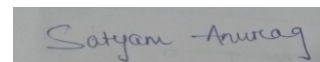


***J-Component Report***  
***ECE1005***  
***Sensors And Instrumentation***  
***Winter semester 2017-2018***

***Automatic light control***  
***By***  
***Using piezoelectric sensor***

***Submitted by:***

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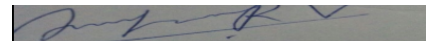
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***Date of submission: 06-04-2018***

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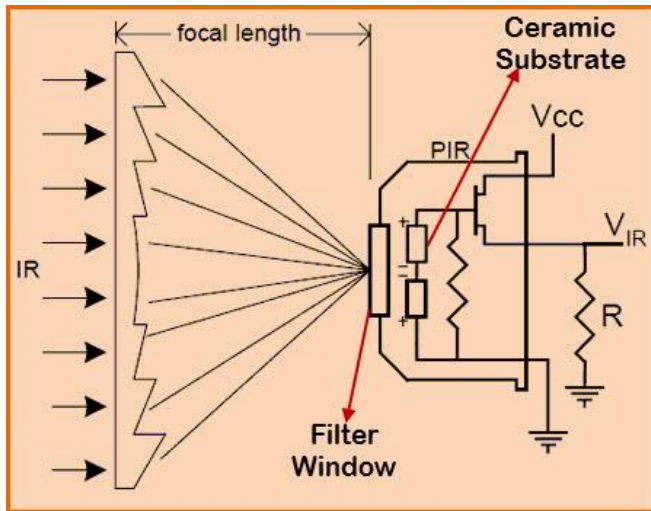
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### ***Abstract:-***

*A sensor is used to detect the changes in quantities or events and generate the respective output signals such as an electrical signal output or optical signal output. The sensors are classified into various types, but, primarily the sensors can be categorized into analog sensors and digital sensors. The **electronic sensor** used to detect the movement of human being within a certain range of the sensor is called as PIR sensor or passive infrared sensor (approximately have an average value of 10m, but 5m to 12m is the actual detection range of the sensor). Fundamentally, pyroelectric sensors that detect the levels of infrared radiation are used to make PIR sensors. There are different types of sensor and here let us discuss about PIR sensor with dome shaped Fresnel lens.*

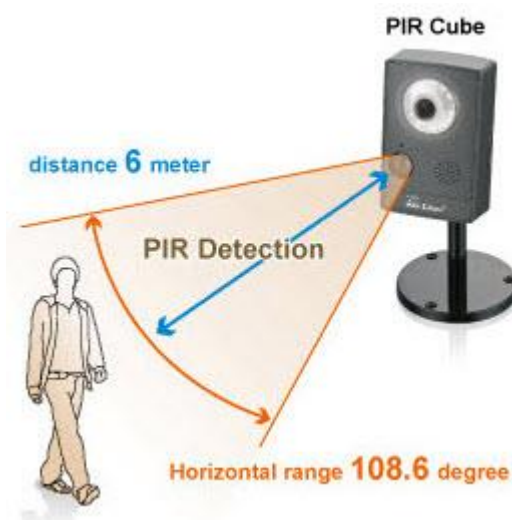
## INTRODUCTION:-

### PIR Sensor Circuit



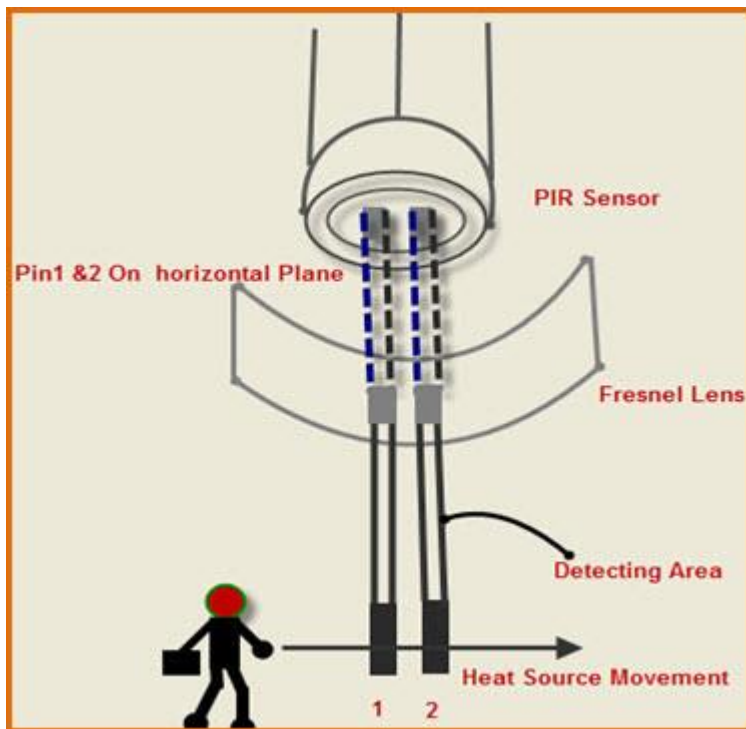
PIR Sensor Circuit

The PIR sensor circuit consists of three pins, power supply pin, output signal pin, and ground pin. The PIR sensor circuit is having ceramic substrate and filter window as shown in the figure and also having dome like structure called as Fresnel lens.  
**PIR Sensor Working**



PIR Sensor Detection Area

Whenever, human being (even a warm body or object with some temperature) passes through the field of view of PIR sensor, then it detects the infrared radiation emitted by a hot body motion. Thus, the infrared radiation detected by the sensor generates an electrical signal that can be used to activate an alert system or buzzer or alarm sound.



**PIR Sensor Working**

*The PIR sensor internally is split into two halves, one half is positive and the other is considered as negative. Thus, one half generates one signal by detecting the motion of a hot body and other half generates another signal. The difference between these two signals is generated as output signal. Primarily, this sensor consists of Fresnel lens which are bifurcated to detect the infrared radiation produced by the motion of hot body over a wide range or specific area.*

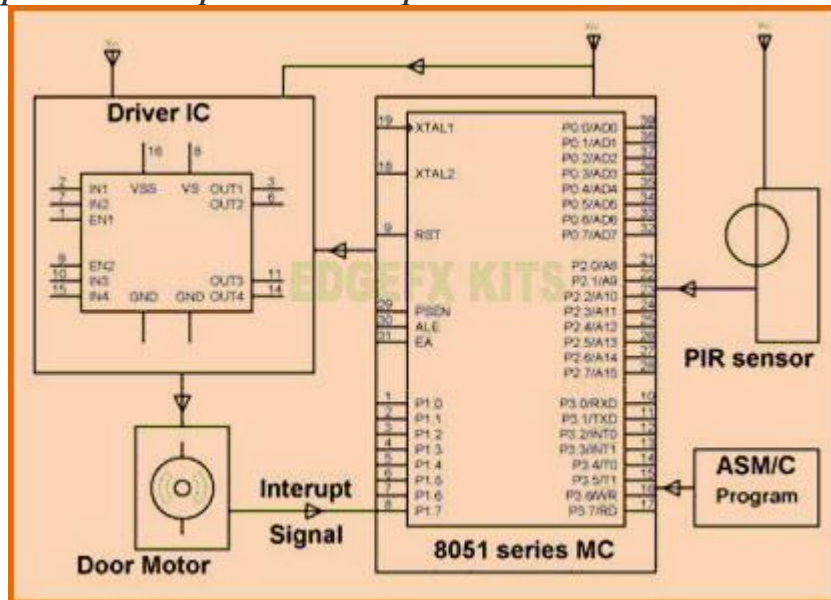
*If once the sensor gets warmed up, then the output remains low until it detects motion. If once it detects the motion, then the output goes high for a couple of seconds and then returns to a normal state or low. This sensor requires settling time, which is characteristically in the range of 10 to 60 seconds.*

### **Practical Applications of PIR Sensor**

*PIR sensors have numerous applications in different fields such as automatic switching operation of outdoor lights, lift lobby, common staircases, automatic switching operation of garden lights based on the presence of a human being, for covered parking area, automatic door operating system in shopping malls, and so on. Let us discuss about a few innovative [electronics projects](#) designed using a PIR sensor circuit.*

## PIR Sensor based Automatic Door Opening System

The automatic door opening system is an innovative electronic project that is designed using PIR sensor. If any human passes through the door, then the sensor generates output pulses. These pulses are sent to the microcontroller which is used to control the operation of motor driver. This motor driver is controlled by microcontroller by giving appropriate pulses to the input and enable pins.



Automatic Door Opening

## System using PIR Sensor

Thus, the motor driver controls the motor interfaced to it and fixed to the door. Hence, if the circuit detects any human passing in its region will enable the motor to operate the door automatically.

## PIR Sensor based Security Alarm System

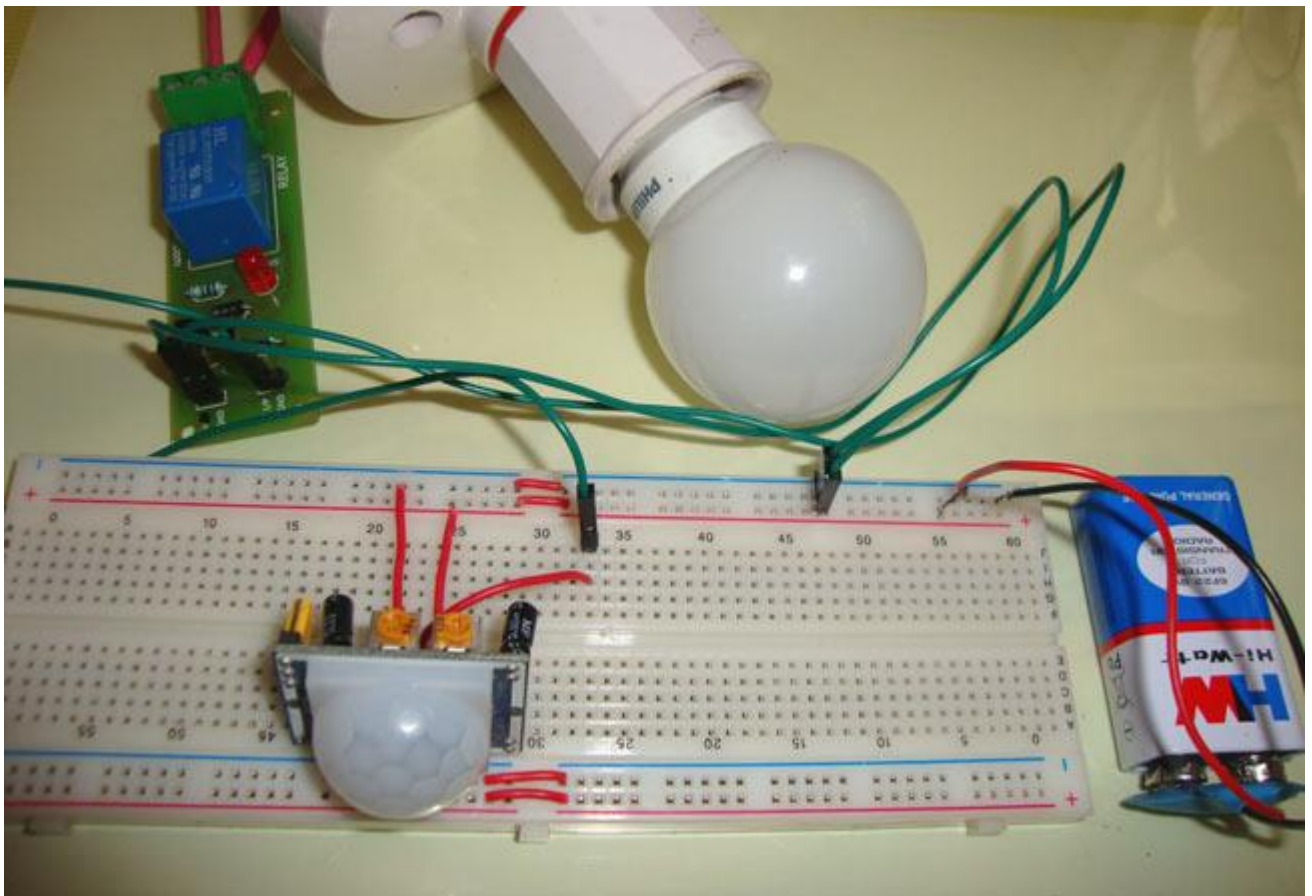
This project is intended to use in the places such as banks and other security intended places. This circuit is interfaced with the alarm system that includes IC UM3561. The UM3561 is an integrated circuit that takes digital input and generates multi tones such as an ambulance or fire engine or police sirens. Thus, if a human being is detected by the PIR sensor circuit, then the digital output is generated by it. This digital output is fed to the IC UM3561 that generates the siren or alarm.

Do you know any other real time applications of PIR sensor? Then, post your answers in the comments section below and help the other readers to improve their knowledge.

## ***MATERIELS AND METHOLOGY:-***

- 1. Bread board***
- 2.12V Relay***
- 3. 1k Resistor (2)***
- 4. Diodes (1N4007)***
- 5. Transistor (BC547)***
- 6. PIR sensor***
- 7. Green led***
- 8. Hook wires***
- 9. DC jack***
- 10. jumper wires***
- 11. Bulb***

### ***Automatic Staircase Lights using PIR Sensor and Relay***



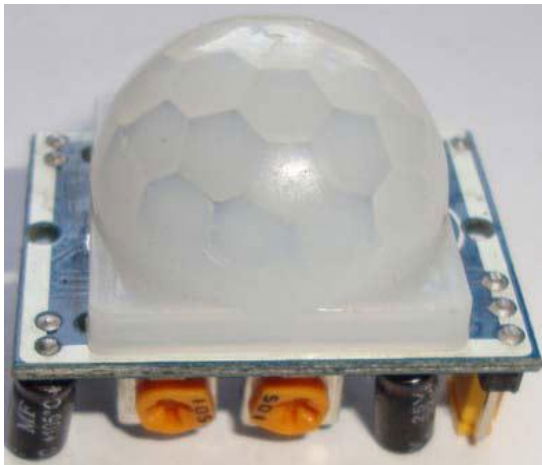
***Automatic Room Lights using PIR Sensor and Relay***



*This automatic staircase light circuit switch on the staircase lights automatically when someone enters on the stairs and gets off after some time. There are two important components in this circuit, first is PIR Sensor (Passive Infrared Sensor) and second is [Relay](#).*

### *PIR Sensor*

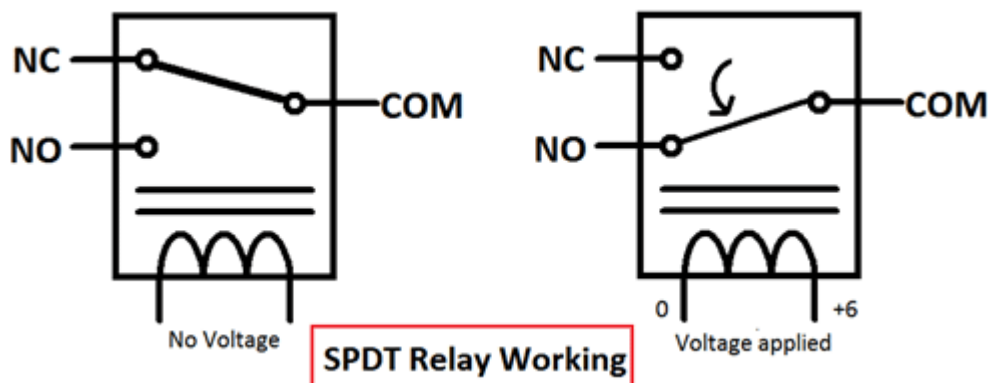
*PIR sensor is used here to detect the Human body movement, whenever there is any body movement the voltage at output pin changes. Basically it detects the Change in Heat, and produce output whenever such detection occurs. You can learn more about [PIR sensor here](#), there are some useful features in PIR sensor like how to change the distance range, how to set the duration for which the light should be ON etc.*



Also check: [Automatic Staircase light using AVR Microcontroller](#)

### *Relay*

[Relay](#) is an electromagnetic switch, which is controlled by small current, and used to switch ON and OFF relatively much larger current. Means by applying small current we can switch ON the relay which allow much larger current to flow. Relay is the good example of controlling the AC (alternate current) devices, using a much smaller DC current. Commonly used Relay is Single Pole Double Throw (SPDT) Relay, it has five terminals as below:



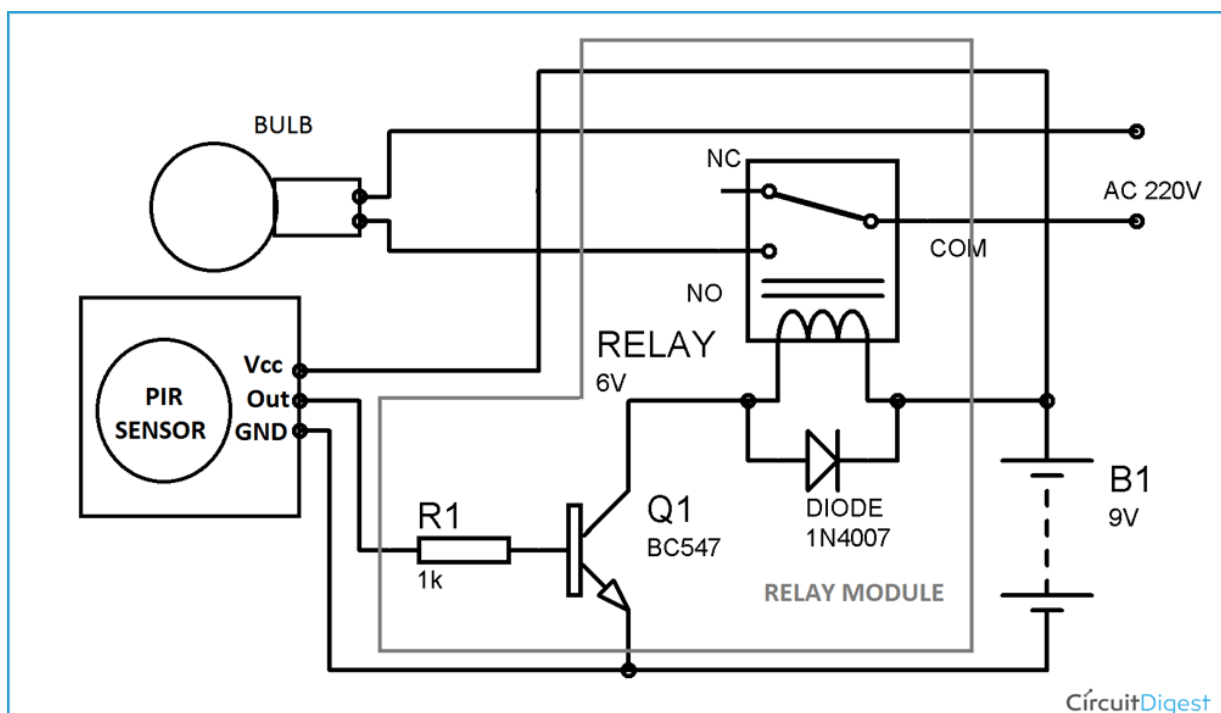
When there is no voltage applied to the coil, COM (common) is connected to NC (normally closed contact). When there is some voltage applied to the coil, the electromagnetic field produced. Which attract the Armature (lever connected to spring),

and COM and NO (normally open contact) gets connected, which allow larger current to flow. Relays are available in many ratings, here we used 6V operating voltage relay, which allow 7A-250VAC current to flow.

Relay is configured by using a small Driver circuit which consist a Transistor, Diode and a resistor. Transistor is used to amplify the current so that full current (from the DC source – 9v battery) can flow through coil to fully energies it. Resistor is used to provide biasing to transistor. And Diode is used to prevent reverse current flow, when the transistor is switched OFF. Every Inductor coil produces equal and opposite EMF when switched OFF suddenly, this may cause permanent damage to components, so Diode must be used to prevent reverse current. A Relay module is easily available in the market with all its Driver circuit on the board or you can create it by using above components. Here we have used 6V Relay module.



*Circuit Explanation:-*





*This automatic staircase light circuit can be easily explained. Whenever PIR sensor detects any body movement, its OUTPUT pin becomes HIGH, which applies the triggering voltage to the base of the transistor, transistor get ON, and current started flowing through the coil. Coil in Relay gets energies and create electromagnetic field, which attracts the lever and COM and NO get connected. This allows a much larger current (220v AC) to flow, which turns ON the BULB. You can increase or decrease the Bulb ON duration by setting up [PIR sensor](#).*

#### **RESULT AND DISCUSSION:-**

*The prototype has been tested in variable real life conditions to verify the overall functionality and seek better performance. The measurements collected during the test phase allow calculating energy savings so that it is possible to estimate cost savings also for larger systems using approximations. Intensity of the street light can be controlled and we can conserve power effectively. we automated the street lights. It reduces the labor charge switching is done manually there is no need of human resource.*

*FUTURE SCOPE Wireless is the buzz of communication industry today. The field of wireless communication is growing leaps and bounds day by day. There have been many advancements taking place in the semiconductor industry leading to more and more advancements in wireless technology. The main aim of the project is to save the power, by using effectively we can save more power, as we know that there is shortage of power nowadays in everywhere mostly in villages etc. So to overcome that we can provide street lights automatically with the centralized intelligent systems. So in future we can design many more advanced technologies to save power*

#### **CONCLUSION:-**

*A new model is presented in this paper which will reduce the power consumption of the street lighting system about 20-35 % compared to conventional design. Here we are saving lot of power without any Wastage, by these advanced technologies we can design many more systems which can be done by solar lights and through these solar lights we have a vast usage at the same time we can do automatic systems instead of doing it manually like with LDR's. Secondly, using highly advanced IC's and with the help of growing technology the project has been successfully implemented.*

#### **TIME SPENT**

<b>SHUBHAM AHUJA</b>	<b>17BEC0156</b>	<b>6hrs/day</b>
<b>SATYAM ANURAG</b>	<b>17BEC0879</b>	<b>6hrs/day</b>
<b>KRISHNAM SURYATEJA</b>	<b>17BEC0138</b>	<b>6hrs/day</b>
<b>B K HEM CHARAN</b>	<b>17BEC0189</b>	<b>6hrs/day</b>
<b>ADITYA TIWARI</b>	<b>17BEC0891</b>	<b>6hrs/day</b>

### ***MONEY SPENT***

<b><i>SHUBHAM AHUJA</i></b>	<b><i>17BEC0156</i></b>	<b><i>200 rupees</i></b>
<b><i>SATYAM ANURAG</i></b>	<b><i>17BEC0879</i></b>	<b><i>200 rupees</i></b>
<b><i>KRISHNAM SURYATEJA</i></b>	<b><i>17BEC0138</i></b>	<b><i>200 rupees</i></b>
<b><i>B K HEM CHARAN</i></b>	<b><i>17BEC0189</i></b>	<b><i>200 rupees</i></b>
<b><i>ADITYA TIWARI</i></b>	<b><i>17BEC0891</i></b>	<b><i>200 rupees</i></b>

### ***REFERENCE:-***

- 1.[https://youtu.be/gkr22g0\\_2L8](https://youtu.be/gkr22g0_2L8)
- 2.<https://youtu.be/wjM6aGAfGuY>
- 3.<https://learn.adafruit.com/pir-passive-infrared-proximity-motion-sensor/example-projects>
- 4.<https://www.elprocus.com/pir-sensor-circuit-with-working/>