Smart Light Automation

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***Abstract*: The objective of the paper is to save electricity that is unnecessarily wasted. Generally, we human beings may forget to switch off the lights and fans when leaving out of the room. We may think it doesn't cost much, but actually, we are wasting a lot of electric power. A controller which can monitor the presence of a person and act accordingly will reduce the electric power which can be installed in any houses, colleges, offices etc..IR sensors, PIR Sensor and an Arduino board are used to monitoring the presence of people in the room. So ideally when the room is empty and when a person entering the room the lights and fans will be turned on and when there was no one in the room they will go off automatically. Our main objective of this work is to control the wastage of electricity and making people ease of living.**

***Keywords*—*IOT, Smart Rooms, Automatic Lights Off*.**

I. INTRODUCTION

Many electrical devices are used in colleges, schools and home etc. Lot of electricity is consumed while using these devices which can be reduced by using certain electronic devices. A microcontroller is used to regulate various electrical appliances using multiple electronic devices. Identifying the presence of an individual in the room is done by making use of an Arduino microcontroller and a couple of IR sensors along with a PIR sensor

II. HARDWARE REQUIREMENTS

In this project, Arduino UNO board is mainly used for controlling purpose, Relay is for external circuit switching, LCD Display board to display the number of persons in the room and finally the IR Sensors & PIR Sensor used for monitoring the motion of persons. The following are the components used to build the model

A. Arduino – UNO
B. 12V Relay Module
C. PIR Sensor
D. LCD Display
E. Bread Board
F. Jumpers
G. Led lights
H. Power Source
I. Laptop

A. Arduino UNO

The Arduino Uno uses ATmega328P microcontroller which is developed by Ardino.cc. Ardino.cc make this Arduino board open for everyone. The board contain a set of analog and digital (I/O) pins and helps us interfacing with various sensors, circuits and circuit boards. Arduino board has 14 digital I/O pins (6 capable of PWM output),6 analog I/O pins. We use Arduino IDE (Integrated Development Environment) via USB type B cable to program Arduino board. We use a USB cable or an external 9-volt battery to charge up the board. It accepts voltage between 7 to 20 volts.

Fig. 1 Arduino UNO

B. PIR Sensor

A PIR sensor also known **as** a passive infrared sensor, is used to measure infrared (IR) light emitting from a person or an object in its range. The main purpose of the PIR sensor as a motion detector. It detects various in the amount of IR light radiating upon it. This may vary depending on the temperature and surface of the object.

Fig. 3 PIR Sensor

C. LCD-Display board

An LCD also known as Liquid-crystal-display, is used to produce a visible image. The 16x2 electronic display module highly used in circuits and DIYs. The LCD module displays a total of 32 characters,16 per line in 2 lines. Each character in LCD is displayed in a 5x7 pixel matrix.

D.12V Relay

A Relay module helps in the external Switching of the circuit. It helps in controlling high voltages, high current load like AC load, motor, lamps etc. It is very easy to interface with Arduino Microcontroller. The Relay module has 3 terminals i.e COM, NO and NC. These terminals are brought out with screw terminal. AN in-built led is provided to indicate the status of the relay. These relay module available as a single channel, two-channel, four-channel, eight-channel, 16 - channel etc.

Fig. 5 Relay

III. CIRCUIT DIAGRAM

The circuit diagram of the proposed model is depicted in the figure 6. The colored lines portray the connecting wires. These wires are to connect various elements in a single port, bread board is used [5].

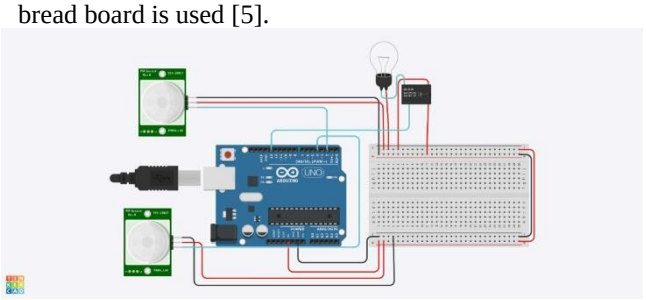

Fig. 6 Circuit connections of the proposed

IV. PROPOSED MODEL WORKING

A couple of infrared sensors are located at the doorway of the room and a PIR sensor is placed in the room such that whole room comes under the range of the sensor. We can also use more than one sensor if the whole room cannot come under the range of a single sensor. The main concept behind this type of set up is simple depicting when a person crosses the first sensor(entering), then it will increment the count. When a person crosses the second sensor first (leaving the room), then the count gets decremented [1]. It is to be noted that both sensors should be placed apart from others. The Lcd board display as soon as there is a change in the count. The PIR sensor checks for motion, if there is no motion it keeps on incrementing the value of 'T'. These values are sent to the microcontroller Arduino board [2]. If there is no one in the room i.e. count less than or equal to zero or no motion for more than 15 mins then the microcontroller sends a signal to break the circuit. So all the fans, lights and other appliances in the room are switch-offed automatically.

V. CODE

We program the Arduino microcontroller using Arduino ide. This is open-source software available on the Arduino website. Programming is nothing but sending a set of rules to the Arduino. It guides the Micro-controller in taking input from different sensors and giving instructions to output devices. Arduino programming is similar to c programming. It mainly contains two blocks/functions. They are setup () and loop (). The more can be learned from the Arduino website [2][6].

A. Setup ()

The setup () function initiates all the setup instructions to Arduino board for the process to begin like defining the i/o pins and defining the input variables. This function executes only once whenever Arduino is booted.

B. Loop ()

Arduino UNO gets all the necessary instructions for its operation from the loop () function. The instructions in this loop gets executed repetitively all through the operation of the Arduino UNO board. loop () function is executed for every 0.6 microseconds. The complete working of the system is programmed in this part.

C. Pseudocode for loop part

```
#person entering room
If(firstsensor==true)
    Increment count
#person is leaving room
    If(secondsensor==true)
        Decrement count
#If there is motion
If(pirsensor==true)
        # show the count on screen
#no person in room i.e. no motion in room.
    IF (COUNT<=0 || T==300000)
#turn off all electric appliances
        Relay is ON
#display no of persons inside room.
        Display(led(count))
```

VI. FLOW CHART

The workflow is given in the flow chart below in figure 8. It provides complete information about the working and code.

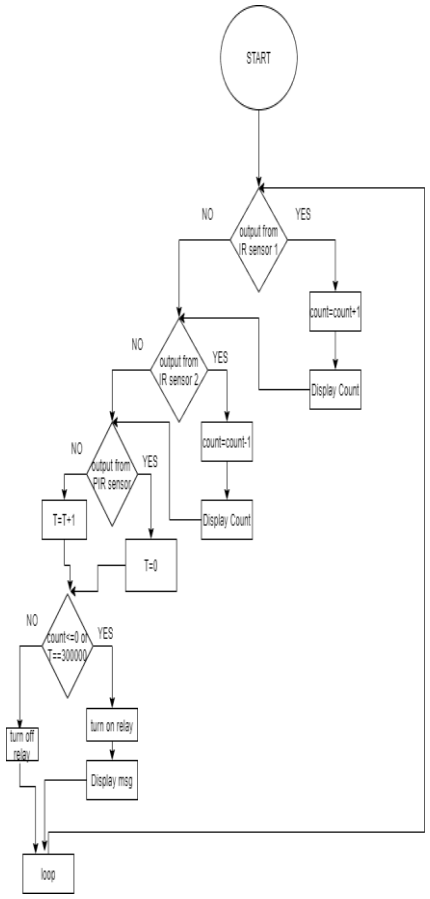

Fig. 8 Sequence Execution of code

VII. EXPERIMENTAL RESULTS

The proposed paper is tested and experimented with a model, where the working is based on the PIR sensor. The in-built led in Arduino turns off implying that the power supply is cut off, if there is nobody in the room which implies that energy is getting conserved instead of wasting. The figure 9 gives a pictorial representation of the circuit connection.

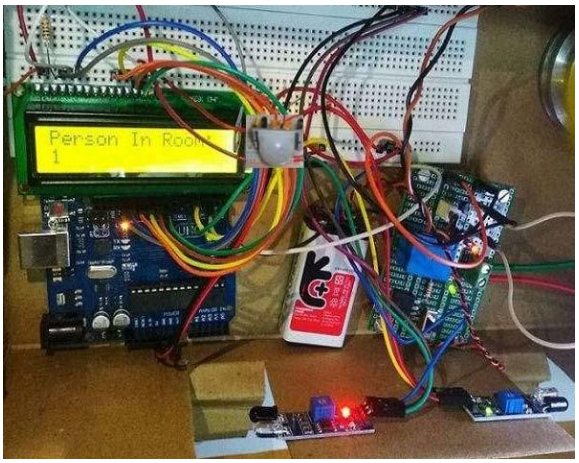

Fig. 9 Model with all components connected

VIII. CONCLUSION

Smart Light Automation is very helpful in saving electricity and building this model is very economical. It is also easy to install in schools, colleges etc. for saving electricity. By installing it in our room, one can forget bothering about turning off the lights when not in use.

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