



CSE251 LAB PROJECT
IR MOTION DETECTOR

GROUP - 6

Name	ID
Mitisha Tasnim Rahman	20301327
H.M Sarwer Alam	20301224
Shudeb Ghosh Barno	20301222
MD. Abdullah Al Sadik	20301094
Samia Semu	20301297

Presented to :

Beig Rajibul Hasan

Purbayan Das

Semester: Fall 2022

Date: 21 December 2022

Abstract

In this project, we have built an IR motion detector using different components. This eventually works as an active detector which works through an LED and it gets triggered when there is blockage of light. Here we also used a buzzer to detect the motion which makes sound along with lighting up the LED. This project was designed to automatically trigger on/off a relay by constructing a circuit with the proper components. Actually, two circuits were built for this, one for the LED and another one for the buzzer. After that we connected both of them to work accordingly. The principle of motion detection using active infrared sensors forms the basis for its operation and in this case, the light through the air is captured by the IR. When this beam gets interrupted, it immediately sends a signal which triggers the LED following which the buzzer also gets activated. On the whole, this device is very much cost efficient and can also be used as a beneficial one in real life applications.

Component List:

- Passive buzzer 5V
- IR transmitter LED 3mm
- Breadboard
- Infrared Photodiode T&R 3mm
- 100 ohm 2W resistor
- 330 ohm 1/4W resistor
- 10k,1k,4.7k ohm 1/4W resistor
- L7805 Voltage regulator
- 9V battery
- LED red 5mm
- Male to male jumper wires
- LM358 op amp
- 9V battery connector
- 4.7uF 50V capacitor
- C829 NPN Transistor
- 100k ohm potentiometer

Working Principle

The main components of IR motion detectors are IR LED and Photodiode LED. Basically, the IR sensor transmits the IR radiation (wavelengths 700 nm - 1 mm) and the photodiode receives / senses that radiation. The photodiode resistance changes according to the amount of IR radiation falling on it, hence the voltage drop across it also changes and by using the voltage comparator (in our case LM358) we can sense the voltage change and generate the output accordingly.

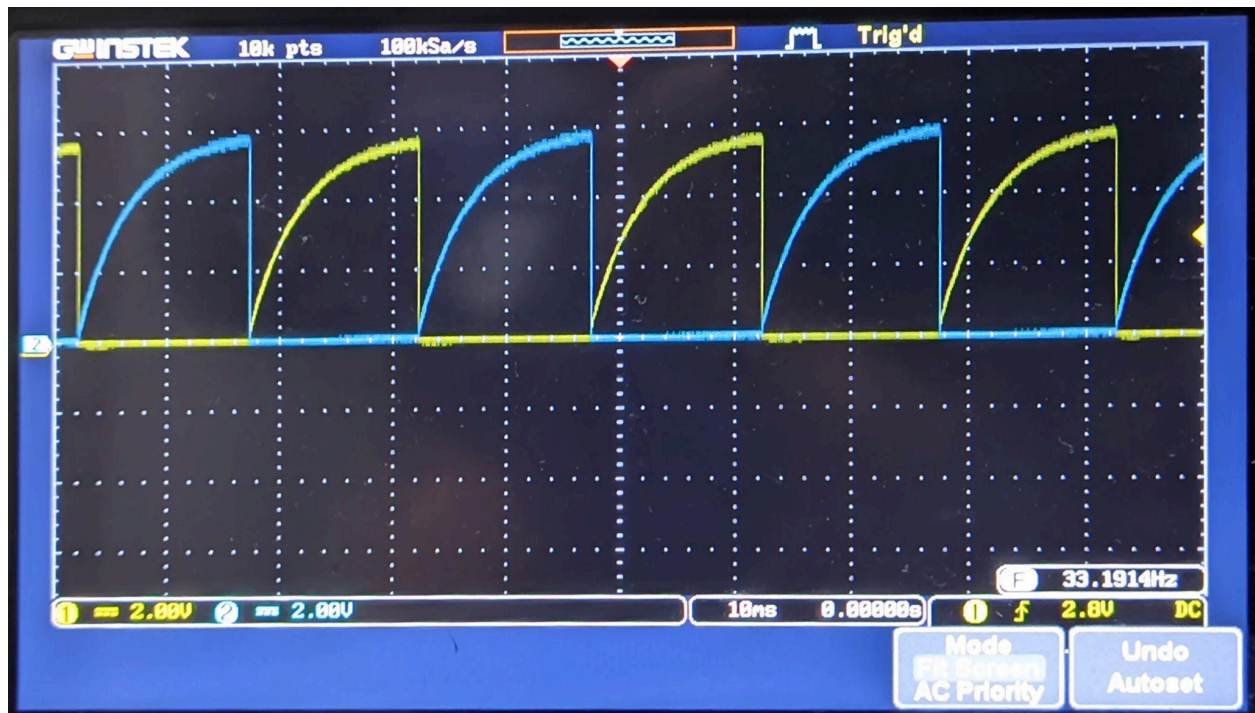
Component	Working principle
IR LED	<ul style="list-style-type: none">• Looks like a normal LED, consumes 20 mA current 3V power.• The angle of emitting radiation is 20 to 60 degrees.
Photodiode	Type - Semiconductor (P-N Junction) <ul style="list-style-type: none">• Known as a Light dependent Resistor (LDR), meaning without light it has higher resistance and becomes lower resistance when it gets light.• Operates in reverse bias, in details, when the light fall on this it conducting the current in reverse direction Here- $\text{Amount of current flow} \propto \text{Amount of light}$
LM358	This operational amplifier is used as a voltage comparator. It works like when voltage at non-inverting (PIN 3) input (+) is higher than the voltage at inverting (PIN 2) input (-), then the output of comparator (PIN 1) is High. On the other hand, the output is LOW.
Astable Multivibrator	Astable multivibrators are used to generate square waves and can work continuously.

Passive Buzzer	Passive buzzers need a triggered wave to produce sound. In our case, it needs a 1.5 - 2 V amplitude square wave to produce sounds.
----------------	--

In short, the circuit mainly works like when we block the IR radiation receiver with something then the IR - PD has lower resistance, so the voltage drop is lower, in this scenario, the non inverting input has higher voltage and the output is High. For this high voltage the Red LED light turns on. Symontinously, the same High voltage goes to the Astable Multivibrator, in the circuit with the help of BJT and capacitor, we get square wave (Mainly the concept of capacitor creates the square wave). Then, these square waves are responsible for turning on the buzzer.

On the other hand, when the IR radiation receiver gets the radiation, in that time, IR - PD has higher resistance, for this the voltage drop is higher here, so non inverting input has lower voltage, which is responsible for LOW output. After that, for low output the RED LED won't turn on and this output is not enough for creating square waves which can turn on the buzzer.

Screenshot of waveforms



Conclusion:

The goal of this project was to automatically turn on and off a relay by building a circuit with the necessary parts. Its functioning is based on the motion detection concept, employing active infrared sensors. Overall, this technology is quite cost-effective and might be used in real-world applications.