

Energy Saving based on Detection and Tracking of Humans using IoT

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Abstract:- Major organizations like colleges, banks, hospitals, industries etc., makes use of a large amount of Electrical Energy and most of the time it gets wasted due to the negligence of majority of people who forgets to turn off the lights & fans while leaving their respective working places. This leads to the heavy wastage of energy and the organizations end up paying a heavy amount of money for this unwanted wastage. New innovations have led to the remote system. Even after this, leaving the device running where we are not using it is still a serious challenge. So for the judicious use of energy we have developed this system. In this proposed system we have developed an idea to automatically control the electrical appliance according to our requirement. The automatic operation of Electrical appliances is controlled by the Human presence and their movement which is continuously detected and tracked by our system, this data is further transmitted to controlling device which in turn operates the electrical appliance of particular place. This system makes use of Internet of things (IoT) technology which makes this system more flexible.

Keywords:- Electrical Appliances, PIR Sensor, Arduino Microcontroller, Internet of Things (IoT), Relay.

I. INTRODUCTION

The proposed system is developed to overcome several drawbacks of the existing system. The proposed system takes the human presence & change in the environment such as disturbance in terms of motion or any movement [2]. This proposed energy saving system which is developed is divided into the following parts:-

- Detecting Module.
- Processing and Controlling Module.

The detecting module consists of PIR sensor also known as motion sensor which is used to detect the presence of human and continuously tracks the motion of the human movement this detected activity is in digital form and this data is transmitted to the processing and controlling module.

The processing and controlling module consists of Arduino and switches that are interconnected to the electrical appliances. When this module gets digital signal from the PIR sensor it initiates the process in which Arduino signals the relay to operate the electrical appliance of the respective place. The PIR sensor continuously monitors the Human movement and based on the motion tracked in the particular place it continuously sends the signal to the Arduino and operation takes place. If the

human leaves the respective place the PIR sensor detects "No Motion" and hence electrical appliances of the respective place are automatically turned off.

PIR Sensor (Passive Infrared Sensor) is an electronic sensor that measures infrared light radiating from objects in its field of view, which are mostly used in motion detectors [1]. As shown in the fig.2 The PIR sensor itself has two slots in it, each slot is made of a special material that is sensitive to IR. Fresnel lens are provided to protect the PIR sensor. So we see that the two slots can 'see' out past some distance (basically the sensitivity of the sensor). When the sensor is idle, both slots detect the same amount of IR, the ambient amount radiated from the room or walls or outdoors [3]. When a warm body like a human or animal passes by, it first intercepts one half of the PIR sensor, which causes a positive differential change between the two halves. When the warm body leaves the sensing area, the reverse happens, whereby the sensor generates a negative differential change. These change pulses are what is detected.

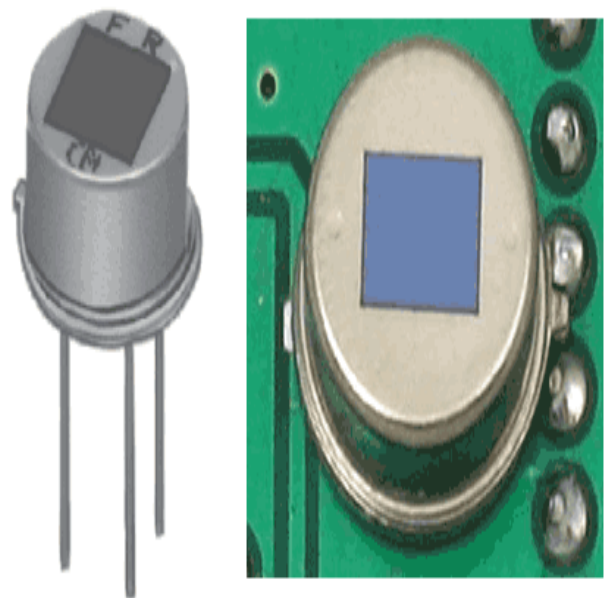


Fig. 1: PIR Sensor

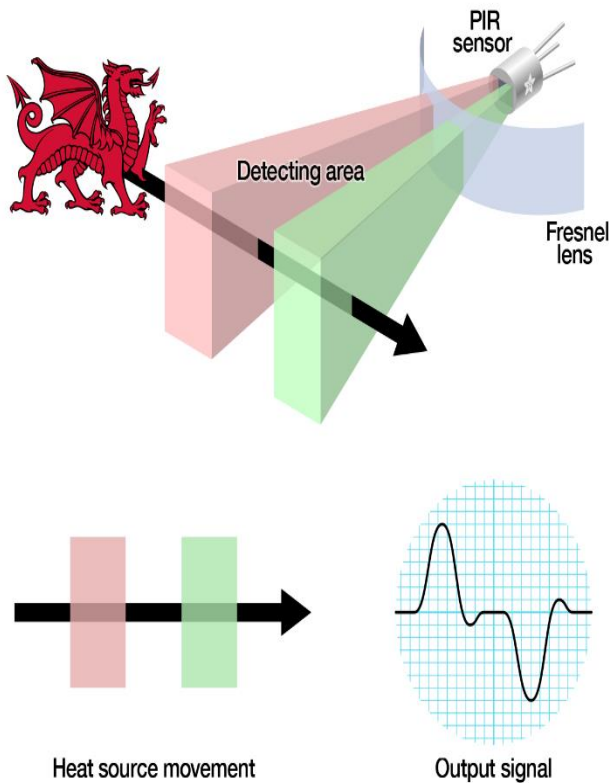


Fig. 2: PIR Sensor Operation.

**II. AUTOMATIC DETECTION, TRACKING
III. AND CONTROL UNIT**

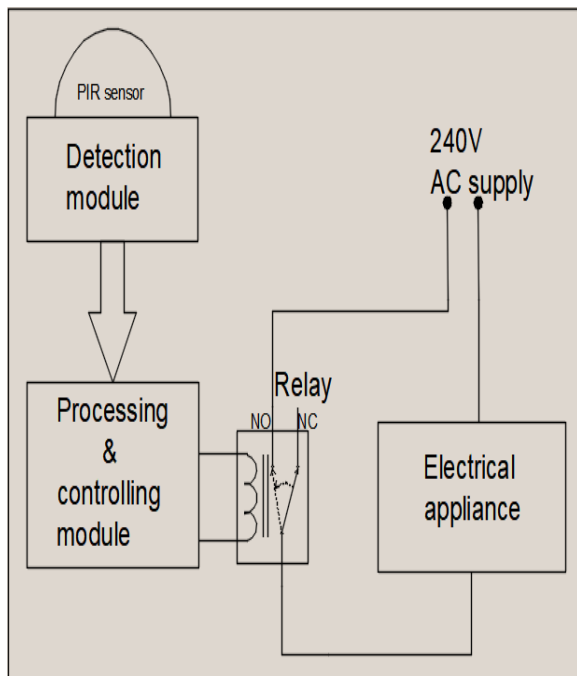


Fig. 3: Block diagram of Automatic control and operation of Electrical Appliance by Detection and Tracking of Human through PIR Sensor.

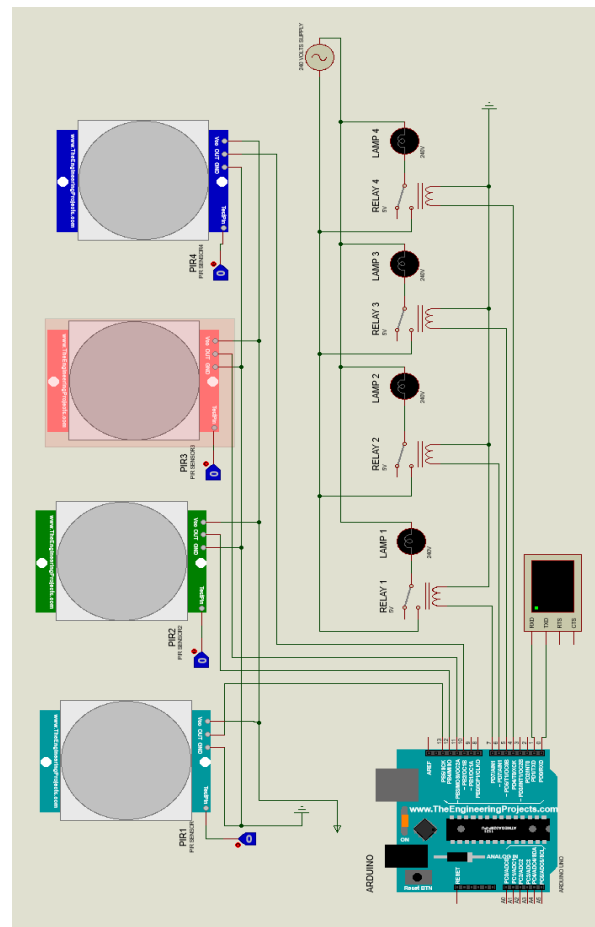


Fig. 4: Working diagram of Automatic control and operation of Electrical Appliance by Detection and Tracking of Human through PIR Sensor and IoT as observed in the Proteus Software

The Automatic Detection, Tracking and control unit consists of two modules. The first is Detection Module having PIR sensor. And the second is Processing and controlling module having Arduino Microcontroller, Relay (The NO contact is connected to the AC power supply and NC contact is left open), AC Power Supply, transmission and receiving device and electrical appliances.

PIR Sensor (Passive Infrared Sensor) detects any movement activity or the disturbance in the working area, that motion/movement is converted in terms of digital signal and since the output pin of the PIR sensor is directly connected to the Arduino Microcontroller the entire data is transferred to the controller which controls the electrical appliance such as lamps, fans etc. through relay.

The operation is divided into several parts. At the initial stage of working, when no motion is detected by the PIR sensor in the detection module, the PIR sensor stands ideal and no signal is given to the processing and controlling module resulting in no supply to the relay coil thus there is no connection established between electrical appliance and main supply.

Now, when Human enters the room there is disturbance caused and this disturbance is immediately detected by the PIR sensor and now a signal is sent to the processing and controlling module from the detection module. Then this signal is processed to the micro-controller which is received from the sensor and a signal is sent to the relay. Now when this signal energizes the relay coil making the NO contact of the relay to establish connection between the main supply and electrical appliance thus the electrical appliance are turned ON, and they stay in this state until there is no motion detected.

At the end, when the room is left empty and when there is no motion detected by the sensor, the sensor stops sending the signals to the micro-controller resulting in de-energizing of the relay coil and making the relay to disconnect the electrical appliance from the main supply thus turning OFF the electrical appliance instantly and contributing to energy saving.

IV. ADVANTAGES

- Speed of operation is fast.
- The system is highly accurate & reliable as PIR sensor is being used.
- The system is precise to use for detection of moving objects and provides control of electrical appliances operation according to the requirement.
- The proposed system proved to be energy efficient and reduces energy wastage.
- The proposed system reduces human efforts and saves the time.
- The proposed system has a provision to wirelessly operate the electrical appliance.
- No need of skilled operators.

V. DISADVANTAGES

- If there is some malfunction in the Microcontroller, the system may misbehave. But chances of occurrence of such misbehave is almost nil.
- Proper protection and care need to be taken on the system side.

VI. CONCLUSION

At the end of the project, the energy saving is done based on the human presence and using human detection technique, which is done in this system. The sensor is used to detect and track the human motion of the area, the output of the sensor is given to the Arduino, and the operation of the electrical appliance is then controlled.

This method will help to reduce the energy consumption in the areas such as places in organizations like class rooms in the educational institutions, home, banks, companies, hospitals etc. The use of the IoT makes the system more advantageous like system also has provision to send the live data through cloud directly to the user's mobile phone, and provides remote control of the device. Thus the proposed system is having several advantages over other existing methods of energy saving.

This system aims at saving Energy which is wasted when people forget to turn off the electrical appliance. With increase in the number of energy consumers it becomes necessary to save energy, this can be achieved by this proposed system.

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