Laser Security Alarm System Using Arduino

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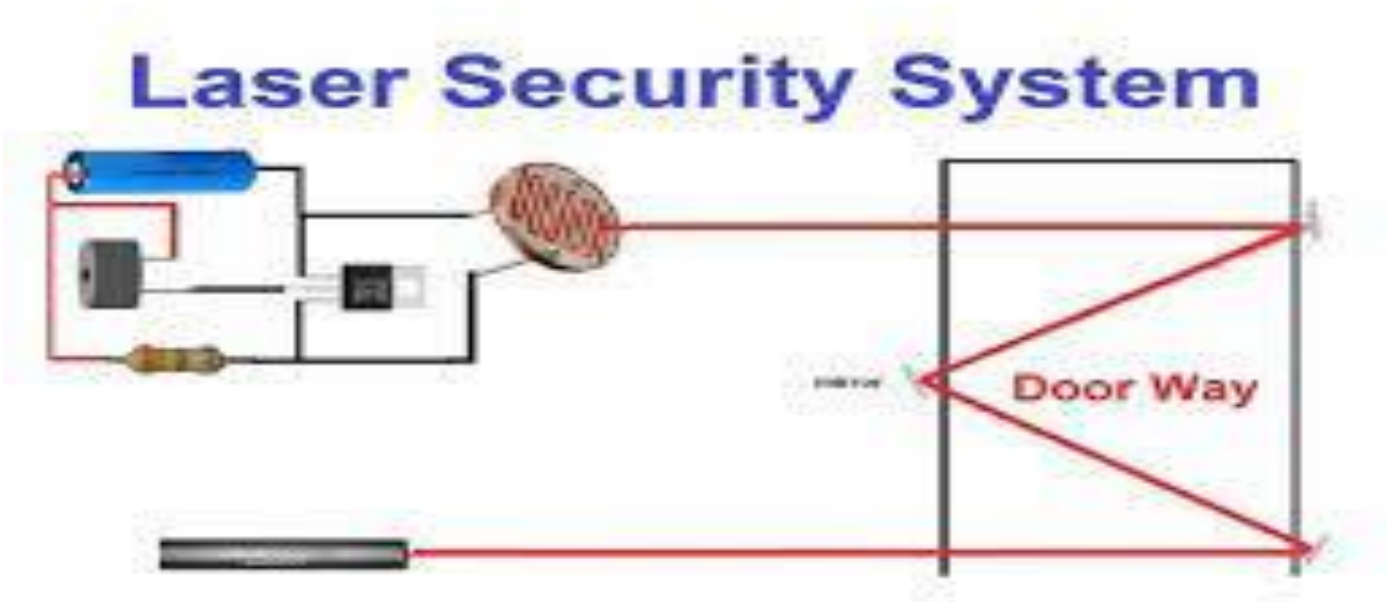

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Design and Development of an Arduino-Based Laser Security System

Abstract:

A study was done to help people secure their houses due to an increase in crime involving the design and execution of an Arduino-based security system employing laser light. When the switch is pressed, this laser security system starts working. The buzzer will then automatically sound if anything or anyone entered the space between the laser light and the light-dependent resistor. The test results indicate that the prototype is 80% successful. The capabilities of the laser, light-dependent resistor, and Arduino as the microcontroller were discovered and used by the researchers. The researchers draw the conclusion that the study was successful as a result.

Keywords: Arduino, microcontroller, light-dependent resistor, prototype, security, LDR, laser security

Introduction:

Having a sense of security is crucial in daily life.The fundamental need of every person is security.For a peaceful life, it is essential that we feel secure and that everything is okay. However, in this dangerous world where crime, terror, and threats are at their highest, how can one cultivate a sense of security? We have a solution in the form of laser security systems, and more and more people are installing them as a result in order to feel safe and secure. A laser security alarm is a tool used for safety. It has numerous applications in the security and defense sectors, ranging from the protection of low-value household items to very high-value assets of an organization. They were once very expensive options for security requirements. This type of security system is becoming more accessible due to cost-cutting measures and rapid technological advancements.

In this project, we used the Laser Diode Module KY-008 to design a Laser Light Security System using Arduino with Alarm. The idea behind the project is to build a security system. The buzzer alarm will begin to ring whenever any object blocks the LASER ray. This project can be implemented anywhere; in addition to buildings or other structures, it can also be used to secure other valuable items like jewelry, diamonds, priceless antiques in museums, etc. With the help of a LASER beam security system, many people secure their homes, offices, shops, warehouses, and other structures.

Objective:

This project's main goal is to create and put into use an Arduino-based laser-light security system, determine the functions of an Arduino, laser, and light dependent resistor; Use the functions of the laser, light dependent resistor, and Arduino; and Create a program that will sound the alarm when something blocks the laser's path.

Scope of Project:

The following scopes are included in the laser-based security system powered by Arduino:

- This project has the capacity to alert people in the area.
- This project is not reliant on the local area's primary power source.
- By human vision , the laser light is hardly perceptible.

Other Significations of Laser Security System:

An additional layer of security through a specific area can be provided by an Arduino-based security system that uses laser light. This project can be used for other purposes besides security, such as safety. For instance, some machines will stop working if a hand or other body part is placed in its path because the laser light will be blocked. This project can assist other researchers in innovating, growing, and enhancing their current projects.

Components Required & their Cost:

i.	Arduino UNO Board	1500
ii.	LASER Diode Module KY-008	200
iii.	Buzzer	50
iv.	LDR	200
v.	Resistors (10k)	5
vi.	Push Button Switch	200
vii.	Bread Board	100
viii.	Jumper Wires	40
ix.	Laptop	

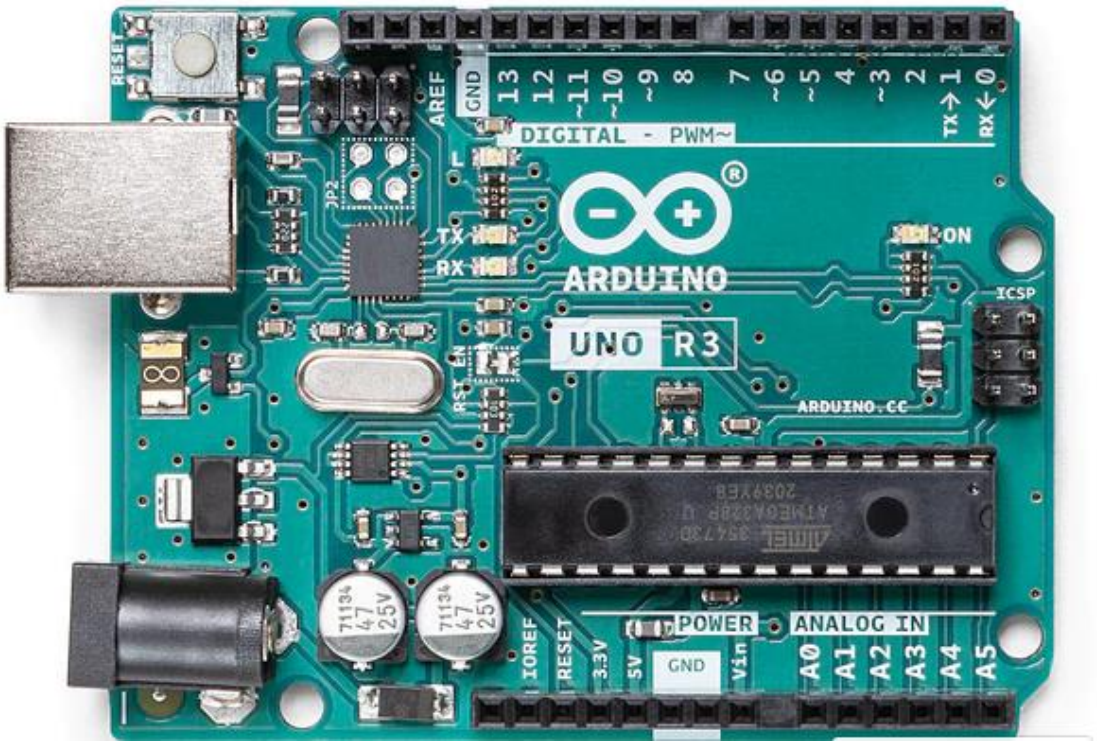
Arduino UNO Board

An open-source microcontroller board called Arduino Uno is built around the ATmega328P processor. Inputs include 6 analog inputs, 14 digital I/O pins, a USB port, a power jack, an ICSP header, and a reset button. All the modules required to support the microcontroller are present in it. Simply use a USB cable to connect it to a computer or an adapter to supply power to get it going. With your Arduino, you can experiment without too much concern. If the worst happened, you could always buy a new one because the Uno is so inexpensive in comparison to other boards like the Raspberry Pi, STM, etc.

The hardware structure of Arduino consists of:

i. Microcintroller
ii. 14 Digital pins
iii. 6 Analog pins
iv. Power Supply
v. USB Port
vi. Reset Button

Microcontroller is the CPU(Central Processing Unit) of Arduino UNO.
14 digital Pins can be connected to devices like computers, LED and LCDs etc.
6 Analog Pins are used to connect sensors as these are mostly analog. Most of the inputs are connected there.
Power Supply pins are IOREF, GND, 3.3V, 5V, Vin. Most of inputs are generally linked at these pins.
Power Jack is used to power the arduino UNO.
USB Port is generaaly used for programming. Programming can be done via USB cable or Arduino IDE.
Reset Button is used to restart the uploaded program.



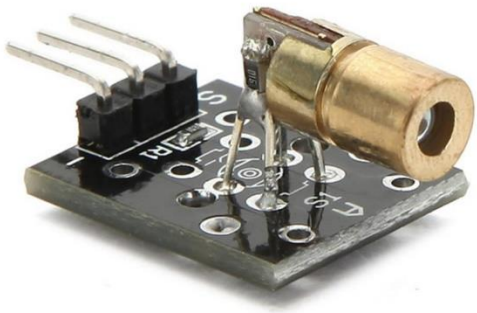
An Arduino UNO

Laser Diode Medule:

A laser diode module is a device that uses a semiconductor laser diode to produce laser light. Typically, it consists of a housing, a lens, and a laser diode chip. Through the process of stimulated emission, in which electrons are excited to a higher energy level and then emit photons as they return to a lower energy level, the laser diode chip produces light. The lens in a laser diode module collimates or concentrates the laser beam into a parallel beam. The housing supports the diode mechanically and shields it from harm from the outside world. Numerous industries, such as telecommunications, barcode scanning, laser pointers, and medical equipment, use laser diode modules. They are smaller, use less energy, and are more efficient than other kinds of lasers, among other benefits. To prevent harm to the laser diode chip, they must be handled carefully as they can be temperature-sensitive.

The specification of Laser Transmitter Module KY-008 is as follows:

- Operating Voltage – $5V$
- Output Power – $5mW$
- Wavelength – $650nm$
- Operating Current – less than $40mA$
- Working Temperature – $-10°C \sim 40°C$ $[14°F\ to\ 104°F]$
- Dimensions – $18.5mm\ x\ 15mm$ $[0.728in\ x\ 0.591in]$



Laser Diode Module

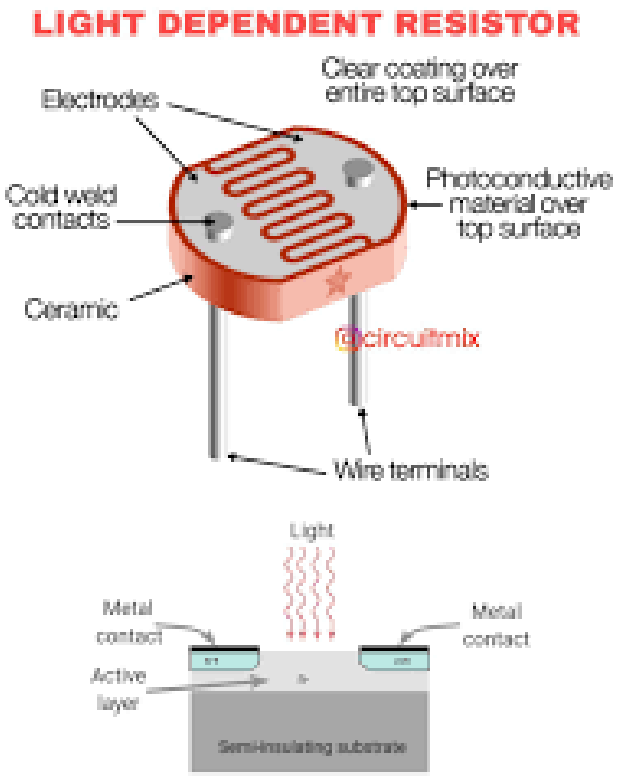
LDR:

An electronic component known as an LDR, or light dependent resistor, alters its resistance in response to the amount of light that strikes its surface. LDRs are also referred to as photocells or photoresistors. LDRs are frequently used in circuits that need to be able to detect light. For instance, by measuring the amount of light entering a room, they can be used to determine when a room is occupied and adjust the display's brightness accordingly.

As more light is shone upon an LDR, the resistance of the device decreases. This indicates that the LDR has a low resistance when ambient light levels are high and a high resistance when ambient light levels are low. The voltage divider circuit can be used to measure this change in resistance, making the LDR useful for a variety of electronic tasks.

It's important to keep in mind that LDRs are not very precise and that their sensitivity to light varies widely. They may also be impacted by elements like temperature and aging. They are a common option for DIY projects and other uses where accuracy is not essential because they are inexpensive and simple to use.

The resistance of an LDR may typically have the following resistances: Daylight = 5000Ω, Dark= 20000000Ω

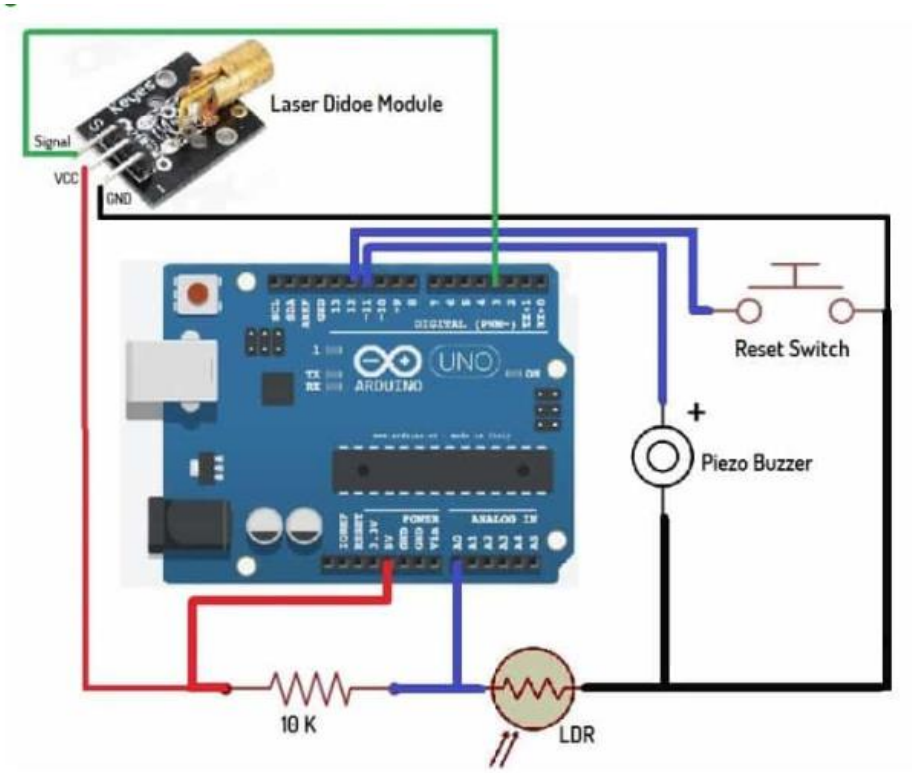


Buzzer:

You can use this buzzer by simply providing it with a DC power supply that ranges from 4V to 9V.Simple 9V batteries can also be used, but a regulated +5V or +6V DC supply is advised. The buzzer is typically connected to a switching circuit that allows it to be turned ON or OFF at specific times and intervals. You can use this buzzer by simply providing it with a DC power supply that ranges from 4V to 9V. A simple 9V battery can also be used, but a regulated +5V or +6V DC supply is advised. The buzzer is typically connected to a switching circuit to turn it ON or OFF at the appropriate time and interval.

The Buzzer

Circuit Diagram:



Circuit for laser Security Alarm

Methodology:

It is a straightforward prototype that guarantees the home's proper safety and security. A spy camera, a laser emitter module, a receiver LDR module, a loud piezo buzzer, a few connecting wires, an ESP WIFI module for internet access, and finally a DC adapter for power source make up the prototype.

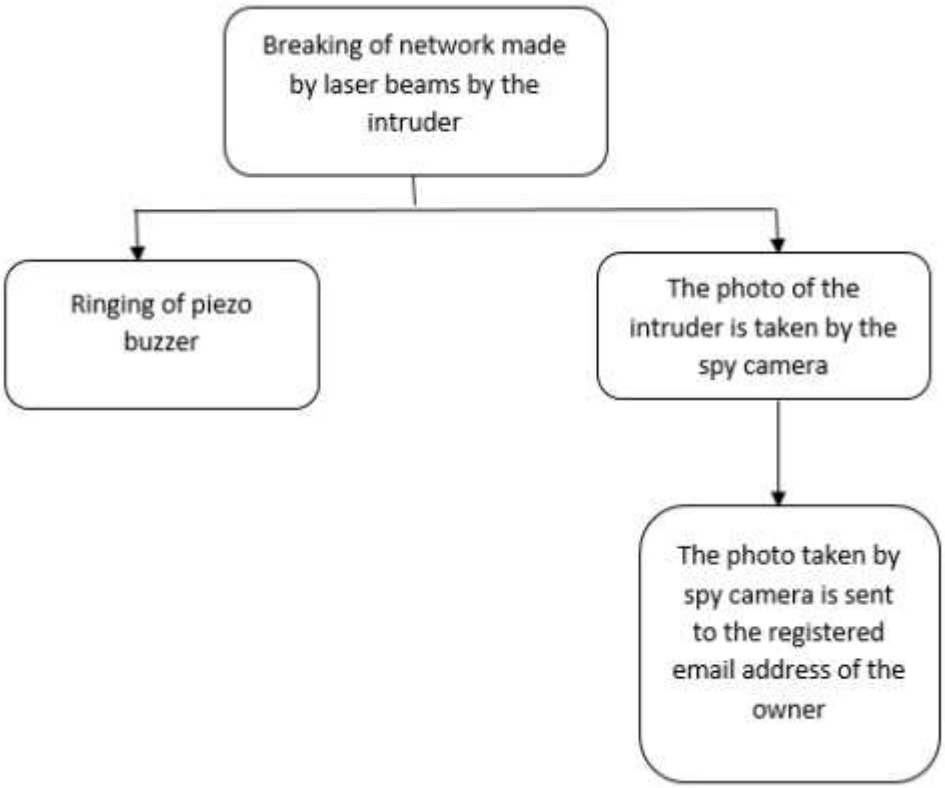


Figure.1. Schematic diagram of the proposed algorithm

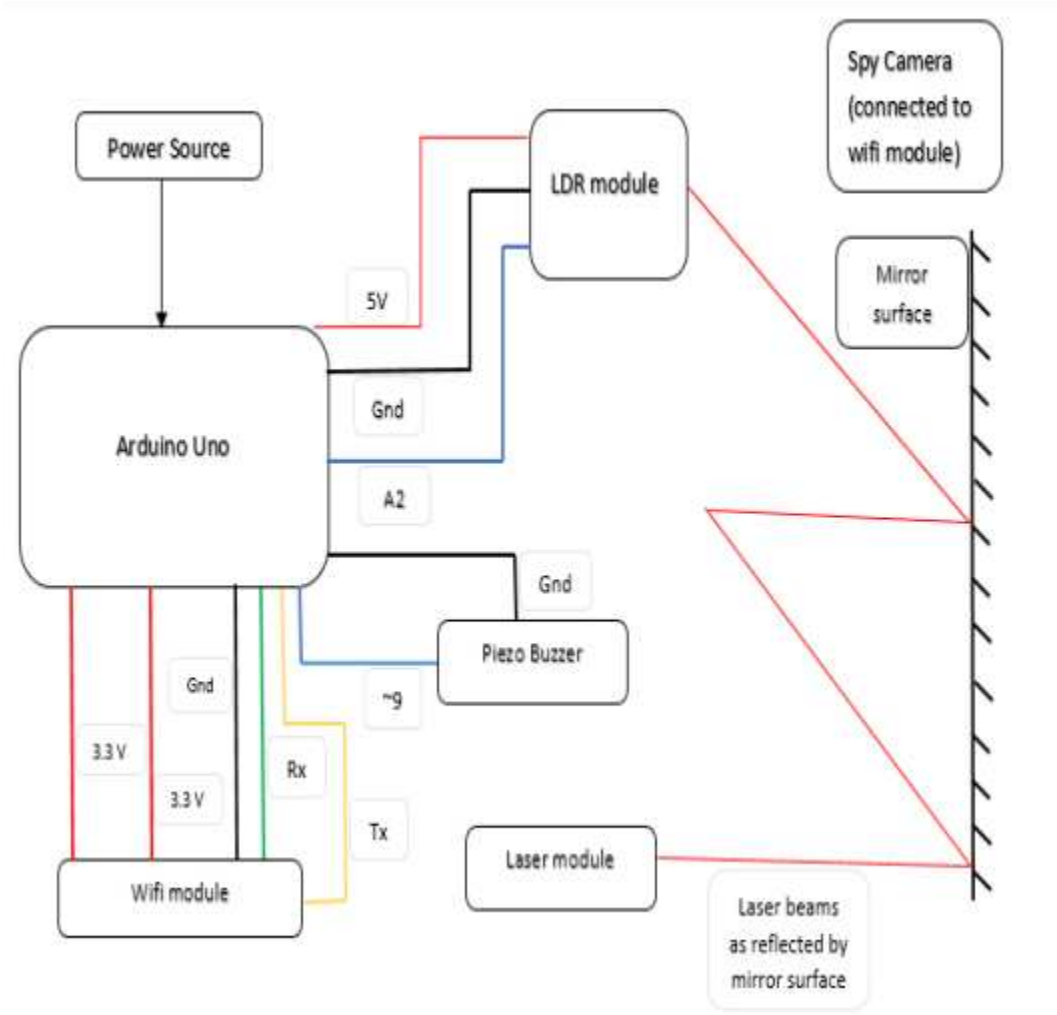


Figure.2. Hardware configuration of laser system

Simply the emitter emits the laser line and the LDR receives the bright striking laser light.

Source Code/Program:

```
int laserPin = 3;

int sensorPin = A0;
int buttonPin = 12;
int buzzerPin = 11;

int laserThreshold = 10;

void setup() {
pinMode(laserPin, OUTPUT);
pinMode(buttonPin, INPUT_PULLUP);
```

```
Serial.begin(9600);
}

boolean alarmState = false;

void loop() {
if (! alarmState) {
delay(1000);
digitalWrite(laserPin, HIGH);
delay(10);
unsigned long startTime = millis();
while (millis() – startTime < 1000) {
int sensorValue = analogRead(sensorPin);
Serial.println(sensorValue);
if (sensorValue > laserThreshold) {
alarmState = true;
break;
}
delay(10);
}
digitalWrite(laserPin, LOW);
} else {
tone(buzzerPin, 440);
if (! digitalRead(buttonPin)) {
alarmState = false;
noTone(buzzerPin);
}
delay(10);
}
}
```

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