PIR BASED SECURITY ALARM

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1. INTRODUCTION

1.1 Overview

The aim of this project is to design a PIR (Passive Infrared Radial) sensor based security system with the main objective to provide security. This electronic security system is enabled with an alarm to alert the opeartor in the presense of an intruder.

1.1 Purpose of the project

The main idea of this circuitry is to provide security. When an intruder walks past the device, the IR beam is cut and the alarm is activated. Thus, alerting the operator. It can be employed at homes, offices, banks, and shops. It also finds extensive application in machine guarding. Wherein, it is used as a safety feature along with the shield around the engineering equipment to prevent equipment contact with body parts when the equipment is running.
Additionally, it is portable and inexpensive compared to other devices available in the market.

2. LITERATURE SURVEY

2.1 Existing Problem

Normally, an electronic security system consists of a transmitter and a receiver where the transmitter sends an infrared radiation which is received by the receiver. But this system has severe disadvantages i.e limited range, high initial investment, complex infrastructure requirement, and poor line of sight. These disadvantages can be eliminated by the use of PIR sensor-based circuitry.

2.1 Proposed Solution

PIR (Passive Infrared Radial) sensors are used instead of infrared or laser transmitters and receivers in this circuit. The sensor and are capable of detecting general movement. PIR devices do not radiate energy for detection. They work entirely by detecting and measuring infrared light radiating from objects in their field of view. Owing to the change in the amount of infrared striking the device, there will be a change in its voltage, which is measured using an amplifier.

3. THEORITICAL ANALYSIS

3.1 Block Diagram

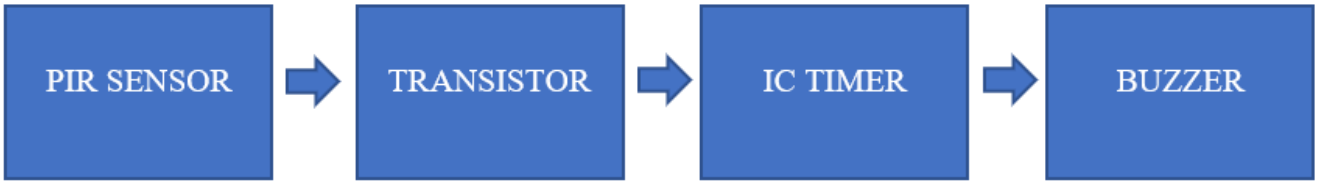

Fig. 1 Block Diagram of PIR based alarm system

3.2 Hardware and Software Requirement

Software Required: KiCad

Hardware Required:

Components Name	Quantity
LM 555 Timer IC(U1)	1
BC547 Transistor (Q1)	1
HC-SR501 PIR Sensor Module(H1)	1
220 ohm Resistor (R1)	1
10K ohm Resistor (R2)	1
47K ohm Resistor (R3)	1
150 ohm Resistor (R4)	1
0.01 uF Capacitor (C1)	1
100 uF Capacitor (C2)	1

Buzzer (BZ1)	1
Slide Switch (SW1)	1
9V Power Supply	1

3.3 Schematic Diagram

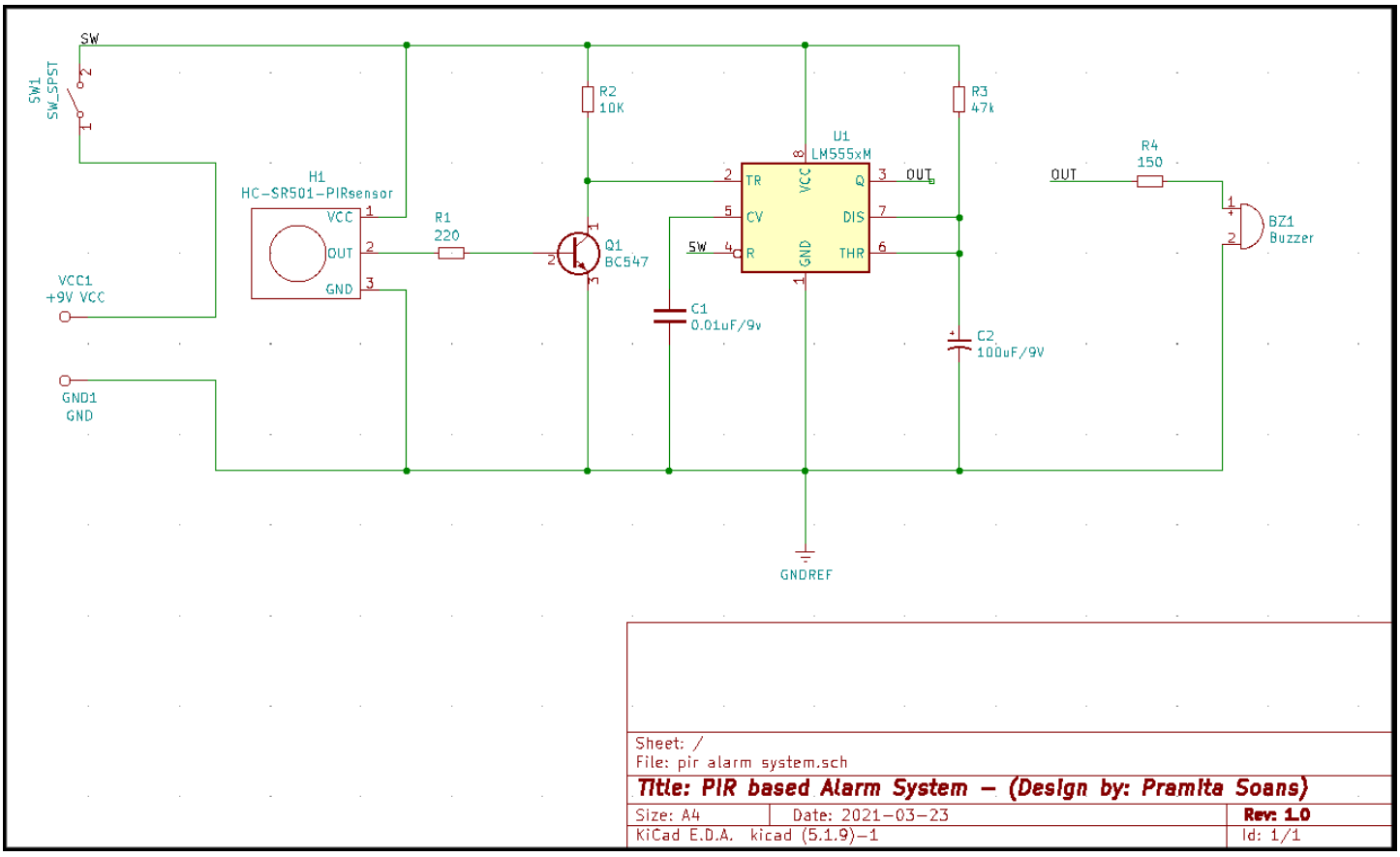

Fig 2. Schematic Diagram

4. OPERATION

4.1 Flow Chart

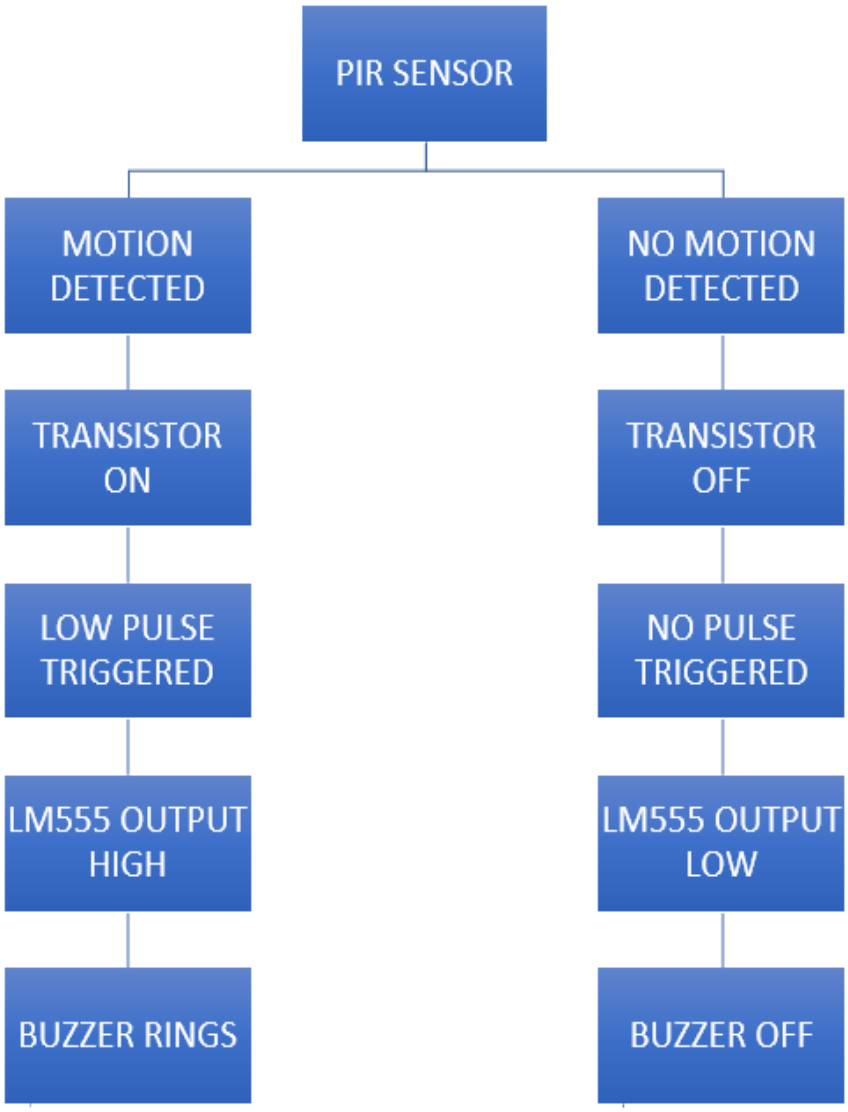

Fig 3. Flowchart

4.1 Principle and Working

Principle : This circuit operates when the PIR sensor detects any motion and the buzzer allows to alert the operator. In the circuit, the transistor works as a switch and the 555 timer IC is configured in monostable mode i.e when it gets a low trigger pulse at its trigger pin, then IC output becomes high.

Working:

1. When the PIR Sensor detects any motion: The sensor provides high output voltage. This output voltage goes to the base terminal of the BC547 Transistor and turns it on. In this condition, the LM555 Timer IC trigger (Pin 2) is connected to the ground through the transistor and gets a low pulse. Hence, the Timer IC Provides output voltage, which goes to the Buzzer. The buzzer is turned on and alerts the operator.

2. When the PIR sensor does not detect any motion: The sensor provides low output voltage. This output voltage is not sufficient to turn ON the BC547 Transistor which means the transistor is in off state. In this condition, LM555 Timer IC trigger (Pin 2) does not recieve a low trigger pulse. Hence, the Timer IC does not provide output voltage and the buzzer is in off state.

5. RESULT

5.1 PCB Design

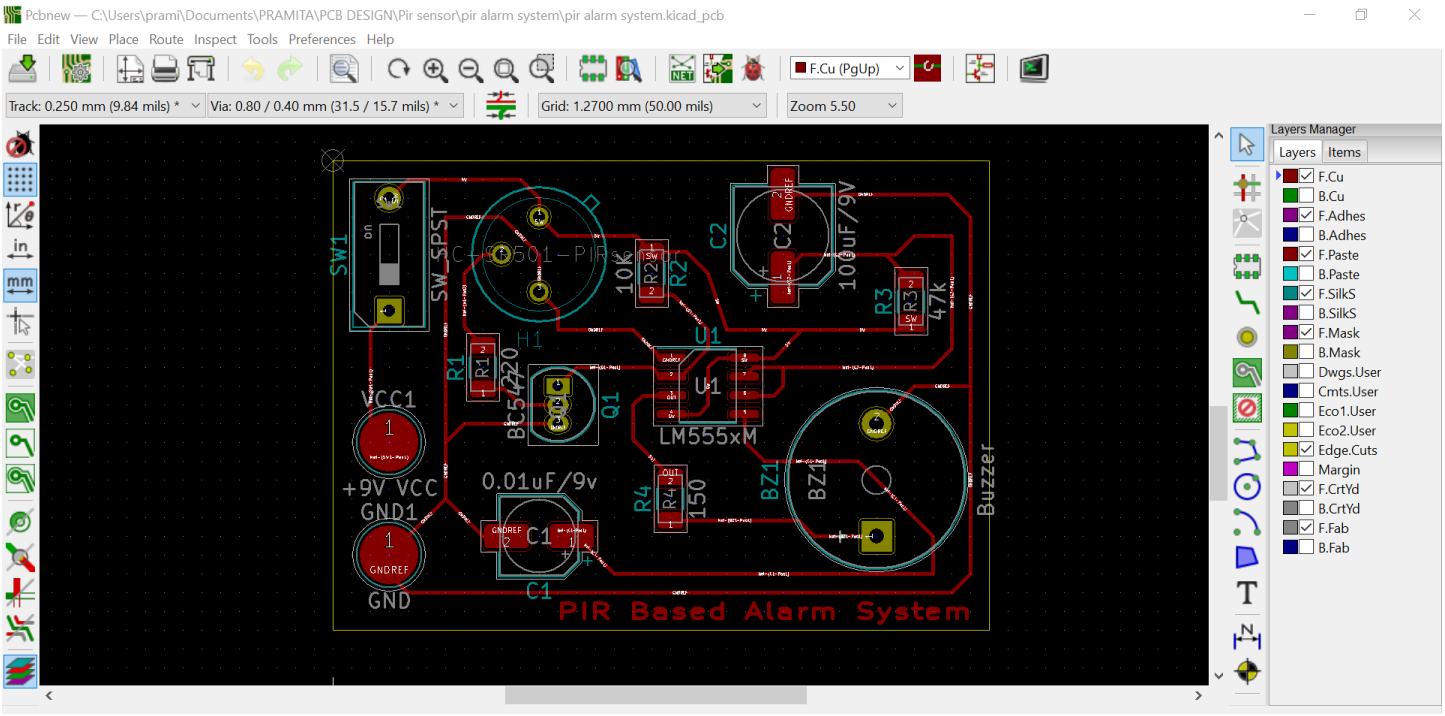

Fig.4 PCB Design

5.2 PCB Design- 3D View

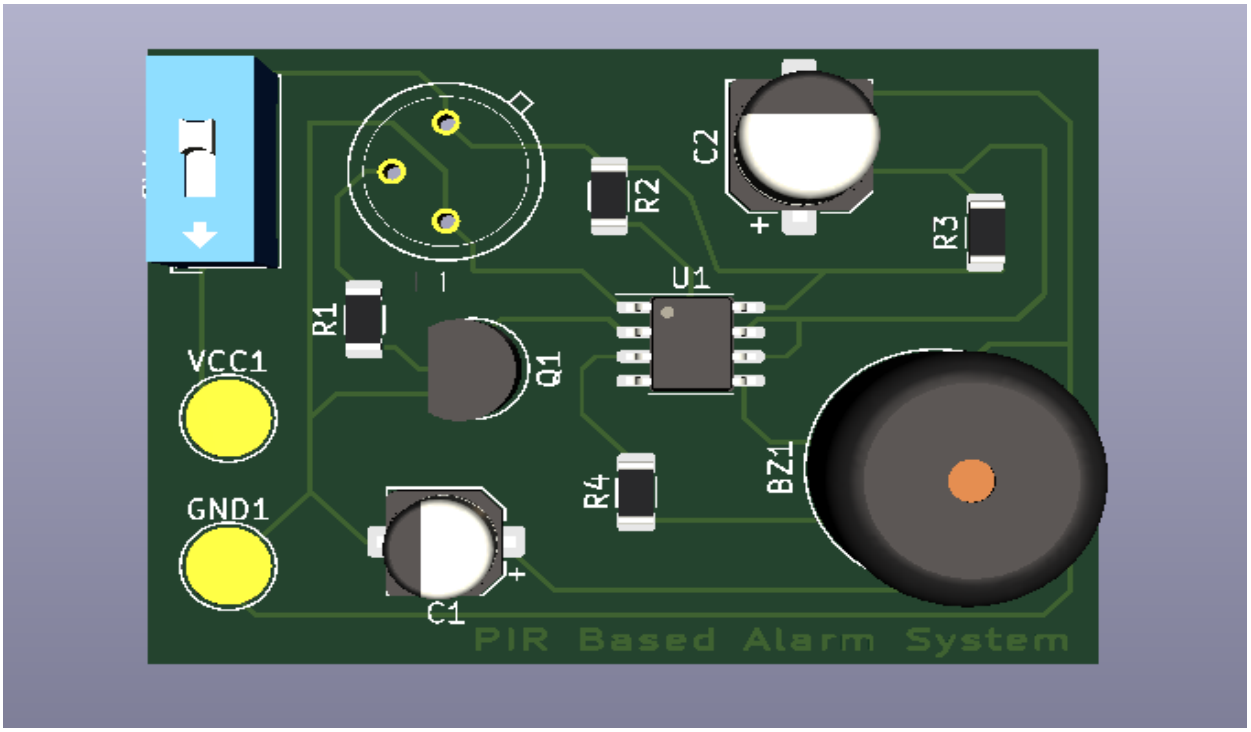

Fig5. PCB Design - 3D View

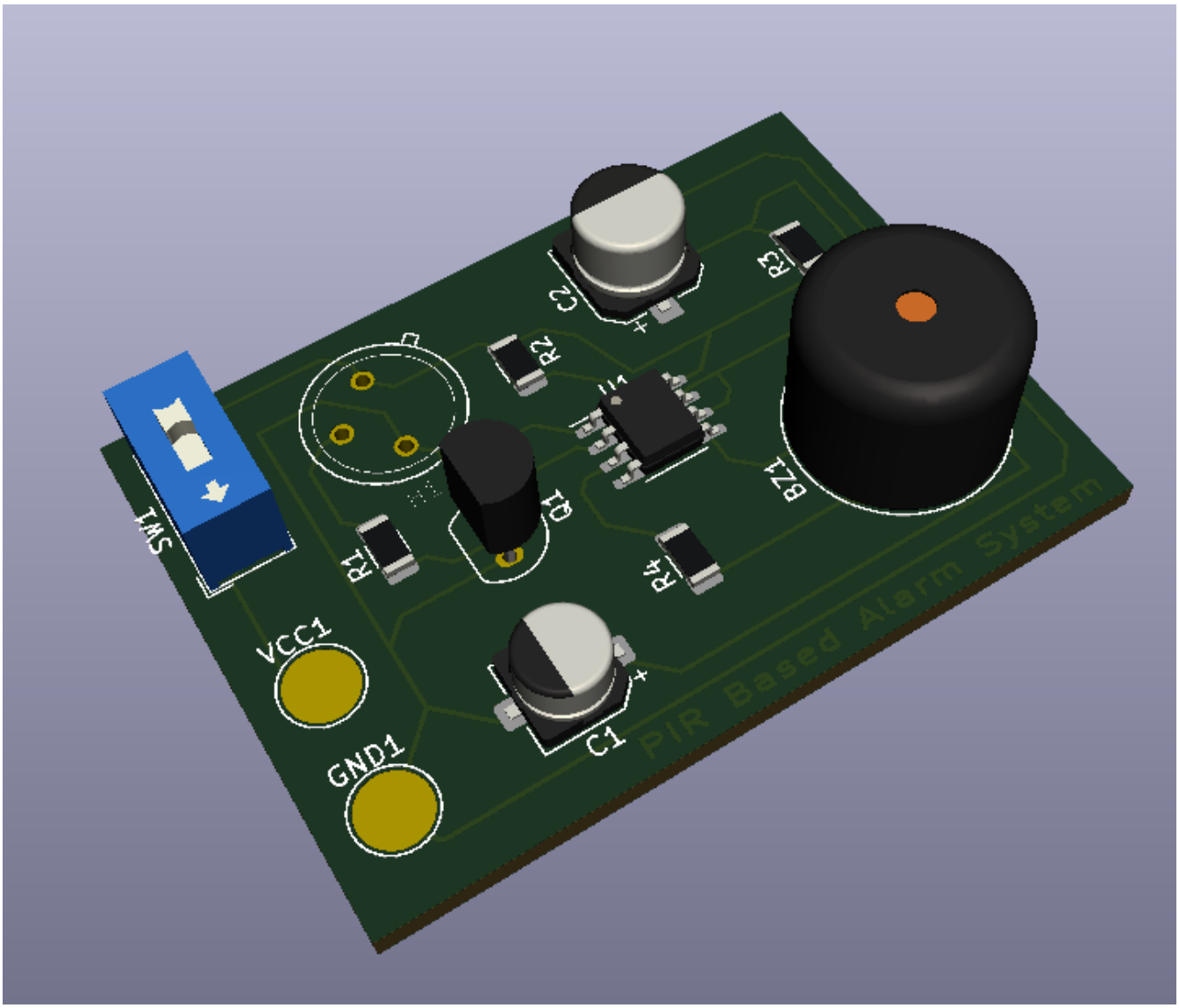

Fig 6. PCB Design-3D View2

6. ADVANTAGES AND DISADVANTAGES

6.1 Advantages

- Detects motion reliably in indoors as well as in day or dark.
- It consumes less energy compare to microwave sensor.
- Cost-effective
- They are good for electrical applications used in smaller and compact premises.

6.2 Disadvantages

- They have lower sensitivity and less coverage compare to microwave sensors.
- It works effectively in LOS (Line of Sight) and will have problems in the corner regions.
- It is insensitive to very slow motion of the objects.
- Since PIR sensors sense heat signatures in room, they are not very sensitive if the room itself is warm. Hence, PIR sensors are not able to detect human beings in summers.

7.APPLICATION

- This can be used in homes, shops, offices, workshops and museums.
- This can be used as an automatic door bell circuit that rings the bell when human is detected.
- This can be applied todefense applications to detect the humans in war field.
- Further, this can be used in toy applications.

8.CONCLUSION

For the PIR based alarm system, the schematic has been designed, PCB drawing is created and the gerber files are generated. All the components are provided with their respective datasheets and adhere to all specifications of the drawing.

9.FUTURE SCOPE

In this PIR Sensor based alarm system, we have used low power, low cost PIR sensor that is easy to interface with other components. By using this system we can minimise power consumption and memory space of the system. Considering the above points, the future work is to improve the system by increasing range and sensitvity of the sensor.

10. Table of Figures