AN

ALTERNATE SOLUTION

FOR

ENERGY CONSERVATION

IN

PUBLIC LIGHTING SYSTEMS

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Nowadays, street lighting systems in industries or cities are growing rapidly. The important considerations in the field of different technologies like electrical and electronics are cost effectiveness, automation and power consumption. There are different street lighting systems developed to maintain and control public lighting. These lighting systems are used to control and decrease energy consumption. Street light controlling is one of the most developing system in India to conserve the energy.

During the night time all the lights on the highway road remain on throughout the night, so the energy loss will be high when there is no movement of vehicles. This project gives a solution for saving the energy. This is attained by detecting an approaching vehicle by turning ON the street lights. As the vehicle passes away from the street light, then the lights get turn OFF. If there are no vehicles on the road, then all the lights will turn OFF.

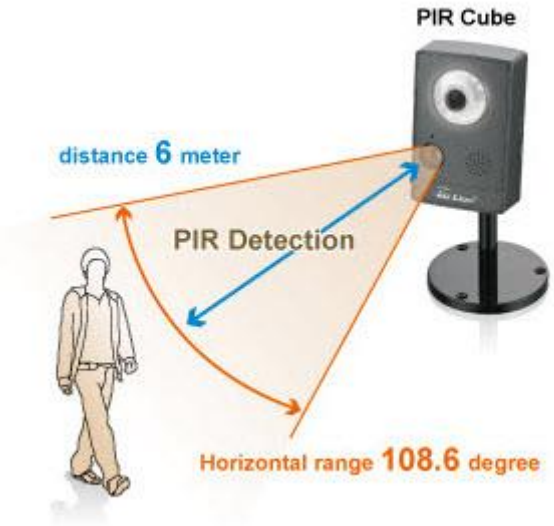
The infrared sensors are placed on each side of the road that are used to detect the vehicle movement and send the logic signals to a Arduino Board to turn on/ off the LEDs for a specific distance. Therefore, this way of dynamically switching ON and OFF the street lights helps in reducing the power consumption.

By using this project, a lot of energy can be saved. The proposed system uses LEDs instead of other lamps. The project is especially designed for street lighting in remote rural and urban areas where the traffic is low at times. The system is multipurpose, extendable and totally variable to user needs.

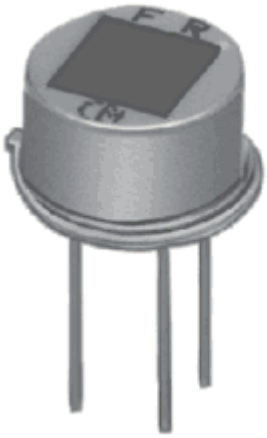
The applications of this street light that glows on detecting vehicle movement mainly involve in highways, real time street lights, hotels, parking areas and restaurants, etc. The advantages are: low cost, more life span and energy can be saved.

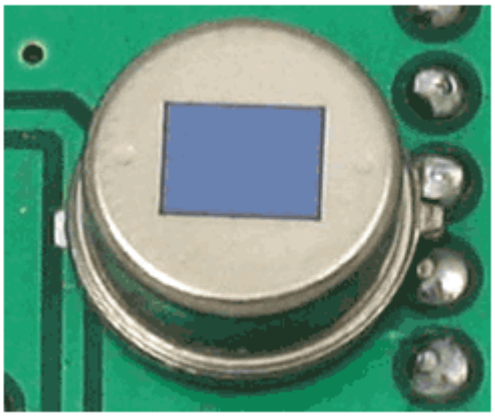
PIR Sensor

The term PIR is the short form of the Passive Infra Red. The term “passive” indicates that the sensor does not actively take part in the process, which means, it does not emit the referred IR signals itself, rather passively detects the infrared radiations coming from the human body in the surrounding area.

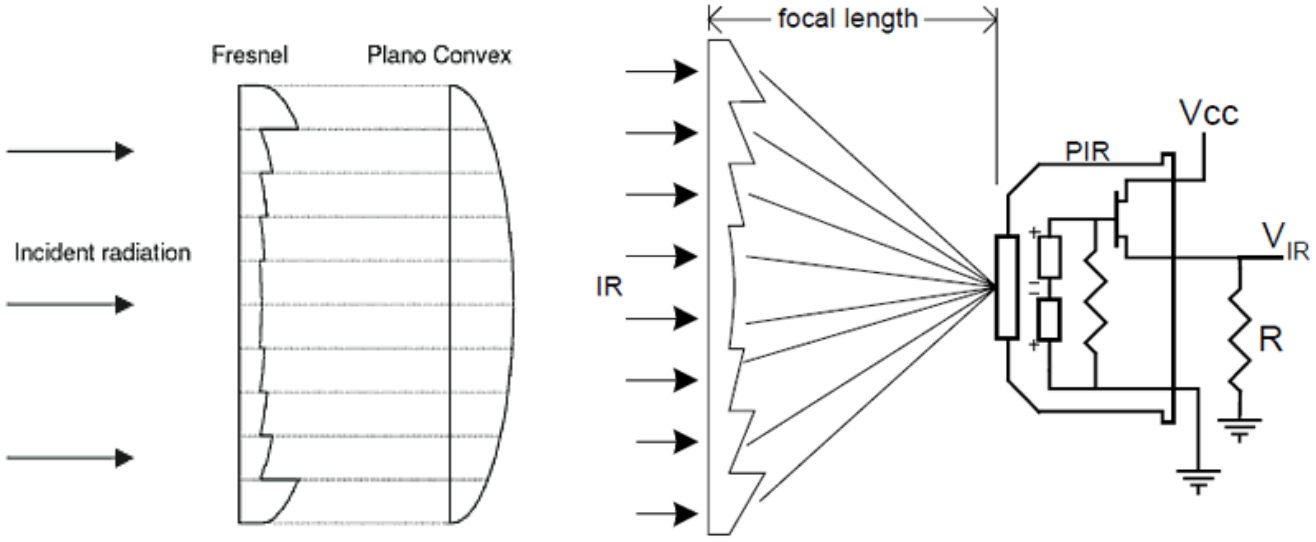


The detected radiations are converted into an electrical charge, which is proportional to the detected level of the radiation. Then this charge is further improved by a built in FET (Field Effect Transistor) and fed to the output pin of the device which becomes applicable to an external circuit for further triggering and amplification of the alarm stages. The PIR sensor range is up to 6 meters at an angle of 108.6º.





The lens can change the breadth, range, sensing pattern, very easily. The lens is just a piece of plastic, that means that the detection area is just two rectangles. To have a detection area that is much larger, we use a simple lens that condenses a large area into a small one. For reasons, we would like to make the PIR lenses small and thin and moldable from cheap plastic, even though it may add distortion. For this reason the sensors are actually Fresnel lenses.

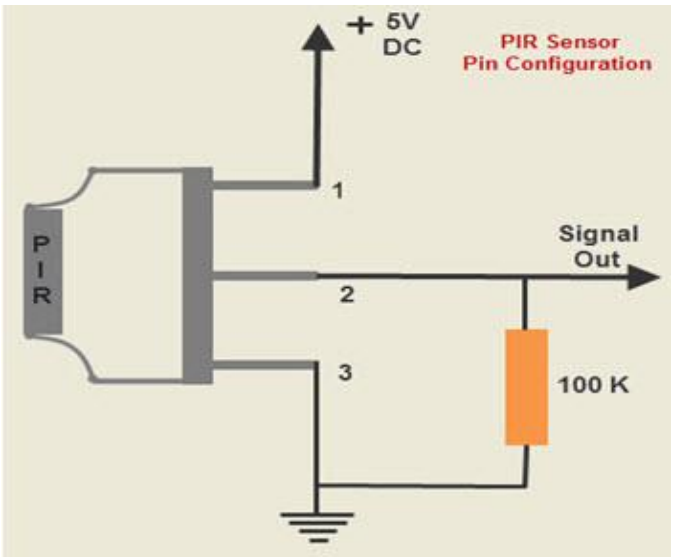


We now have a much larger range. However, we actually have two sensors, and we don't want two really big sensing-area rectangles, but rather a scattering of multiple small areas. So what we do is split up the lens into multiple section, each section of which is a Fresnel lens.

Pin Configuration of PIR

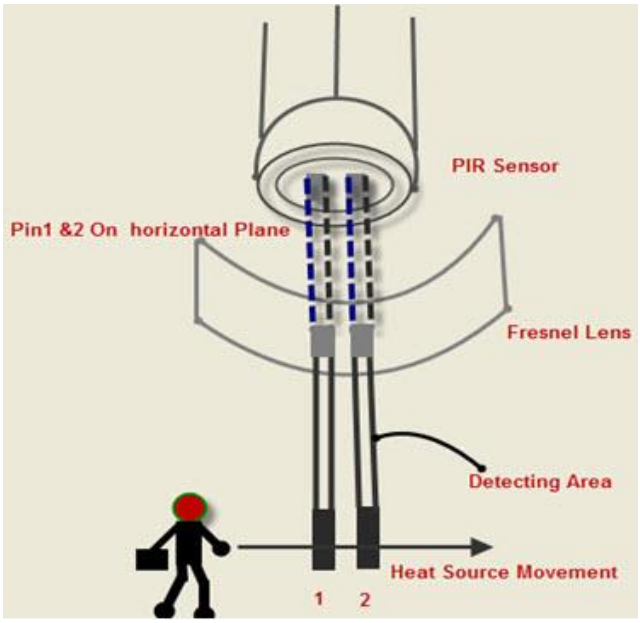
The Passive infrared sensors consist of three pins as indicated in the diagram.

- Pin1 corresponds to the drain terminal of the device, which should be connected to the positive supply 5V DC.
- Pin2 corresponds to the source terminal of the device, which should be connected to the ground terminal via a 100K or 47K resistor. The Pin2 is the output pin of the sensor, and the detected IR signal is carried forward to an amplifier from the pin 2 of the sensor.
- Pin3 of the sensor is connected to the ground.



PIR Sensor's Working Principle

PIR sensor detects a human being moving around within approximately 10m from the sensor. This is an average value, as the actual detection range is between 5m and 12m. PIR are fundamentally made of a pyro electric sensor, which can detect levels of infrared radiation.



The PIR sensors consist of two slots. These slots are made of a special material which is sensitive to IR. The Fresnel lens is used to see that the two slots of the PIR can see out past some distance. When the sensor is inactive, then the two slots sense the same amount of IR. The ambient amount radiates from the outdoors, walls or room,etc.

When a human body or any animal passes by, then it intercepts the first slot of the PIR sensor. This causes a positive differential change between the two bisects. When a human body leaves the sensing area ,the sensor generates a negative differential change between the two bisects. The infrared sensor itself is housed in a hermetically sealed metal to improve humidity/temperature/noise/immunity. There is a window which is made of typically coated silicon material to protect the sensing element.