ABSTRACT

Technology develops day by day within the world. Nowadays the crime gang also improves their technology to hold out their operation. So, technology of security should be modern with time to shield the planet from crime. We arrange to make a security issue as our project. During this project, we've got to use a laser ray to hide an outsized area. We all know laser light goes too long distances without scattering effects. Its additional laser beam is just at the source and destination point, in any case invisible. These two properties help us to develop a contemporary security system, which may name as the "Laser Tripwire Security System using Arduino UNO." When somebody or object crossover the laser light, automatically the buzzer starts ringing. The laser ray goes through a long-distance without scattering effect and the ray is almost invisible.

This project deals with a model of laser security alarm system design. Laser security systems used to be difficult to install and rarely available to anyone other than the super-rich. Now, there are dozens of different security systems on the market that utilize lasers and can effectively protect everything from small apartments and businesses to large areas of property. Most home laser security systems consist of two parts: a basic alarm unit and an infrared motion detector. Laser based security system is a type of security and alarm system that uses laser light and a light sensor. Laser is known that a laser light goes through long distance without any scattering effect (disturbing) and it is only visible at source and the destination point so it can be used as mediator between source and destination but to analyse the source a sensor is need, here the use of LDR is applicable. Just analysis is not enough alerting should be done in general alerting is sound effect so here buzzer act as alerting. Making use of this, a laser security system is designed. Its working: There is a laser diode that generates the laser beam which continuously strikes over the Light dependent resister sensors. When any person crosses the path, it inhibits laser to reach LDR and the sensor generate a low which is read by controller to power on the buzzer.

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INTRODUCTION

The term Internet of Things (IoT) was arguably in an online article by Kevin Ashton in 1999, referring first coined to uniquely identifiable objects that are organized in an Internet like structure. Objects in IoT can sense the environment, transfer the data, and communicate with each other. The INTERNET OF THINGS (IoT) has been envisioned as one of the most promising networking paradigms that bridge the gap between the cyber and physical world. The prevalence of IoT leads toward a new digital context for configuring novel applications and services. IoT consists of a variety of things or objects such as RFID tags, sensors, actuators, mobile phones, etc., which are interconnected through both wired and wireless networks to the Internet.

The Internet of things (IoT) can be defined as the inter-networking of physical devices, vehicles (also referred to as "connected devices" and "smart devices"), buildings, and other items embedded with electronics, software, sensors, actuators, and network connectivity which enable these objects to collect and exchange data.

1.1 Project Overview

Need of security is the basic necessity of any individual. The feeling that we are safe and everything around us is all right is imperative for a peaceful living. But in this unsafe world, when crime, terror and threats are on their peak, how can one attain that sense of security? Here, laser security system provides us with a solution and for this reason more and more people are installing them in order to stay safe and secure. Various electronic security systems can be used at home and other important working places for security and safety purposes.

Laser Security alarm is a device used for security purposes. It has a wide application in fields of security and defence starting from the security of simple house hold material to a very high valued material of an organization. They once used to be expensive solutions for security needs. Owing to cost cutting and fast technological advancements, this form of security system is becoming more affordable.

Lasers differ from other light sources in a few significant ways. There are two features that are important for security systems. Unlike a light bulb or flashlight, laser light doesn't spread out, it is

a narrow beam. And laser light is essentially a single colour. Because laser light doesn't spread much, it can be sent it a long way and still have enough energy in a small area to trigger the security system detector. Because it's a single wavelength, it can put a blocking filter on the detector to let laser light through without letting background light onto the detector.

Laser light travels in a straight line. For instance, to protect the front of the yard, putting the laser at one comer and the detector at the other corner would do the job. That's not a very practical configuration, though. More typically, if it is needed to protect the perimeter of a room, or at least the enhances. So, laser security systems start with a laser pointing to a small mirror. The first mirror is angled to direct the beam to a second small mirror, and so on until the final mirror directs the beam to the detector. If the beam is interrupted anywhere between the laser and the detector, the electronics will put the warning signal.

1.2 Existing System

The Existing System for a laser security system may involve traditional methods such as motion sensor, infrared sensors or physical barriers. These systems often lack precision and can be prone to false alarms or easy evasions.

1.3 Proposed System

In this proposed system there are several blocks like laser module , buzzer Alarm is connected to our controller. There are three main components to a laser security system: an LDR module, an Arduino, and a Laser diode module. The laser could be a source of light that puts out a straight line, pencil beam, of light of a single colour. The LDR is sensitive to light. The LDR is connected to the Arduino UNO. When the laser beam is interrupted and can’t reach the LDR, its voltage output changes, and the circuit senses the change and puts out a warning in the code and then the buzzer starts alert signals. The project basically works on the principle of Laser light Intensity. If by any means the laser light is interrupted the alarm will start unless it is reset with the password that we interpreted in the source code.

CHAPTER – 2

REQUIREMENT SPECIFICATION

2.1 Hardware and Software Requirements

Table. 2.1: Hardware requirements

Sl.no.	Components
1	Arduino Uno
2	Laser Module
3	Laser Sensors
4	Sound Buzzer
5	Breadboard
6	Led Lights
7	Jumper Wires
8	USB cable

Table. 2.2: Software requirements

Sl.no.	Software
1	Arduino ide

2.2 Hardware Requirements

ARDUINO UNO

Arduino is an open-source prototyping platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IoT applications, wearable, 3D printing, and embedded environments. All Arduino boards are completely open-source, empowering users to build them independently and eventually adapt them to their particular needs. The software, too, is open-source, and it is growing through the contributions of users worldwide.

Specification:

Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limit)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328P) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz
Length	68.6 mm
Width	53.4 mm
Weight	25 g

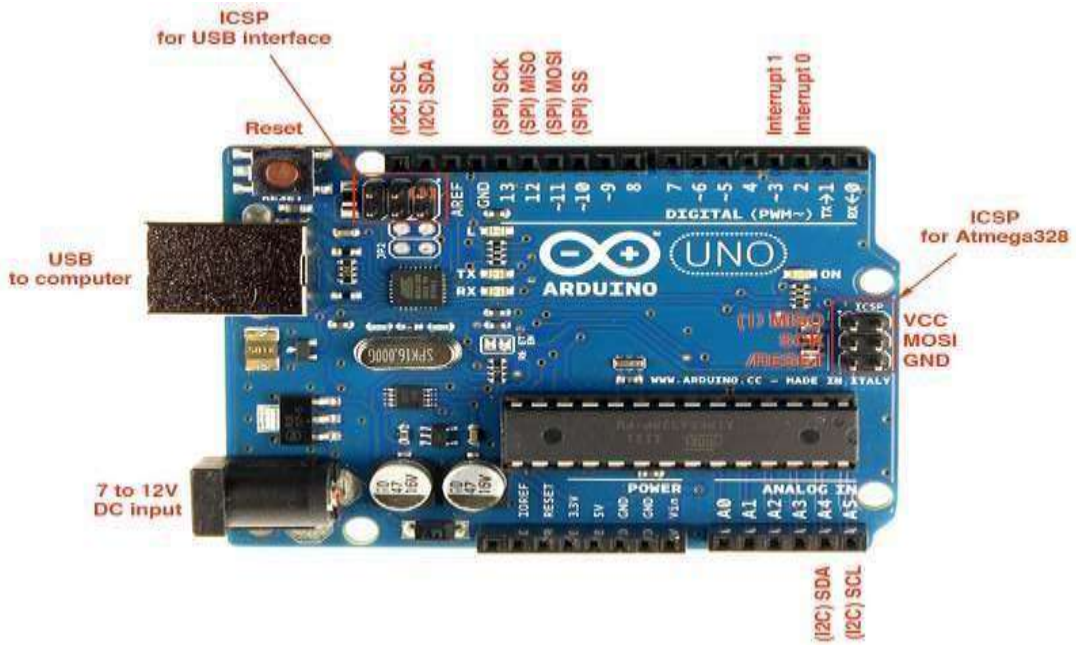

Figure. 2.1: Arduino board

Breadboard

Figure. 2.2: Breadboard

A breadboard is a solderless device for temporary prototype with electronics and test circuit designs. Most electronic components in electronic circuits can be interconnected by inserting their leads or terminals into the holes and then making connections through wires where appropriate.

The breadboard has strips of metal underneath the board and connect the holes on the top of the board.

Laser Sensor

Figure. 2.3: Laser Sensor

"Laser sensors" typically refer to sensors that utilize lasers in their operation for various measurement, detection, or monitoring purposes. These sensors rely on laser technology to perform their intended functions with precision and accuracy.

Laser Module

A laser module is a compact device that typically consists of a laser diode, optics, and sometimes additional components such as drivers or cooling systems. Its primary function is to emit a laser beam with specific characteristics such as wavelength, power, and beam divergence. Laser modules come in various shapes and sizes, ranging from small, handheld pointers to larger, more powerful modules used in industrial or scientific applications.

Figure. 2.4: Laser Module

Sound Buzzer

Figure. 2.5: Sound Buzzer

A sound buzzer, also known simply as a buzzer or an alarm buzzer, is an electromechanical device used to produce audible signals or alerts. It typically consists of a housing, an electromechanical transducer (such as a piezoelectric element or electromagnetic coil), and a resonating membrane.

Jumper Wires

Figure. 2.6: Jumper wires

Jumper wires are simply wiring that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards and there are three types of jumper wires male to male, female to female, male to female.

2.3 Software Requirements

Arduino IDE

The **Arduino Integrated Development Environment (IDE)** is a cross-platform application that is written in functions from C and C++. It is used to write and upload programs to Arduino compatible boards.

CHAPTER-3

ANALYSIS AND DESIGN

3.1 Circuit Diagram:

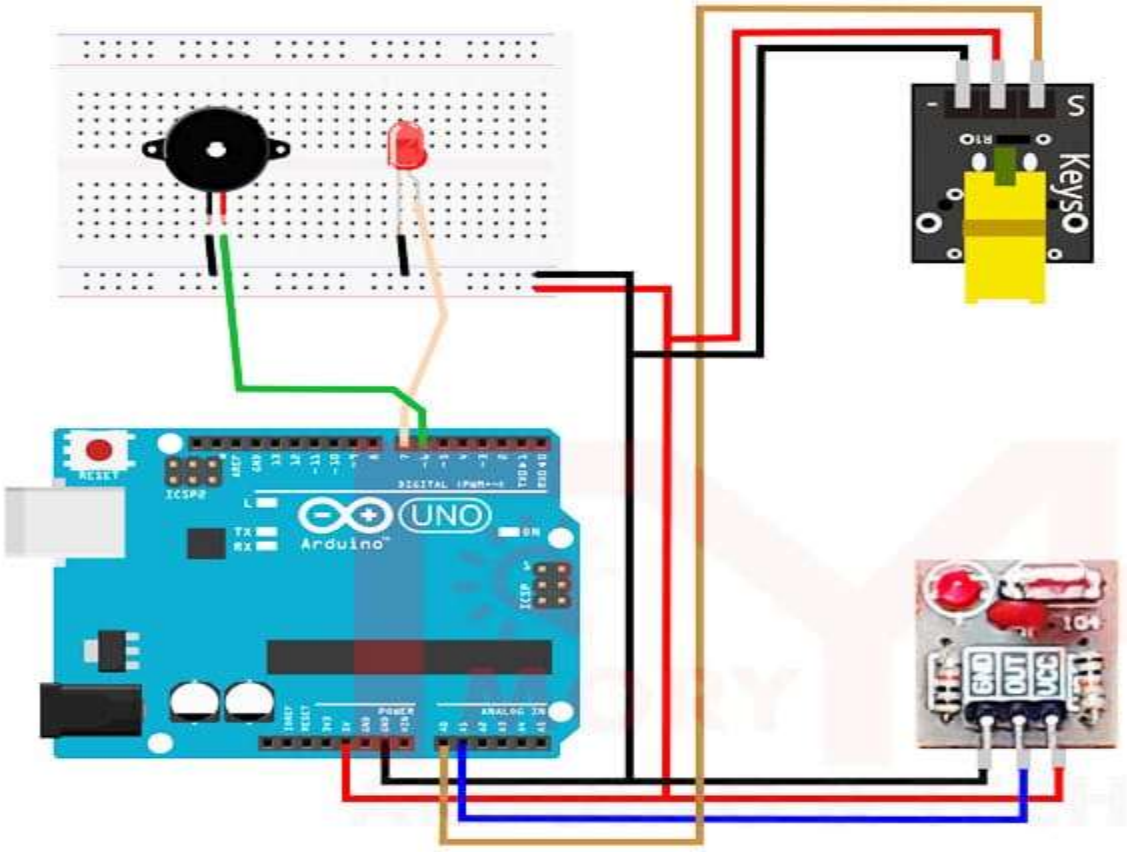

Figure. 3.1: Circuit diagram of Laser Tripwire Security system

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 too few 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.

If the laser light is blocked by an intruder from falling on the LDR (even for a small duration), the resistance of the LDR goes to few hundreds of Ohms and as a result, the output of the Op –Amp will be HIGH. This will turn on th Transistor. As the output of the transistor is connected to the Trigger Pin (Pin 2) of the 555 Timer IC, if the transistor is ON, the trigger pin gets a short low pulse and as a result, the output of the 555 becomes HIGH. This will activate the alarm by turning ON the buzzer.

CHAPTER – 4

IMPLEMENTATION

4.1 Source Code:

```
#define NOTE_F6  1397
#define NOTE_G4  392

int LED=13; //red led
int LED2 = 8; //green led

int alarmSpeaker = 7;
int Laser = 12;
int LaserSensor = 2;
int SensorReading = HIGH;


void setup()
 {
        pinMode(LED, OUTPUT);
        pinMode(LED2, OUTPUT);
        pinMode(Laser,OUTPUT);
        pinMode(alarmSpeaker, OUTPUT);
        pinMode(LaserSensor, INPUT);

 }


void alarmTone()
  {
        tone(7,  NOTE_F6, 400);
        delay(100);

 }

void alarm()
 {
        delay(300); //Time before alarm starts
        alarmTone();

 }
```

```
void loop()
{

        digitalWrite(Laser, HIGH);
        SensorReading = digitalRead(LaserSensor);

        if(SensorReading == LOW)
          {
              digitalWrite(LED,HIGH);
              digitalWrite(LED2,LOW);
              alarm();
           }
        else
          {
             digitalWrite(LED,LOW);
             digitalWrite(LED2,HIGH);
          }


}
```

4.2 Design of the System

The picture shows the miniature model of the Laser Tripwire Security system.

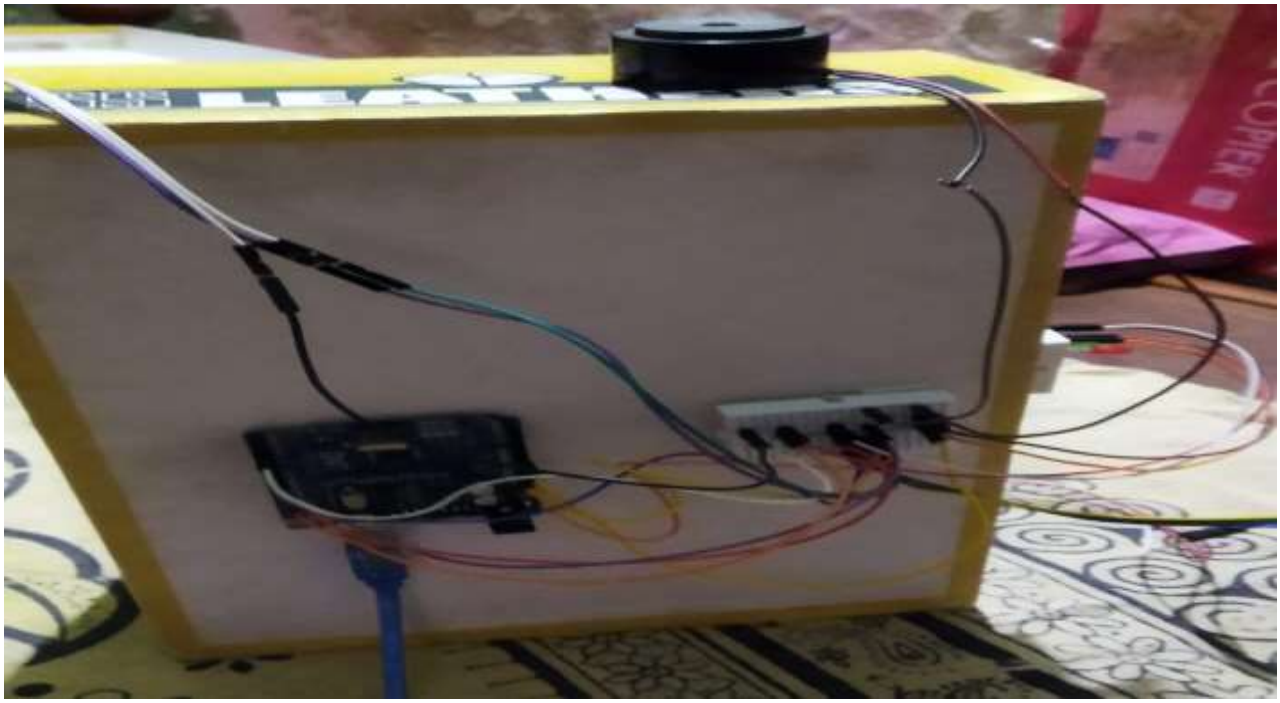

Figure 4.1 Experiment Back Design

Figure 4.1 Experiment Front Design

In a laser tripwire security system for an IoT project, a laser emitter and a receiver are positioned facing each other, creating a laser beam. When an object crosses the beam, it interrupts the connection between the emitter and receiver, causing a signal to be sent to a microcontroller or IoT device. This device processes the signal and triggers an action, such as sounding an alarm.

This module consists of the laser emitter, where we have attached the glass pieces to get the reflection of the laser light. At the end we have attached the Laser Receiver which receives the laser light stream. When there is no object disturbing the laser light. The green Light will be on, which represents that there is no object. Once any object is interrupted ,the red led is one and a sound buzzer is activated until and unless the object doesn’t interrupt the laser light.

CHAPTER – 5

TESTING

Test case 1: Initial setup

The below diagram shows the initial case of the system.

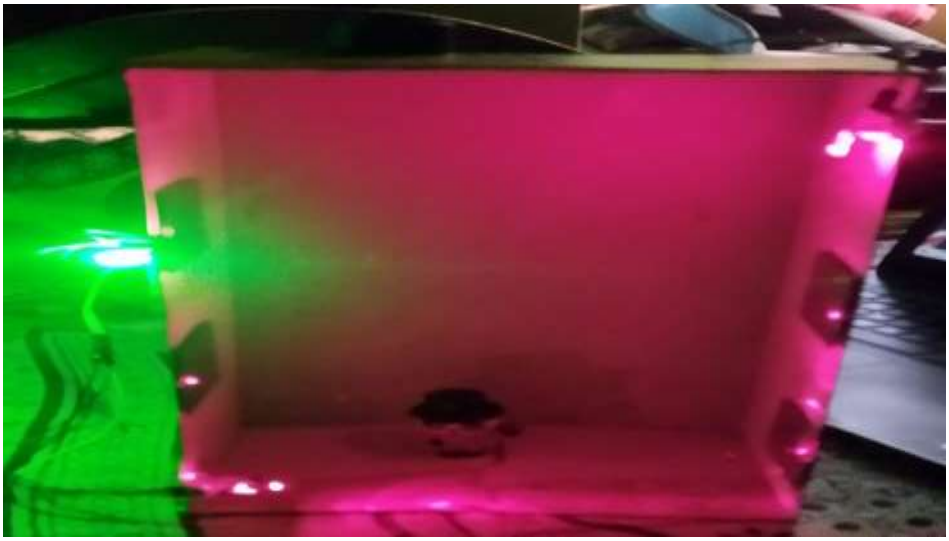

Figure 5.1: initial setup

Test case 2: Obstacle Detected.

The diagram below depicts the instance when the object disrupts the laser beam. A red LED light is activated, accompanied by a sounding buzzer, which persists until the object ceases to interrupt the laser

Figure 5.2 : Obstacle Detected

Test case 3: No Obstacle Detected

The diagram below illustrates the scenario when the object does not obstruct the laser light. The LED light is green.

Figure.5.3: No Obstacle Detected

CHAPTER – 6

CONCLUSION

Laser security system provides us the security against any crime, theft in our day-to-day life and so people are installing them in order to stay safe, secure and sound. Various electronic security systems can be used at home and other important working places for security and safety purposes. It is a great opportunity and source of saving man power contributing no wastage of electricity. The "Laser Security System" is an important helping system. Using this system robbery, thefts & crime can be avoided to large extend. Avoiding thieves' results in the safety of our financial assets and thereby this system provides us protection against all.

The Laser & LDR system is highly sensitive with a great range of working. The system senses the light emitted by the Laser falling over the LDR connected with the circuit. Whenever the beam of light is interrupted by any means, it triggers the alarm or siren. This highly reactive approach has low computational requirement, therefore it is well suited to surveillance, industrial application and smart environments.

6.1 Future Enhancement

- Implement wireless communication capabilities (such as Wi-Fi or Bluetooth) to enable remote monitoring and control of the security system via a smartphone app or a web interface. This allows users to receive alerts, check the system status, and even arm/disarm the system remotely.
- Explore the use of machine learning algorithms to improve intruder detection accuracy and reduce false alarms. Train the system to distinguish between different types of disturbances and prioritize critical alerts.
- Expand the system to include multiple laser beams at different heights or angles to create a more complex security perimeter. This provides better coverage and makes it harder for intruders to bypass the system.

- Integrate the system with messaging services (such as SMS, email, or push notifications) to provide instant alerts to users when a breach is detected. Additionally, consider adding voice alerts or sirens for audible notifications.

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