



Project Report

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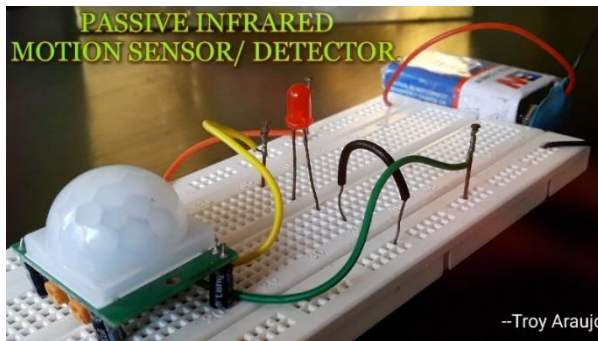
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PIR Motion Sensor

INTRODUCTION

Every Engineering solution is aimed at serving mankind by easing out their lives in some way or the other. Based on team discussion, we identified that apart from human basic needs (Food, Clothes and Shelter), Safety is one of the most vital need that is essentially required to secure even the basic needs mentioned above. Safety of human life and its belongings can be assured through security. With this consensus, team agreed to undertake and deliver a project which facilitate the security requirements of modern era. Therefore, rolling out of "PIR Motion Sensor" was finalized to be the project.

1. Project Overview:

The objective of this project is to develop a motion sensor alarm based on a Passive Infra-Red Sensor (PIR). The aim of the project is to build a motion sensor which transmits and receives the signal. This project is about the motion detection using Infra-Red sensor wirelessly. When the sensor is triggered, the signal will transmit to take further action. For this project, we have related this sensor system with an auto power light switching system. Which means when the sensor is triggered, The LED light will turn on. The objective is tending to switch ON the light automatically. After doing some research from the internet and taking advice from the lecturer, tools and equipment were identified in order to complete the project.

2. Project Applications:

The motion sensors are used in the following:

1. Intruder alarms
2. Automatic ticket gates
3. Entry way lighting
4. Security lighting
5. Automated sinks/toilet flusher
6. Hand dryers
7. Automatic doors

3. Components Used:

1. PIR sensor
2. Breadboard
3. Connecting wires
4. LED:
5. Buzzer:
6. Battery:
7. Safety Gloves
8. Anti-static wrist band

PIR Sensor:

PIR sensors allow us to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. PIR sensors are small, inexpensive, low-power, easy to use and don't wear out. For that reason, they are commonly found in appliances and gadgets used in homes or businesses. They are often referred to as PIR, "Passive Infrared", "Pyroelectric", or "IR motion" sensors.



Buzzer:

The function of the buzzer in the circuit is to produce sound when the sensor detects any kind of motion.

LED:

The purpose of LED in motion sensor is to glow when detected motion. When the PIR sensor detects motion, the output pin will go high to 3.3V and light up the LED.

Breadboard:

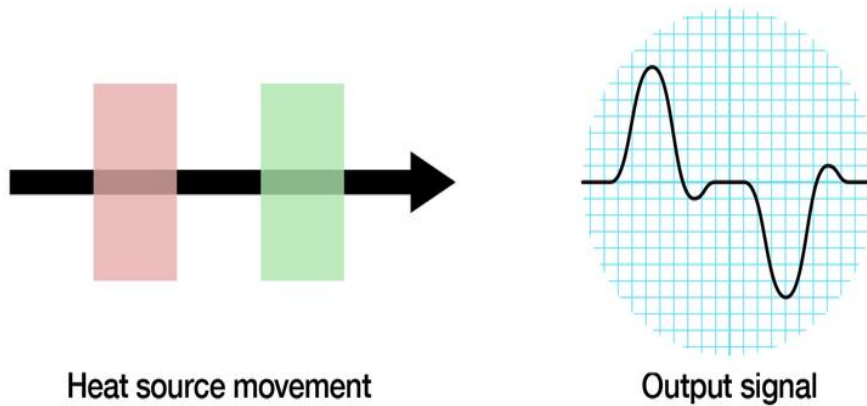
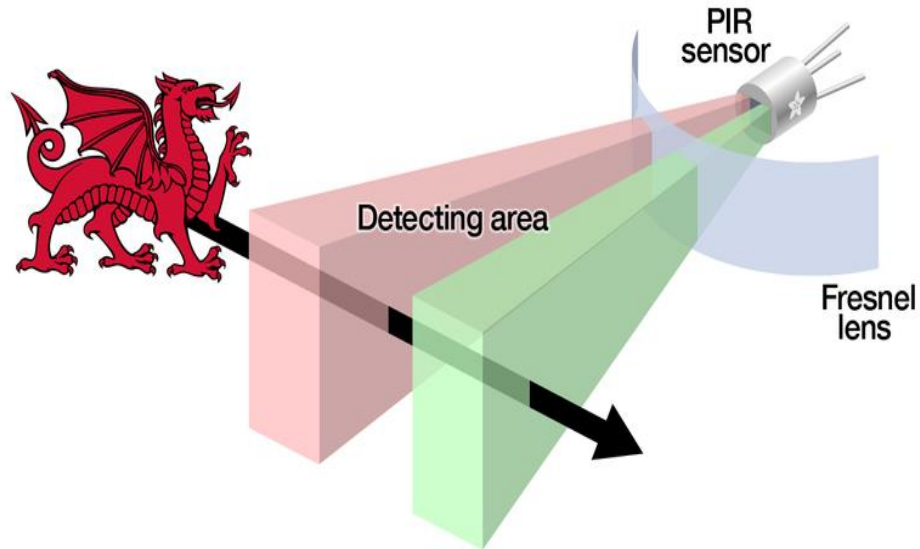
The breadboard is used to make the circuit. All the apparatus is connected on the breadboard in order to make the circuit work.



4. Working:

PIR sensors are more complicated than many of the other sensors because there are multiple variables that affect the sensors input and output. To begin explaining how a basic sensor works, I'll use this rather nice diagram.

The PIR sensor itself has two slots in it, each slot is made of a special material that is sensitive to IR. The lens used here is not really doing much and 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. 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.



5. My participation in project:

In this project I have done many tasks which were given to me by my groupmates in order to complete this project. The task which I have done are the following

1. Estimation of the project:

Project estimation was carried out based on below mentioned inputs:

1. Technical Feasibility (*based on Solution & design document, BOQ, RAT*)
2. Project Maser Plan (*Planning, Procurement, Execution, Testing and Report Preparation*)
3. Procurement Process
4. Risks and Assumptions
5. Cost Analysis
6. HSE (Health, Safety & Environment) measures

Below is the outcome of project estimation:

1. Project is technically and financially feasible to be rolled out.
2. Project estimated cost (including component, tools, accessories, transportation and others) was calculated as Rs. 5000
3. Project would be completed in 02 weeks
4. Special budget was reserved to observe COVID-19 precautions throughout project cycle; especially during procurement and assembling process.

2. Procurement:

Based on BOQ, I prepared a list of components, tools, test instruments and safety material as mentioned below:

Item	Qty	UOM
PIR sensor	1	Each
Breadboard (Large)	1	Each
Connecting wires	1	Meter
Battery	1	Each
Buzzer	1	Each
LED	1	Each
Safety Gloves	1	Pair
Anti-static wrist band	1	Each
Soldering Station	1	Each
Soldering Wire	1	Meter
Solder Puller	1	Each
Toolkit	1	Each
Face Mask	3	Each
Sanitizer	1	Bottle

Next on, I identified relevant market places from where abovementioned items can be purchased. I called upon different shops of College Road Rawalpindi, Blue area Islamabad and Aabpara Market Islamabad to get quotation of listed items. Based on financial comparison and ease of access, I, along with my project team members Zaki Muttayab and Arham Mahbub Khan, reached out College Road Rawalpindi where I cross verified the rates, quality and availability from different shops and finally purchased components, toolkit and safety gloves. Before that, I visited nearest pharmacy to purchase face masks, sanitizer etc.

3. Assembling the project:

After purchasing the apparatus, I assembled different components on breadboard for the proof of concept and finally to ascertain that the objective of project is achieved. For this purpose, following steps were taken by me in order to assemble the circuitry and made it ready for testing.

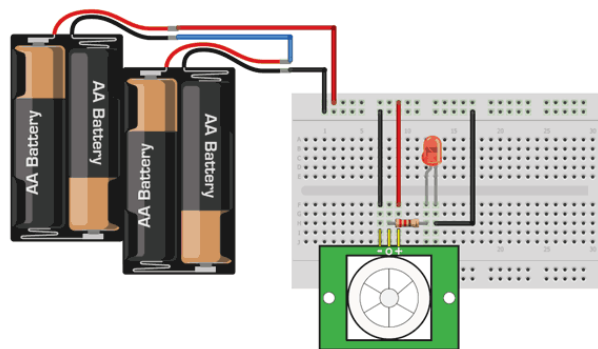
- A. First of all, I attached connecting wires to the PIR sensor output pins with the help of soldering station.

- B. Later, I attached LED to the breadboard and a connecting wire in the parallel to the LED and other end at the positive terminal.
- C. Then I attached the buzzer to the breadboard and then connecting wires were attached with the Digital Out Terminal of the PIR sensor.
- D. Further, I attached the positive and negative terminals of battery to the breadboard.
- E. Finally, I changed the sensitivity and time delay from the potentiometers of the PIR sensor and after changing the sensitivity the motion sensor starts working.

Testing:

When battery is connected to the circuit, PIR sensor took 1 minute to stabilize and within that time the LED light blinked few times. After 1 minute LED light did not blink and when I moved my hand within the sensor range the LED glow-up and buzzer also gave sound indicating the motion.

When the PIR sensor detects motion, the output pin will go "high" to 3.3V and light up the LED. Once you have the breadboard wired up, insert batteries and wait 30-60 seconds for the PIR to 'stabilize'. During that time the LED may blink a little. Wait until the LED is off and then move around in front of it, waving a hand, etc., to see the LED light up.



- **References:**

1. <https://learn.adafruit.com/pir-passive-infrared-proximity-motion-sensor/overview>
2. <https://www.youtube.com/watch?v=NZ1RHtF2rEA>
3. <https://www.youtube.com/watch?v=4BkmBF0D65A&t=836s>
4. <https://learn.adafruit.com/pir-passive-infrared-proximity-motion-sensor/how-pirs-work>