

Laser Beam Security System with Arduino and Alarm Trigger

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Abstract:

This system is to analyze, that now a day's security is an important aspect. Technology develops day by day in the world. Now days the crime gang also improves their technology to carry out their operation. So, technology of security should be modern with time to protect the world from crime. We decide to make a security issue as our project. In this project we have used laser beam to cover a large area. We know laser light goes to long distance without scattering effect. It's additionally obvious just at source and occurrence point, in any case invisible. These two properties help us to develop a modern security for today's days system, which may name as "Laser Security System." When any person or object crossover the laser light, automatically the buzzer starts ringing. Laser beam goes through long distance without scattering effect and the ray is almost invisible. The project involves the use of Arduino UNO, Laser Module, Buzzer, LDR, Resistor 100kohm, connecting wires and a simple program. With this equipment's we can easily set up a security alarm anywhere for unwanted intruders. A Laser Security System goes about as a standalone system, which makes sound or commotion when it distinguishes any sporadic action or can be part of a much bigger security or any other automation system which can alert owner.

Keywords — Arduino UNO, Laser Module, Buzzer, Resistor 100kohm, connecting wires and LDR

1. INTRODUCTION

Security is a most important factor in day to day life. Need of security is the basic necessity of every individual. The feeling that we are safe and everything around us is all right is imperative for a peaceful living. Be that as it may, in this unsafe world, when crime, terror and dangers are on their pinnacle, how might one achieve that suspicion of safety? For that 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. Different electronic security systems can be utilized at home and other significant working spots 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 defense starting from the security of a simple house hold material to a very high valued material of an organization. They once used to be very expensive

solutions for security needs. Owning to cost cutting and fast technological advancements, this form of security system is becoming more affordable. We probably seen an old western movie where the good guys settle down and run a string at ankle height around their camp, tying it to the filled with rocks. When the bad guys try to sneak up in the mid night, they kick the wire and pull over, making a rattle that awakens the sleeping good guys, who win the day. A laser security system works with the same principle. Instead of a string, there's a ray of light surrounding the area, and instead of the rocks, there's an alarm of one sort or another

2. METHODOLOGY

The Laser Security System Alarm project adopts a systematic approach to design and develop an efficient intrusion detection system. This project begins with requirement

analysis, in which the aim is to create a low-cost yet reliable solution in terms of a laser beam to detect unauthorized entry. The key components such as Arduino Uno microcontroller, laser module, Light Dependent Resistor (LDR), and buzzer are chosen with regard to their cost-efficiency and integration feasibility.

The laser module produces a beam, which is directed onto the LDR. The LDR senses the variation in light intensity due to obstructions in the laser beam, which are translated into a voltage signal. The Arduino captures this signal and, whenever the voltage varies outside a threshold (which signifies beam obstruction), drives the buzzer to inform users of the intruder. The system is constructed on a breadboard, and the sensor threshold is calibrated in a proper manner to detect the same under varied conditions. Following the programming of Arduino to accept sensor inputs and generate outputs, the system is tested to ensure its functionality and optimize performance. The last step involves transferring the circuit to a more permanent form, making sure that the system is reliable as well as scalable for different security applications.

The Laser Security System architecture is structured into four major layers: power supply, sensing, processing and output/alert. The power supply layer provides a constant 5V DC to all devices, normally derived from a battery or USB power supply. The sensing layer includes a laser module and a light-sensing device, e.g., an LDR (Light Dependent Resistor). The laser is constantly directed onto the LDR, creating an invisible light barrier. In normal circumstances, the LDR gets constant light, and it keeps a constant analog signal. If an object blocks the laser beam, the intensity of the light decreases, leading to a variation in the output of the sensor. This information is relayed to the processing layer, which is based on an Arduino microcontroller. The Arduino has been programmed to constantly check the LDR's value and compare it against a predetermined threshold. If the light value goes below the threshold, it recognizes this as an intrusion. The alert/output layer is subsequently driven, engaging equipment like LEDs or buzzers to alert of the breach.

Optional, the system can integrate GSM or Wi-Fi modules to enable SMS or network-based alerts.

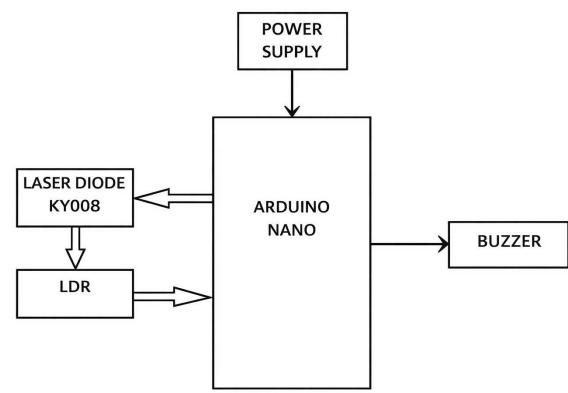


Figure 1: Block Diagram of laser security system

3. WORKING OF LASER SECURITY SYSTEM

The project basically works on the principle of interruption. If by any means the LASER light is interrupted the alarm will start unless it is reset with push-button. The laser is a concentrated light source that puts out a straight beam of light of a single color. The LDR is sensitive to light and puts out a voltage when the laser light hits it. When the laser beam is interrupted and can't reach LDR, its voltage output changes, and eventually the alarm will ring.

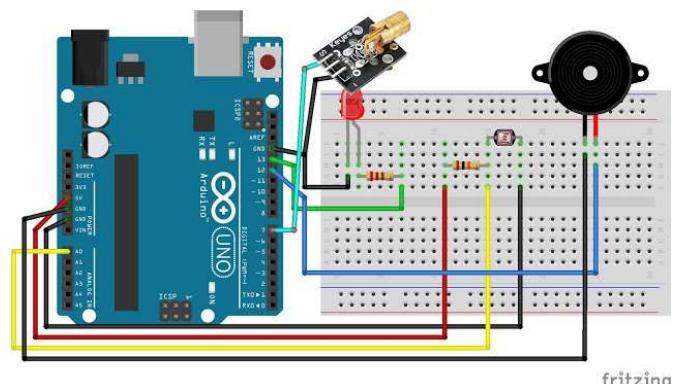


Figure 2: Circuit diagram of laser security system

4. SYSTEM FLOW CHART

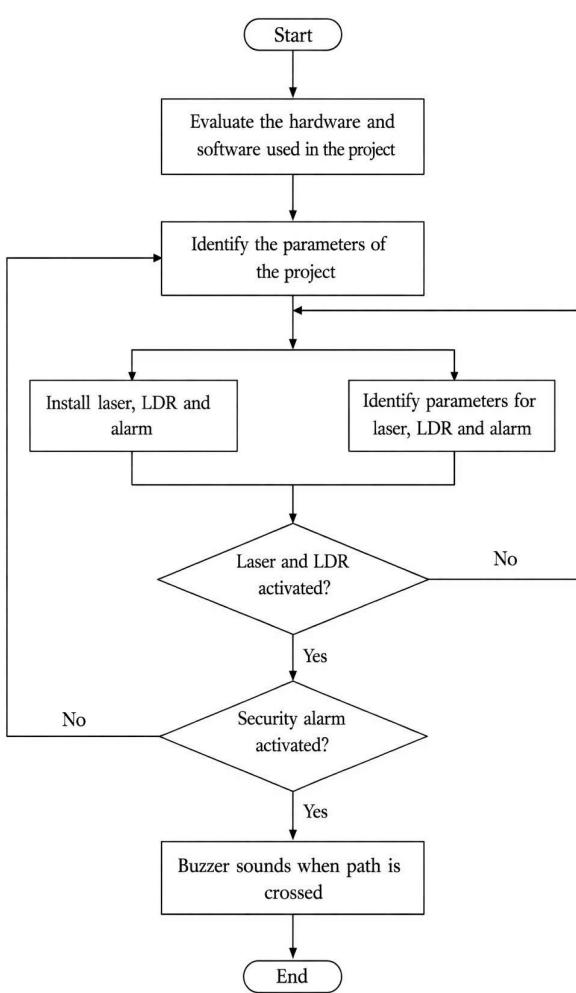


Figure 3: Flowchart of the system

In normal conditions, the LDR keeps receiving this laser light and converts the brightness of the laser into an analog electrical signal. The Arduino constantly reads this signal and compares it with a set threshold value — this threshold represents the signal level when the laser is falling normally on the LDR.

As long as the laser beam remains uninterrupted (i.e., no one or nothing is blocking it), the signal stays above the threshold. In this case, the Arduino does nothing and keeps silently monitoring.

However, if someone passes through the laser beam or blocks it, the light falling on the LDR drops. As a result, the LDR's signal also drops below the threshold. The Arduino detects this change as an intrusion or disturbance.

Once this happens, the Arduino immediately responds by activating the buzzer to make a sound and possibly turning on an LED to give a visual alert. If additional modules like GSM or Wi-Fi are connected, the system can also send a remote alert to the user or security personnel.

When the obstruction is removed, the laser light once again reaches the LDR normally. The LDR's signal returns to its original value, and the Arduino resets the alert and resumes normal operation.

This process continues in a loop, allowing the system to monitor the area continuously in real-time for any unauthorized activity.

5. RESULTS

The laser beam is exactly aligned with the LDR so that continuous detection of light is possible. The LDR does not receive any obstruction, so it detects the laser light continuously. Therefore, the Arduino maintains the buzzer off, meaning no obstruction exists.

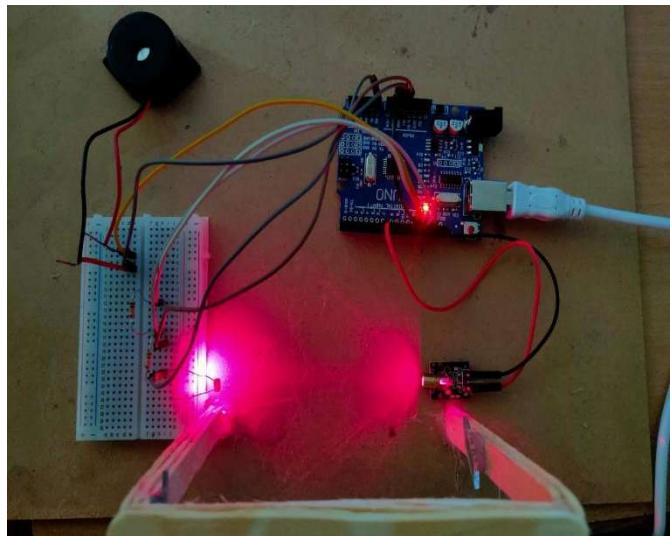


Figure 4: Top view of the system

A laser and an LDR (Light Dependent Resistor) to sense obstacles. When the laser beam is broken by an object, the LDR detects a reduction in light intensity and sends a signal to Arduino. Arduino then turns on a buzzer for indicating the presence of an obstacle.

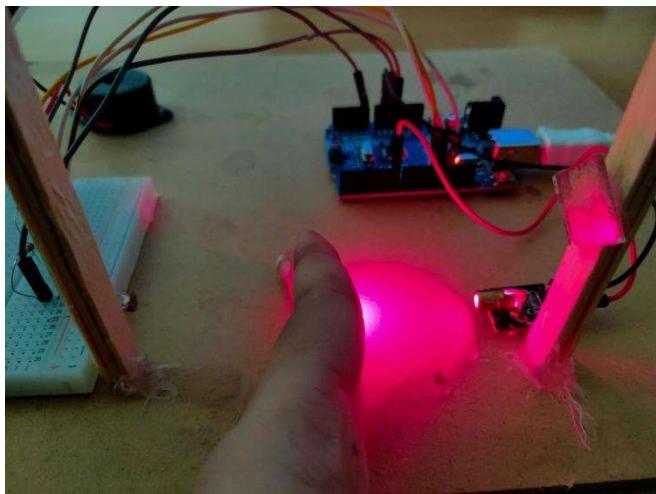


Figure 5: Obstacle detection

6. OVERVIEW

The Laser Security System using Arduino is a cost-effective intrusion detection setup that uses a laser beam and LDR to detect any obstruction. When the laser path is blocked, the LDR senses the drop in light and triggers a buzzer alert via the Arduino. This system ensures real-time monitoring with minimal components. It is scalable, reliable, and ideal for home or small-scale security applications.

7. CONCLUSIONS

Laser Security System provides an easy, inexpensive, and efficient method of intrusion detection with minimal electronic components and Arduino-based software. By integrating a laser beam and an LDR sensor, the system effectively detects any blockage in the beam and immediately sounds an alarm through a buzzer or LED. The application of the Arduino microcontroller enables real-time monitoring, rapid response, and simple adaptation according to individual security requirements. The software, implemented in the Arduino IDE, offers a programmable platform for developing the logic and incorporating supplementary features such as GSM or Wi-Fi modules for remote notification. In general, the project illustrates that microcontroller-based systems can provide security in the home, office, or secluded area with negligible hardware and complexity in programming.

8. REFERENCES

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