



VIT-AP UNIVERSITY

LASER SECURITY SYSTEM BASED ON ARDUINO UNO

Engineering clinics
Project report submission

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Abstract

A laser security system is a type of alarm system that uses beams of light to detect intruders. The system consists of a laser source, a receiver and a controller. The laser source emits a beam of light that travels across the protected area and reaches the receiver. The receiver senses any changes in the intensity or frequency of the light and sends a signal to the controller. The controller then triggers an alarm or other actions if an intrusion is detected. Laser security systems are often used in high-security areas such as banks, museums or military bases because they are very accurate and difficult to bypass.

Laser security systems have some advantages and disadvantages over other security systems. Some of the advantages are:

- They are invisible or nearly invisible to the naked eye, making them hard to avoid or disable by intruders.
- They can cover large areas with fewer sensors and wires than other systems.
- They can be customized to fit different shapes and sizes of spaces.
- They can be integrated with other security devices, such as cameras, motion sensors, or sirens.

Some of the disadvantages are:

- They can be triggered by false alarms, such as animals, dust, or weather conditions that break the laser beam.
- They can be expensive and complex to install and maintain.
- They can pose a safety hazard if the laser beam is too powerful or if it is exposed to the eyes.

Laser security systems are real and can provide effective protection for various applications. However, they are not suitable for every situation and may require additional security measures to ensure optimal performance and safety.

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Introduction

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.

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 color. 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 corner 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.

The laser security system project is an innovative and cost-effective way to protect homes, businesses, and other properties from unauthorized access and intrusions. The system uses a laser beam to create a tripwire that, when interrupted, triggers an alarm and sends an SMS or makes a phone call to the user's mobile phone. This allows the user to respond quickly to potential security breaches and take appropriate action, whether that means calling the police or investigating the incident themselves.

The system is based on an Arduino board, a popular open-source microcontroller platform that can be programmed to perform a wide range of tasks. In this project, the Arduino is used to control the laser module, the buzzer, and the GSM module, which allows the system to communicate with the user's mobile phone.

Overall, the laser security system project is an excellent example of how modern technology can be used to solve real-world problems in an affordable and accessible way. By combining simple hardware components with powerful software tools, users can create customized security systems that meet their unique needs and provide reliable protection against intruders and other security threats.

Background

The project is a simple laser security system that uses an Arduino and a GSM module to detect intruders and notify the user via SMS and phone call. The system works by emitting a laser beam from a transmitter to a receiver. When an intruder crosses the laser beam, the receiver detects the interruption and triggers an alarm. The alarm sound is produced by a buzzer connected to the Arduino. In addition to the alarm, the system sends an SMS message to a predefined phone number using the SIM800L GSM module. The system can also make a phone call to the same phone number.

This project is a good example of how an Arduino and a GSM module can be used to build a simple security system. While the project is relatively basic, it provides a good starting point for those interested in building more advanced security systems using these components. The project can be customized by adjusting the sensitivity of the laser receiver and the duration of the alarm and phone call. Additionally, the system can be expanded by adding more sensors, such as motion detectors, to increase the level of security.

Problem definition

The main problem this project aims to address is the lack of affordable and effective security systems for homes and businesses. Traditional security systems can be expensive and require professional installation, making them inaccessible to many people. Additionally, they may not be flexible enough to adapt to the specific needs of different users.

The laser security system project provides an affordable and customizable solution to this problem. By using low-cost hardware components and open-source software, users can create a security system that meets their specific requirements and fits within their budget. The system can be easily installed and configured by the user, eliminating the need for professional installation.

Furthermore, the system can be used in a variety of settings, including homes, offices, warehouses, and outdoor areas. This flexibility makes it an ideal solution for anyone looking to protect their property from intruders and other security threats.

In addition to providing an affordable and customizable solution, the laser security system project also addresses some of the limitations of traditional security systems. For example, traditional systems may rely on motion detectors, which can be triggered by pets or other harmless movements. The laser security system, on the other hand, uses a laser tripwire to detect intruders. This method is less prone to false alarms and can be more reliable in detecting actual security threats.

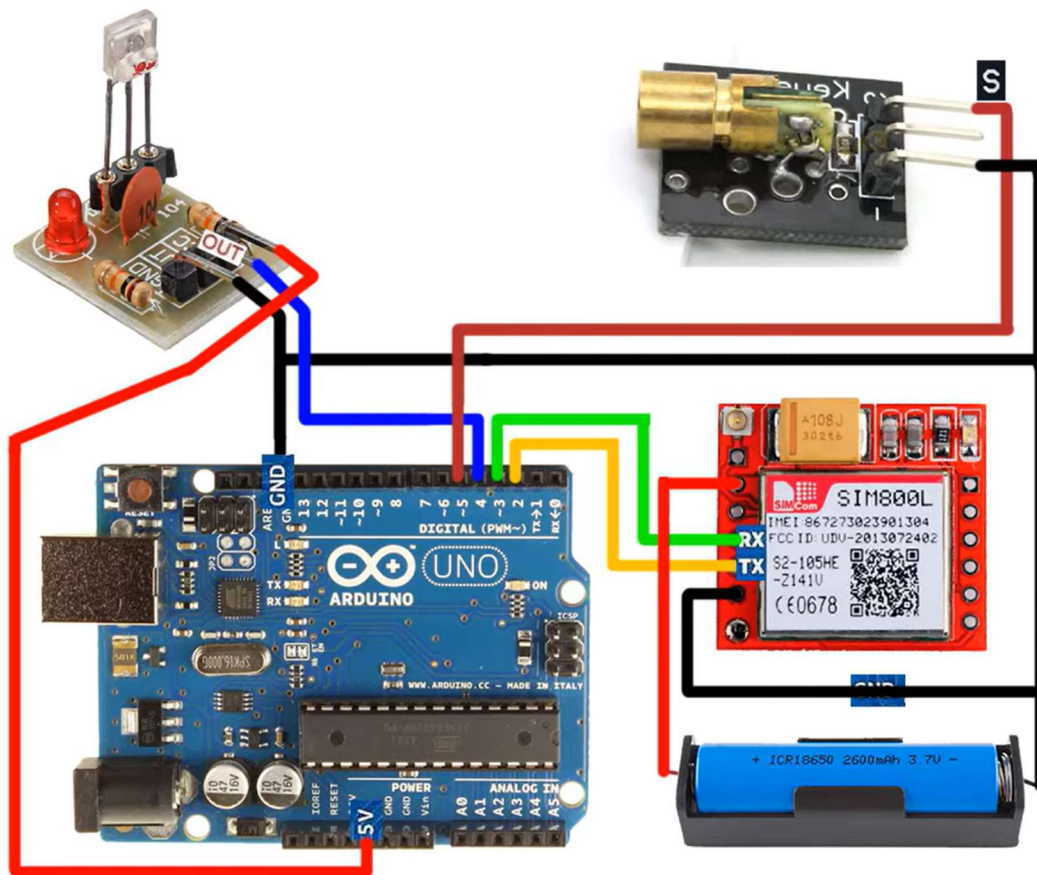
Moreover, the system can be enhanced with additional features, such as remote monitoring and notifications. This allows users to receive alerts on their phones or other devices if the laser tripwire is triggered, even when they are away from their property.

Objectives

The objectives of this project can be outlined as follows:

- Develop a cost-effective security system using an Arduino and a GSM module.
- Design a laser tripwire system that can effectively detect intruders.
- Create an alarm system that triggers when the laser tripwire is triggered.
- Configure the system to send SMS alerts or make phone calls to the user when the alarm is triggered.
- Develop a user-friendly interface that allows for easy customization of the system.
- Provide a reliable and affordable security solution for homes and small businesses.
- Increase awareness about the importance of security and promote the use of technology to address security concerns.
- Encourage further development and improvement of low-cost security solutions using open-source hardware and software.\

Circuit Diagram:



Procedure

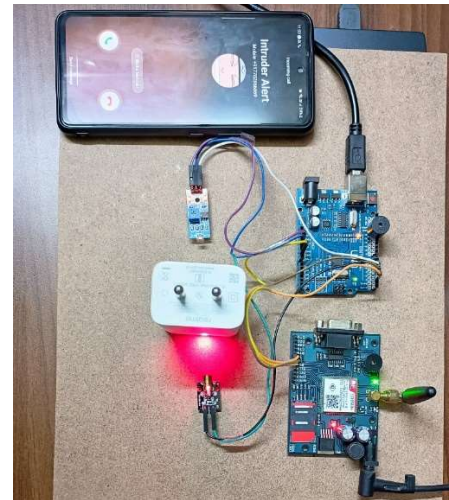
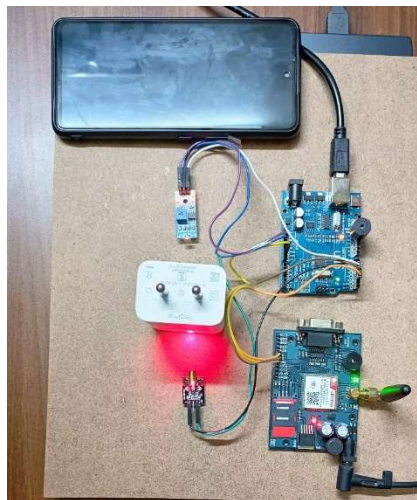
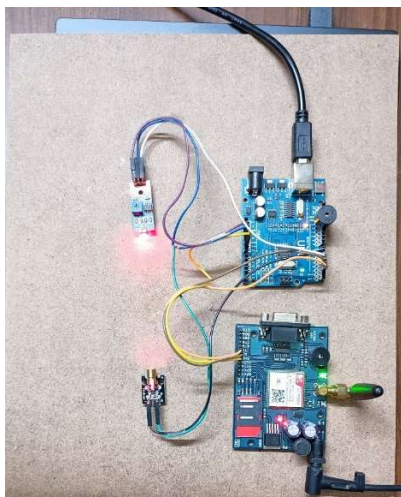
The procedure for building the laser security system project can be outlined as follows:

1. Gather the necessary components, including an Arduino board, a GSM module, a laser module, a buzzer, and other supporting components.
2. Connect the laser module to the Arduino board, ensuring that the transmitter and receiver pins are connected to separate digital pins.
3. Connect the buzzer to the Arduino board, ensuring that it is connected to a digital output pin.
4. Connect the GSM module to the Arduino board, ensuring that the RX and TX pins are connected to separate digital pins.
5. Upload the provided code to the Arduino board using the Arduino IDE software.
6. Power on the system and test the laser tripwire by interrupting the laser beam.
7. Test the alarm system by verifying that the buzzer sounds and the GSM module sends an SMS or makes a phone call.
8. Customize the code to suit the specific security needs of the user, such as changing the phone number for SMS alerts or adjusting the sensitivity of the laser tripwire.
9. Install the laser security system in the desired location and activate it to provide 24/7 monitoring and protection.
10. Monitor the system regularly to ensure that it is functioning properly and adjust the code or hardware as needed.

Results

The main result of this project is to create a working laser security system that detects intruders and triggers an alarm and/or sends an SMS to the user's phone. The laser tripwire detects an intruder's presence by breaking the laser beam, which then triggers the alarm and sends an SMS to the user's phone. The system is designed to be affordable and customizable, allowing users to modify it to fit their specific needs and preferences.

In addition to detecting intruders, the laser security system can also help deter potential intruders by providing a visible indication that the property is protected. The laser beam is not visible to the naked eye, but a visible laser pointer can be used to show the location of the laser tripwire. This can serve as a visual deterrent to potential intruders and help prevent break-ins before they occur.



Conclusion and Future scope

In conclusion, the laser security system project provides an effective and affordable solution for home security needs. By incorporating a laser tripwire, the system can detect intruders and alert the user via SMS or phone call. Additionally, the system features a loud alarm and flashing lights, which can deter intruders and attract attention in case of an emergency.

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.

The future scope of this project includes adding more advanced features to the system, such as integrating it with home automation systems or using AI algorithms for enhanced detection capabilities. The system can also be improved by using more advanced hardware components and optimizing the code for better performance. Overall, this project has the potential to evolve into a sophisticated and robust security system that can provide comprehensive protection to homes and businesses.

References

- <https://github.com/ahmadlogs/arduino-ide-examples/tree/main/sim800l-laser-tripwire>
- <https://projecthub.arduino.cc/fanesahadi/f2a79eb0-8ff4-4e1d-90d6-1b0992515f29>
- <https://youtu.be/g2k7P24RIlo>
- <https://www.techboystoys.com/how-to-make-laser-security-alarm-system/>

Code:

```
#include <SoftwareSerial.h>

const String PHONE = "ENTER_YOUR_PHONE_NUMBER";

#define rxPin 2
#define txPin 3
SoftwareSerial sim800L(rxPin,txPin);

#define LASER_RECEIVER_PIN 4
#define LASER_TRANSMIT_PIN 5
boolean laser_flag = 0;

#define BUZZER_PIN 11

void setup()
{
  Serial.begin(115200);
  sim800L.begin(9600);
  pinMode(LASER_RECEIVER_PIN,INPUT);
  pinMode(LASER_TRANSMIT_PIN,OUTPUT);
  digitalWrite(LASER_TRANSMIT_PIN,HIGH);
  pinMode(BUZZER_PIN, OUTPUT);
  digitalWrite(BUZZER_PIN,LOW);
  sim800L.println("AT");
  delay(1000);
  sim800L.println("AT+CMGF=1");
  delay(1000);
}

void loop()
{
  while(sim800L.available()){
    Serial.println(sim800L.readString());
  }

  int laser_value = digitalRead(LASER_RECEIVER_PIN);

  if(laser_value == LOW) {
    digitalWrite(BUZZER_PIN,HIGH);
    if(laser_flag == 0) {
      laser_flag == 1;
      make_call();
    }
  }
  else {
```

```
digitalWrite(BUZZER_PIN,LOW);  
laser_flag = 0;  
}  
}  
  
void make_call()  
{  
    sim800L.println("ATD"+PHONE+";");  
    delay(20000);  
    sim800L.println("ATH");  
    delay(1000);  
}
```