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ABSTRACT

Laser based Security System is a type of security and alarm system that uses laser light and a light sensor. A security system protects our homes, offices, banks, lockers etc. from intrusion and unauthorised access. There are different types of security systems available and laser based security system is an important and efficient type.

A Laser security system can act as a standalone system, which makes some sound or noise when it detects any irregular activity, or can be part of a much bigger security and home automation system, which can send messages, call the owner etc.

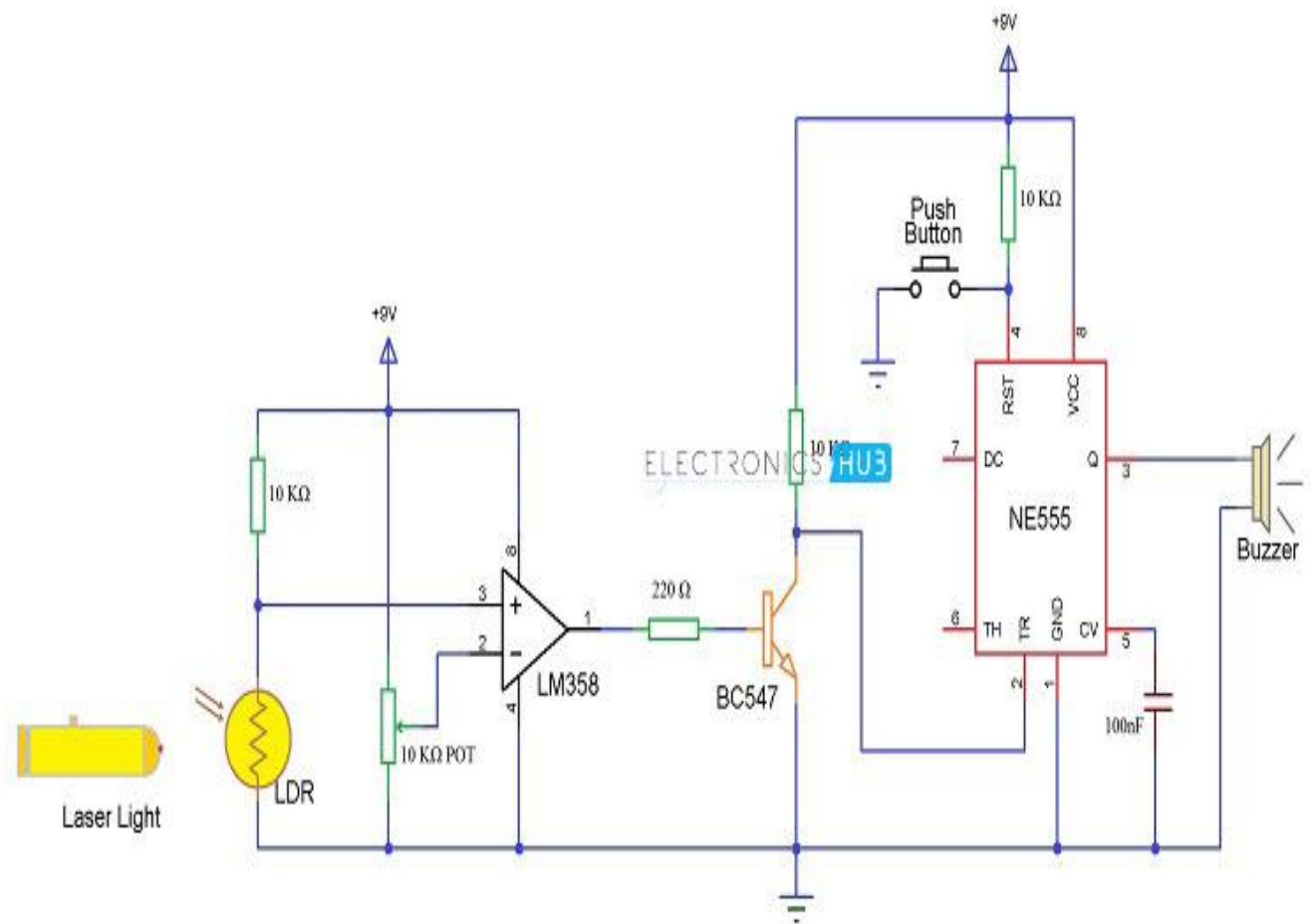
In this project, we have designed a simple DIY laser based security system, which acts as a tripwire like security system and triggers an alarm when the laser is interrupted.

PROJECT DESCRIPTION

COMPONENTS USED

- LM358 (Op – Amp IC)
- NE555 (Timer IC)
- LDR
- 3 x 10 K Ω Resistors (1/4 Watt)
- 220 Ω Resistors (1/4 Watt)
- 10 K Ω Potentiometer
- BC547 (NPN Transistor)
- Small Buzzer
- 100 nF Capacitor (Ceramic Disc Type Capacitor – Code 104)
- Push Button
- Laser Pointer
- 9V Battery
- Connecting Wires
- Breadboard (Prototyping board)

CIRCUIT DIAGRAM



Component Description

Laser Pointer

Laser Pointer acts as the main source of light in this project. We have used a small laser pointer with an output power of less than 1mW. The laser pointer emits red light and the wavelength of the laser output is between 630 nm to 680 nm.

LDR (Light Dependent Resistor)

The LDR acts as a light sensor in this project. As the intensity of the light falling on the LDR increases, the resistance of the LDR decreases and vice – versa. The LDR is used in combination with the laser to form the light sensor and source.

NE555 (IC 555)

IC 555 is a precision timing IC that provides time delays or oscillations. 555 Timer IC has three modes of operation: Astable, Monostable and Bi-stable. In this project, we are going to use the IC 555 in Bi-stable mode.

LM358 (OP – Amp)

LM358 is a dual Operational Amplifier IC and it is capable of operating in all the conventional operational amplifier circuits. In this project, the LM358 is used as a Comparator.

EXPERIMENTAL SETUP

The design of the laser security system circuit is very simple. We will see the design of the circuit in this section and in the working explanation we will see the working of the individual component.

Coming to the design of the circuit, first, the LDR and a 10 K Ω resistor are connected in a voltage divider fashion and its output (common point) is connected to the pin 3 (non – inverting) of the Op- Amp IC LM358.

For the inverting terminal (pin 2), connect the wiper of a 10 K Ω potentiometer (other two terminal of the POT are connected to VCC and GND).

The output of the Op – Amp (Pin 1) is connected to the base of the transistor (BC547) through a resistor.

The trigger pin of 555 (Pin 2) is pulled high using a 10 K Ω resistor.

The reset pin (pin 4) of the 555 is connected to VCC through a 10 K Ω resistor and a push button is connected between Pin 4 of 555 and GND. A bypass capacitor of 100 nF is connected between pins 5 and GND. A buzzer is connected to pin 3 of 555 IC.

Working of the Project

A simple, cheap and effective laser based security system is developed in this project. Let us see the working of this project.

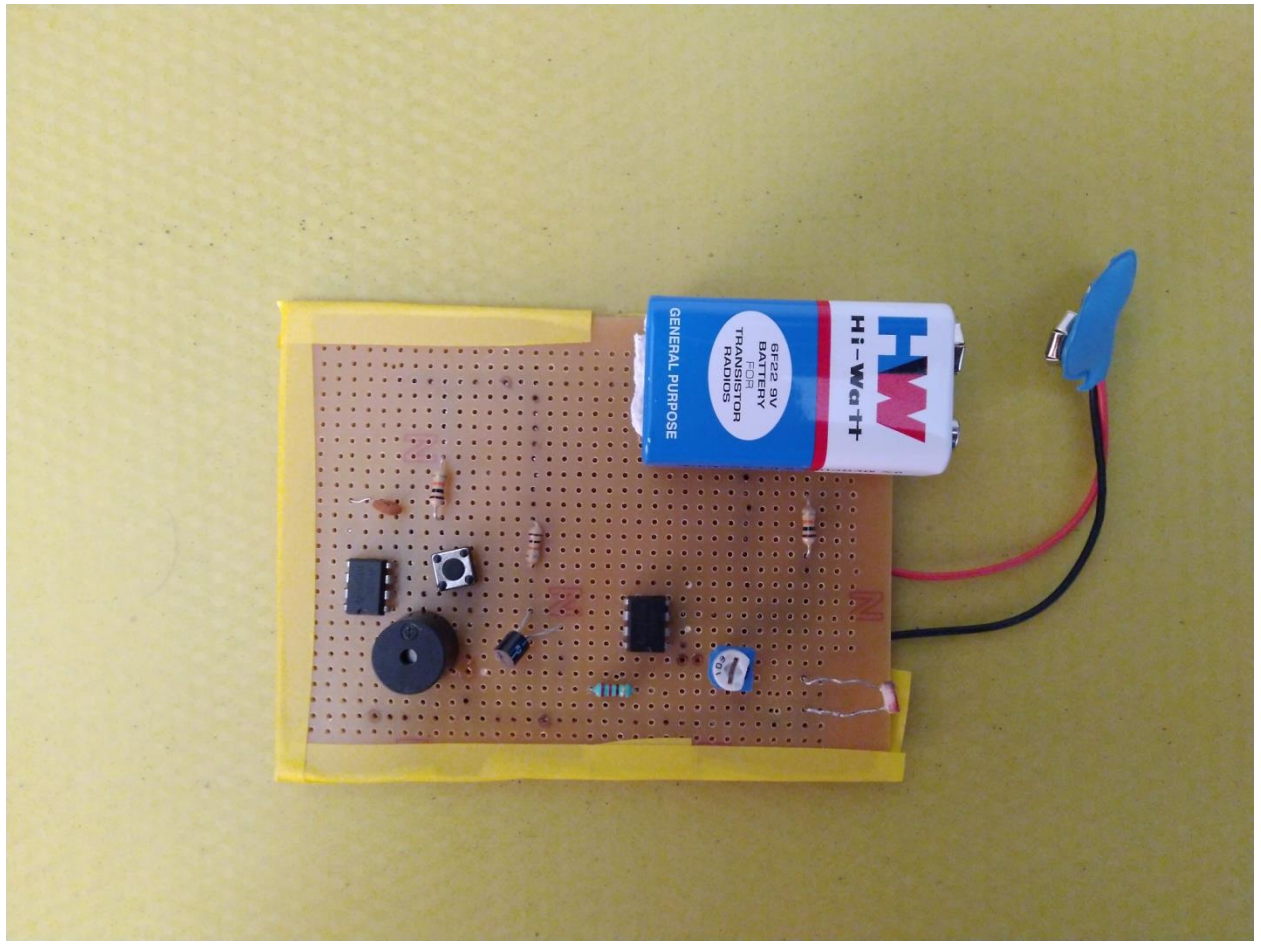
First, the Op – Amp circuit acts as a comparator i.e. it compares the voltages at the inverting and non – inverting terminals and produces an output accordingly.

The LDR – 10 K Ω resistor Voltage divider is connected to the non – inverting terminal of Op –Amp and a POT is connected to the inverting terminal.

Assume, the laser pointer is placed directly in line of sight to the LDR and the light from the laser is continuously being incident on LDR.

In this situation, the resistance of LDR falls down to few Ohms (or tens of Ohms) and as a result, the voltage at the non – inverting terminal will be less than that at the inverting voltage. The output of the Op –Amp is low and the transistor is OFF.

OUTPUT IMAGES



Advantages

- The circuit, construction and setup for the Laser Security System is very simple.
- If used with a battery, the laser security system can work even when there is a power outage.

Disadvantages

- The laser security system works only if the laser is obstructed. If the intruder passes without obstructing the laser, it is considered as a failure.
- In order to secure a larger area, we need more lasers and corresponding sensors.

Applications

- Laser Security System can be used in safety lockers in our homes, where even if the locker's code is hacked, it acts as an additional layer of security.
- Apart from security systems, this laser based setup can also be used to check if pets or babies crossed a certain boundary.
- Can be used by army on L.O.C for defence purpose and safety of are country .

REFERENCE

- **Wikipedia.com**
- www.electronicshub.org
- www.modulight.com