V
TV	220Vac	0V
Projector	12Vdc	0V

In Table I. operating voltages for different elements are shown. Some elements can be operated in dual mode of electricity.

5. Conclusion

In this experiment there are some limitation. The first limitation is this project cannot count the number of people. Secondly it uses different power supply. Other than this is a complete power management system. By implementing this system in corporate area waste of electricity may remove and save electricity. In future image processing may remove the limitation that it has now.

6. References

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