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Laser Beam Alarm System with Automated Door Lock System

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Abstract - *This paper introduces a security system that combines a Laser Beam Alarm with an Automatic Door Lock System to enhance security in residential and commercial environments. Leveraging the integration of cutting-edge technology, this research explores the deployment of laser sensors and automatic locking mechanisms to detect and prevent unauthorized entries. This enables control and ensuring a comprehensive and responsive security solution. Extensive testing has proven the system's efficiency in intrusion detection by instantaneously activating alarms and door locks upon any security breach. This study details the design, functionality, and testing outcomes of the system, underscoring its potential to redefine security measures for large-scale protection against unauthorized access. By merging technology with traditional security tactics, this Laser Beam Alarm System with Automated Door Lock System presents an innovative approach to tackling modern security challenges.*

***Key Words*: RFID, laser, LDR, Security System, Arduino Nano, Solenoid Door lock**

1.INTRODUCTION

In today's world, the need for effective security measures has never been more critical. With technological advancements, those with malicious intent have found new ways to breach security, posing challenges to traditional security systems. Consequently, there is an urgent need for innovative solutions that keep pace with these advancements. Individuals and organizations alike are on a continuous search for better and more reliable ways to protect their premises.

To address this need, we have developed a new security system named the Laser Beam Alarm System with Automated Door Lock System. This system utilizes laser technology to safeguard areas against unauthorized access. The principle behind this system is straightforward: if an unauthorized individual attempts to enter the protected area, the laser detects this activity. Immediately, an alarm is triggered to alert of the intrusion, and doors automatically lock to prevent entry. Lasers provide a precise and reliable method for detecting intrusions, significantly reducing the likelihood of false alarms—a common issue with other types of security systems. Moreover, we designed the system to be user-friendly, ensuring ease of installation and use. This approach makes advanced security accessible to a broader audience, providing peace of mind to home and business owners alike.

2. LITERATURE SURVEY

A few reviews were done in the past as part of research papers on:

The first system involves a Home Automation Security system with Laser Lights Alarm designed for large spaces like factories to improve security. It utilizes Raspberry Pi controllers, laser beam modules, PIR sensors, and alert lights to detect intruders, sending alerts to mobile users and web pages. The system successfully sent and received messages and requests during testing.

The second system is a wireless security system controlled by a wireless remote or touch-tone phone, featuring infrared motion sensors and an alarm unit triggered by detecting human body heat. It uses two types of laser beams: a green visible beam and an invisible infrared beam to enhance security measures.

The third system introduces a LASER-based smart security system focusing on detecting burglars using imperceptible laser rays at entry points like doors and windows. Once the laser beam is crossed, the alarm is triggered continuously until manually turned off. This cost-effective system sends a photo of the intruder to a registered email address for verification, utilizing components like Arduino, LDR module, WIFI module, and a buzzer for alerts.

3.WORKING

When the system is activated, the laser diode emits a continuous, invisible laser beam across the entrance or area to be monitored. This beam is aimed directly at an LDR (Light Dependent Resistor) sensor placed on the opposite side. The laser diode and LDR sensor are crucial components; the diode serves as the source of monitoring light, while the LDR sensor acts as the receiver, changing its resistance based on the light intensity it detects.

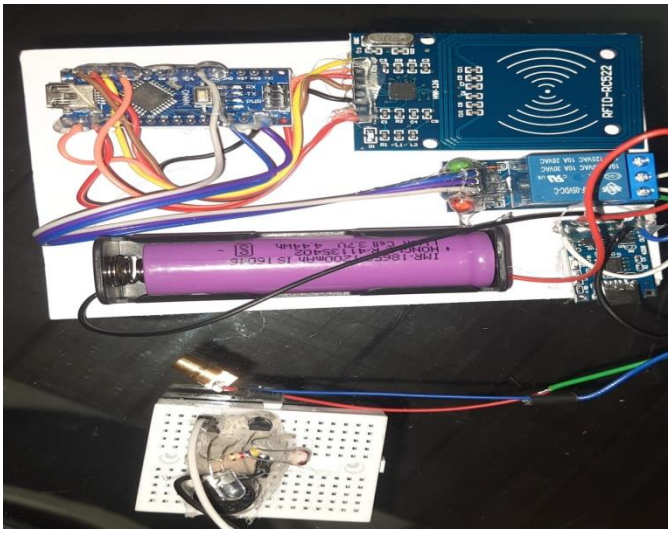

Fig -1: Laser Alarm System

Under normal conditions, with the laser beam uninterrupted, the LDR sensor receives a constant light signal, maintaining a low resistance state. This steady signal indicates to the system's control unit, managed by a Nano microcontroller, that the area is secure and free from intrusion.

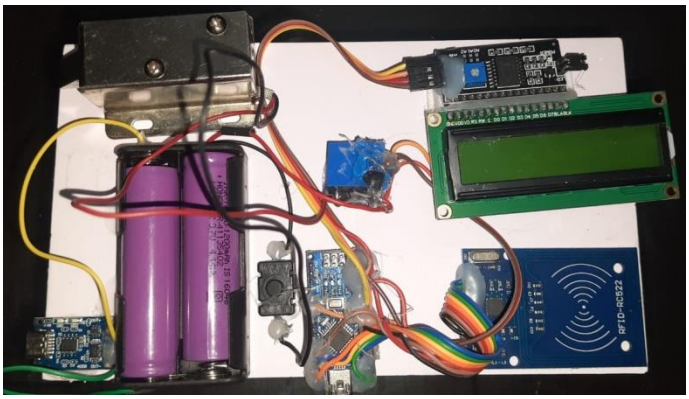

Fig -2: Automatic Door Lock System

The critical moment of operation occurs when an intruder interrupts the laser beam. This interruption blocks the beam from reaching the LDR sensor, causing a sudden change in its light reception. The LDR sensor responds by altering its resistance, signaling a disruption in the secured area.

This signal is immediately processed by a Nano microcontroller, the system's brain, programmed to recognize the change in resistance as an indicator of a potential security breach. Upon detection, the microcontroller activates a 5v Buzzer. This buzzer acts as an audible alarm, alerting anyone nearby to the potential intrusion and often deterring the intruder from proceeding further.

Fig –3: *Laser Beam Alarm with an Automatic Door Lock System*

Through this sequence of actions—starting from the laser diode's surveillance, the LDR sensor's detection, to the immediate locking of the door and activation of an alarm—the Laser Beam Alarm System with Automated Door Lock System provides a formidable line of defense against unauthorized entries. This setup not only deters potential intruders but also ensures a rapid response to any security breach, thereby significantly enhancing the safety and security of the protected area.

4.CIRCUIT DESIGN

The Arduino Nano microcontroller serves as the system's main hub, receiving inputs from sensors and RFID authentication to control operations. The 18650 battery serves as the power source, regulated by the TP4056 module to provide a stable 5V output. The RFID reader communicates with the Nano for access control, activating the solenoid lock through the relay module when valid authentication is detected.

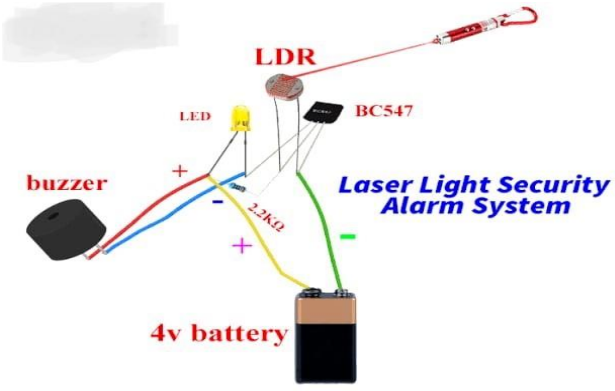

Fig -4: Connections in Laser Alarm System

A laser alarm is set up using a laser diode and an LDR sensor. Interruption of the laser beam triggers a resistance change in the LDR, signaling potential intrusion. The solenoid lock is operated by a relay module controlled by the Nano. An LCD display, augmented by the I2C module for enhanced communication, provides system status updates. Buzzer and LEDs connected to the microcontroller offer visual and audible notifications.

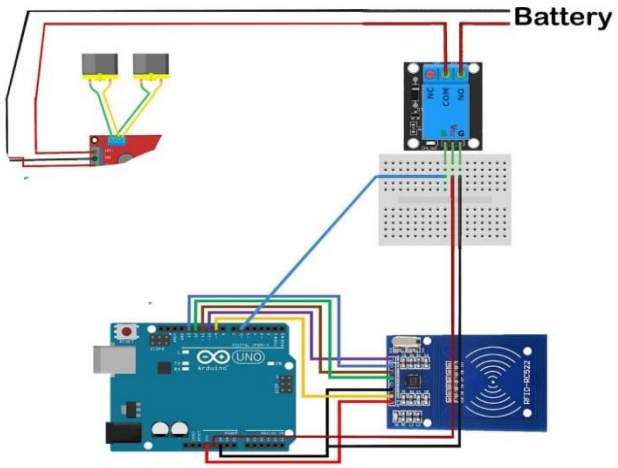

Fig -5: Connections in Door Lock System

5.SOFTWARE DESCRIPTION

The Arduino IDE is a free software that lets you create and transfer programs to Arduino boards like the Nano. It has an easy-to-use interface with a code editor, a chat window, buttons, menus, and options for selecting the board and serial port. It can handle C and C++, comes with a lot of built-in features, and has a library of user-made libraries. The Serial Monitor lets you troubleshoot and talk to the board in real time. It works on Windows, macOS, and Linux.

6. CONCLUSIONS

The Laser Beam Alarm System with Automated Door Lock System provides an effective and accessible security solution at a low cost. This system democratizes advanced laser technology, making it affordable and easy to use for a wide range of users, from homeowners to jewelry shops, banks, and educational institutions looking to secure exam papers. Its straightforward design allows for quick installation and operation, instantly detecting unauthorized entries with an alarm and automatic door locks. By offering this high-tech security in a budget-friendly package, the system ensures that advanced protection is available to all, enhancing safety across diverse environments without the hefty expense typically associated with such technology.

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8.BIOGRAPHIES

Smt. Sarita Chauhan is working at MLVTEC, Bhilwara in the capacity of Assistant Professor in ECE Department and has more than 20 years of experience. She has more than 26 publications in International Journals and is the author of two books under RTU.
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