Design and Implementation of Laser Security System using ESP32 Cam

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Abstract: *Home security alarm systems are in high demand these days. Crime is on the rise and we need something to keep us safe. We all know about the high security systems on the market but not everyone can afford them. We are going to build a cost-effective electronic system that can detect the movement of intruders and trigger the alarm. Basically, When the Light of the laser diode cuts by an intruder it beeps an alarm and notify about the incident*

Keywords: ESP32 Cam, LDR, Laser Diode, Buzzer

I. INTRODUCTION

In today's world, safeguarding critical infrastructure, sensitive areas, and valuable assets is a top priority. However, traditional security measures often fail to provide comprehensive protection against ever-changing threats. Laser-based security has emerged as a cutting-edge solution that offers improved detection capabilities and dependable perimeter monitoring. By utilizing cutting-edge laser technology, it creates an invisible barrier. When breached, these systems trigger immediate alerts, allowing security teams to respond quickly to threats. By sending laser beams across perimeters and connecting them to highly sensitive sensors that detect even the tiniest intrusion attempt, from human intruders to wildlife. In addition to their effectiveness in preventing unauthorized entry, laser security systems are versatile in deployment, allowing them to be used for a wide variety of purposes. From protecting military facilities and industrial complexes, to protecting valuable assets and controlling borders, laser security systems provide tailored solutions to meet a variety of needs.

However, when implementing a laser security system, various factors must be taken into account, such as environmental conditions, accuracy of laser beams, power demands, and how well the system integrates with existing security systems. Despite these drawbacks, the investment in security systems is worth it in terms of increased security and peace

II. METHODOLOGY

The system consists of both software and hardware. The hardware component consists of an Android phone, LCD display, Bluetooth module, Arduino, speaker, and Flex sensors. Software includes the Arduino sketch and the programming for an Android phone application. There are three components to the suggested system.

Risk Assessment - Identify areas or assets that need protection and evaluate the risks and threats they are exposed to

Design Phase - Design the security system's layout, including the location of laser emitters and sensors, as well as control units. Factors to consider include terrain, distance, and obstacles to be covered

Laser Selection-. Selecting the Right Laser for the Job Select the right laser for the job, taking into account factors like power output, wavelength and modulation capabilities. A diode laser or solid-state laser is often used for security purposes.

Integrate sensors with laser emitters. This allows for the detection of interruptions or interference in the laser beam. Typical types of sensors used in this process include photodegradable sensors (PD sensors), phototransistor sensors (PTSs), or infrared detectors (IR detectors).

Calibration: Align the laser beams precisely so that the protected area is fully illuminated and the false alarm rate is reduced. Alignment tools and techniques include mirrors, prisms and optical collimators centralized control system to monitor sensor outputs, adjust sensitivity levels, and set alarms. Control and Monitoring System Centralized control system for laser-based security

Integration With Other System -Laser-based security systems can be combined with other security systems, such as security cameras, access control, or alarm systems.

III. RELATED WORK

Mirrors – In the Project mirrors are used to Reflect the Laser Beam Which is Propogated from the laser module .The mirrors are adjusted such that it can reflect the laser beam till the LDR Sensor.to work the LDR sensor Properly.
Blynk Application -The Blynk Application is used to Sending alerts about if any Intruder is Interrupted the light beam propogation

Block Diagram
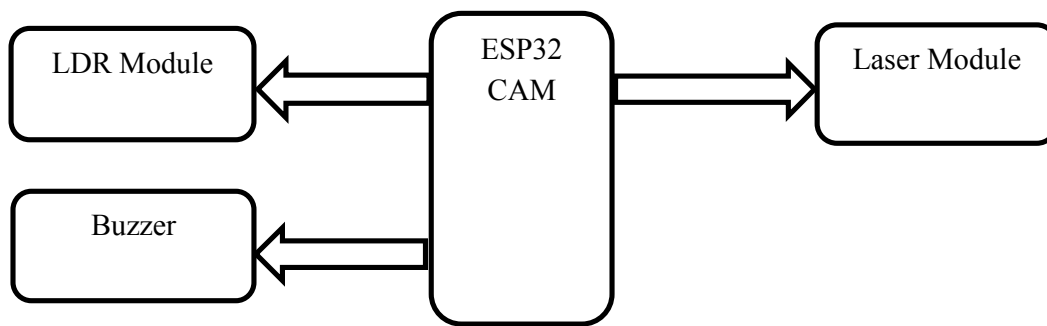
Hardware & Software Implementation

Hardware Implementation
ESP 32- I have used ESP32-CAM module because it provides both Wi-Fi and Bluetooth connectivity. This enables to connect your projects to local Wi-Fi networks, control them remotely, and communicate with other devices and smartphones using Bluetooth. Also its Having its own Built in Camera Module.
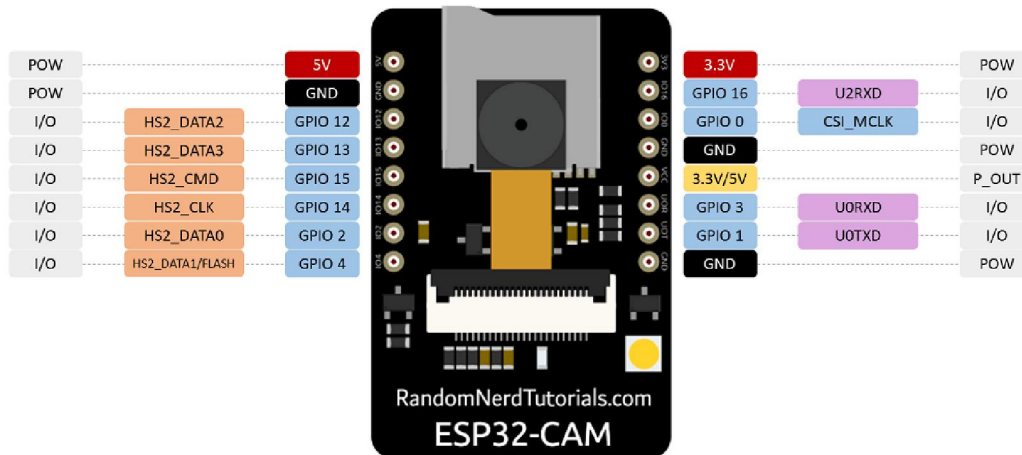

LDR Module- A Light Dependent Resistor (LDR) is a type of passive electronic sensor used to detect light. It's made up of two conductors separated by an insulator which becomes more conducting when exposed to high levels of light intensity, forming a variable resistor in the circuit.
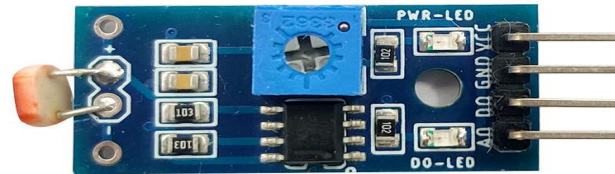
(fig :Flexible Sensor)

3) Laser Module- In the laser display industry the term "laser module" stands for a device that emits a single static laser beam of single or multiple wavelengths These modules are compact and efficient, offering high power output in a small package. They use precision-molded lenses and a proprietary optical design to deliver exceptional performance and power density. They are ideal for use in applications where space is limited and require a high-output laser.
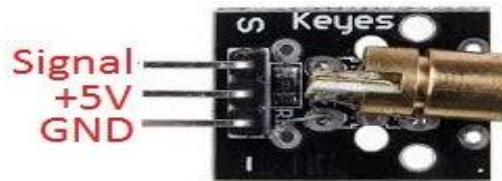
Buzzer-An audio signaling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound

Software Implementation
ARDUINO IDE
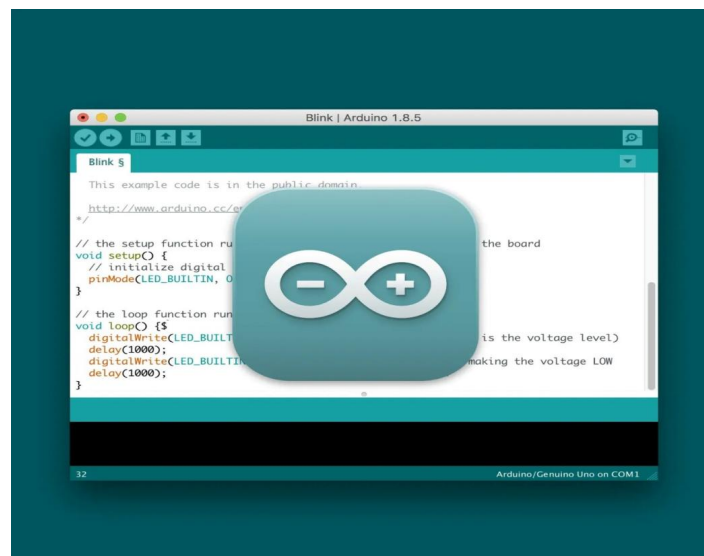
IV. PROPOSED SYSTEM

The suggested system uses an ESP 32 Cam microcontroller and LDR sensor is located at the infront of the Laser Module for Whenever the light beam reflected from the mirrors will cut by an intruder the buzzer will start beeping .mwans when the light is cut by an any intruder then it will notify about that .

The Security in the form of Laser is not much costly .

V. CONCLUSION

Overall, a laser security system is a highly effective and efficient way to protect your and detect intruders. Whether you're looking to secure your home, business, or industrial site, a laser security system is a great solution that offers a range of benefits

ACKNOWLEDGMENT

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