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Laser Security System

Electrical Project

Under the Guidance of

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Objective

To demonstrate a laser based security system that uses a light dependant resistor(LDR) to detect an intruder and a nodemcu to notify the user (via our web app) when there is a security threat. This setup plays a crucial role in protection of information and stock sensitive building blocks like banks, offices,etc.

Apparatus

S.No	Components	Quantity	Specification
1	Project Wire	5m	
2	nodeMCU	1	ESP8266 Chip
3	Laser Module	1	
4	Resistor	2	
5	Transistor	1	2N2222
6	Buzzer	1	
7	LDR	1	
8	USB wire and powerbank	1	
9	Thermocol sheet	1	
10	Solder		
11	PCB board		

Theory

- LDR : A photoresistor (or light-dependent resistor, LDR, or photo-conductive cell) is a light-controlled variable resistor. The most common type of LDR has a resistance that falls with an increase in the light intensity falling upon the device. When the light level decreases, the resistance of the LDR increases.

- NPN Transistor: The transistor in which one p-type material is placed between two n-type materials is known as NPN transistor. The NPN transistor amplifies the weak signal enter into the base and produces strong amplify signals at the collector end. In NPN transistor, the direction of movement of an electron is from the emitter to collector region due to which the current constitutes in the transistor. In this case, we're using a weak current signal to switch on a high current and high voltage buzzer.

- Resistor : A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses.

- LED

- Buzzer

Circuit Overview
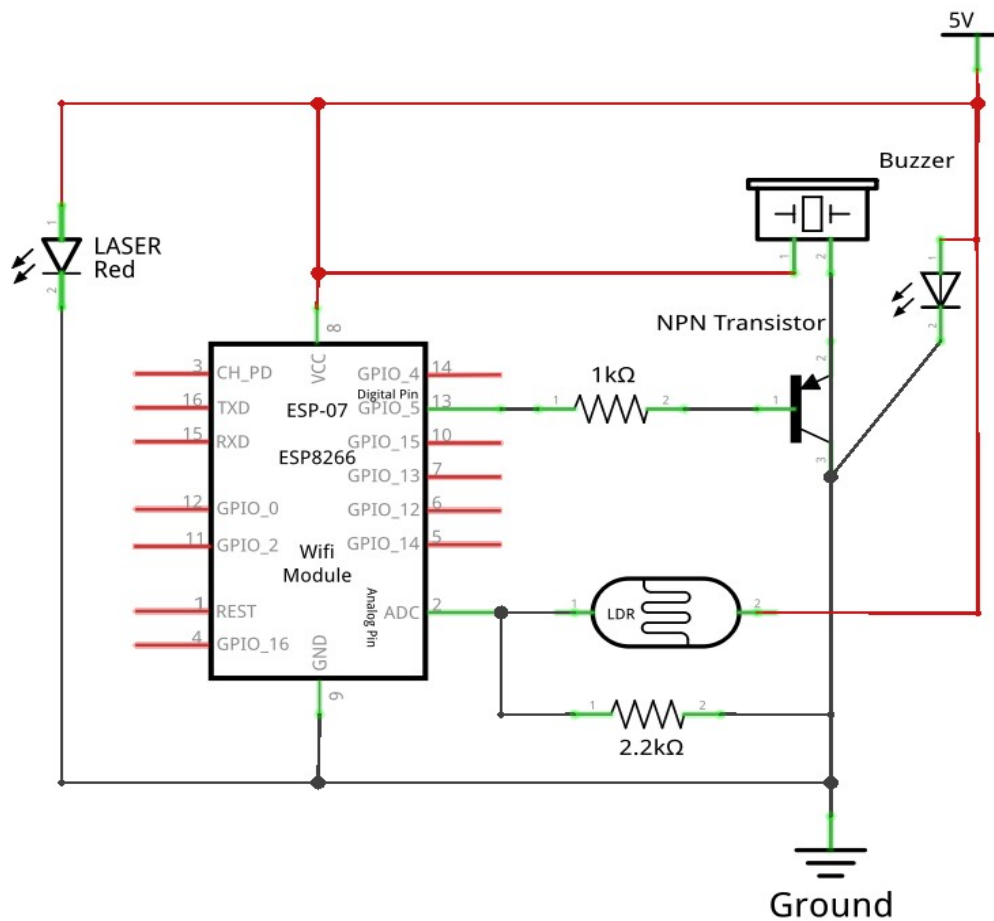
We have used a small computer/ IOT platform, called a nodeMCU to link various parts of our circuit.

The nodeMCU allows us to interface with electrical components through the use of pins.

- The analogue pins have an analogue to digital convertor built into them. They sense voltage between 0 and 3V and map it into 1024 parts which can be accessed by the nodeMCU.

- The digital pins are switches which have ON and OFF states and can be controlled by the computer.

- VV pins allow us to directly access the full voltage provided by the USB ie 5 Volts.

- 3V pins - 3 Volts.

- Ground pins.

The entire circuit is divided into two parts, which are in turn connected to the nodemcu.

The LDR is connected an analouge pin on one side and to a (pull down) resistor which then goes to the ground on the other side.

We have an NPN transistor on the other side.

- Base is connected to a digital pin with a resistor to prevent back current in between.

- Emitter is connected to the ground.

- Collector is connected to the buzzer and led, which are connected to an always on 5V pin on the other side.

Finally, the laser module is connected to an always on 3V pin.

Working

When the system is switched on, the laser pointing at the LDR sends a signal of >700 to the computer.

However, when the laser is blocked by external factors, the LDR can only sense light from other sources like tubelights, which send a signal of 300 max.

In this case, we have programmed our computer to do two things.

- Send a notification to our web app present at *http://electricalproject.abifog.com/*

- Turn on the digital pin which sends a tiny current to the transistor's base. This causes the led and buzzer to go off.

Thus, the user can be alerted if someone tries to bypass our laser security system.

ADVANTAGES

- The battery used in infrared devices last for long duration due to low power consumption.
- The sensor does not require any contact with the product to be sensed. The infrared devices are more appropriate for targets which are close than 10 mm.
- Infrared motion sensors detect motion in daytime and nighttime reliably.
- Infrared devices can measure distance to soft objects which may not be easily detected by ultrasound.
- Some alarm systems serve a single purpose of burglary protection; combination systems provide both fire and intrusion protection.
- Infra-red devices are smaller in size and more affordable.
- No corrosion or oxidation can affect the accuracy of infrared sensor.

DISADVANTAGES

- Infrared frequencies are affected by hard objects (e.g. walls, doors), smoke, dust, fog, sunlight, etc. Hence it does not work through walls or doors.
- Infrared waves at high power can damage eyes.
- It supports shorter range and hence it performance degrades with longer distances.

APPLICATIONS

- Security alarms are used in residential, commercial, industrial, and military properties for protection against burglary (theft) or property damage, as well as personal protection against intruders.
- Car alarms likewise help protect vehicles and their contents.
- Due to the nodeMCU and online application, it will alert the user even if they are not in the vicinity of the alarm system.
- Prisons also use security systems for control of inmates.
- Intrusion alarm systems may also be combined with closed-circuit television surveillance (CCTV) systems to automatically record the activities of intruders, and may interface to access control systems for electrically locked doors.