NEW HORIZON
COLLEGE OF ENGINEERING
New Horizon Knowledge Park, Ring Road, Marathalli
Autonomous College Permanently Affiliated to VTU, Approved by AICTE & UGC
Accredited by NAAC with 'A' Grade, Accredited by NBA

Outer Ring Road, Bellandur, Bengaluru – 560103

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

20EEL68 Mini Project IV

Report on

LASER SECURITY ALARM SYSTEM

Submitted in the partial fulfilment of the VI Semester Mini Project

Submitted by

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Under the Guidance of

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Associate professor

VISVESVARAYA TECHNOLOGICAL UNIVERSITY

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2022-23

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CERTIFICATE

Certified that the Project work entitled **"LASER SECURITY ALARM SYSTEM"** carried out by **Kamalesh Badola (1NH20EE048), Kushal Naik K (1NH20EE056), Lava Kumar M N (1NH20EE057), Mohammed Aman (1NH21EE407),** Bonafide Student(s) of New Horizon College of Engineering submitted the report in the partial fulfilment for the award of Bachelor of Engineering in **Department of Electrical and Electronics Engineering, New Horizon College of Engineering** of Visvesvaraya Technological University, Belgaum during the Year 2022-23.

It is certified that all the corrections/suggestions indicated for Internal Assessment have been incorporated in the report deposited in the department library. The project report has been approved as it satisfies the academic requirements in respect of project work prescribed for said Degree.

Name & Signature of the Project Guide	**Name & Signature of Head of the Department**
Dr. Vinoth Kumar K	Dr.Sujitha.S

SEMESTER END EXAMINATION

Internal Examiner **External Examiner**

ACKNOWLEDGEMENT

I take this opportunity to convey my gratitude to all those who have been kind enough to offer their advice and provide assistance when needed which has led to the successful completion of the project.

We are grateful to the Chairman of New Horizon Educational Institution, **Dr.MOHAN MANGHNANI** for providing infrastructural facilities and many other resources needed for our project. I would like to express my immense gratitude to our principal, **Dr.MANJUNATHA** for motivating us to carry out research in the NHCE and **Dr. SUJITHA.S**, Head of the department for their constant support and motivation that has encouraged me to come up with this project and also for providing the right ambience for carrying out the work and the facilities provided to me.

I express my warm thanks to my project guide **Dr. VINOTH KUMAR K,** Department of Electrical and Electronics Engineering, New Horizon College of Engineering for his/her skilful guidance, constant supervision, timely suggestion and constructive criticism in successful completion of my project in time.

I wish to thank all the faculty of the Electrical and Electronics Engineering department for providing required support throughout the project.

I would like to thank my parents for supporting and helping in the completion of the project.

Last but not the least I would like to thank all my friends without whose support and co-operation the completion of the project would not have been possible.

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DECLARATION

We, **Kamalesh Badola (1NH20EE048), Kushal Naik K (1NH20EE056), Lava Kumar M N (1NH20EE057), Mohammed Aman (1NH21EE407),** students at New Horizon College of Engineeringhereby declare that this project work entitled **" LASER SECURITY ALARM SYSTEM "** is an original and bonafide work carried out by me at New Horizon College of Engineering in partial fulfillment of Bachelor of Engineering in Electrical and Electronics Engineering Visvesvaraya Technological University, Belgaum.

We also declare that, to the best of our knowledge and belief, the work reported herein does not form part of any other thesis or dissertation based on which a degree or award was conferred on an earlier occasion by any student.

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CERTIFICATE

Certified that the Mini Project work entitled **"LASER SECURITY ALARM SYSTEM"** carried out by **Kamalesh Badola (1NH20EE048), Kushal Naik K (1NH20EE056), Lava Kumar M N (1NH20EE057), Mohammed Aman (1NH21EE407)** a bonafide student of New Horizon College of Engineering in partial fulfilment for the award of **Bachelor of Engineering** in Electrical and Electronics Engineering of the Visvesvaraya Technological University, Belgaum during the year 2022-2023.It is certified that he/she has completed the project satisfactorily.

Name & Signature of the Project Guide	**Name & Signature of Head of the Department**
Dr. Vinoth Kumar K	Dr.Sujitha.S

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6	Title of the Document	Laser Security Alarm System
7	Similar Content(%)identified	16%
8	Acceptable maximum limit (%) of similarity	20%
9	Date of Verification	31.05.2023
10	Checked by (Name with signature)	Mr. Kodandapani D
11	Specific remarks, if any :	No

We have verified the contents as summarized above and certified that the statement made above are true to the best of our knowledge and belief.

Mr. Kodandapani D
Plagiarism - Coordinator

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20EEL68 Mini Project IV

PROJECT IMAGES

PROJECT TITLE: LASER SECURITY ALARM SYSTEM

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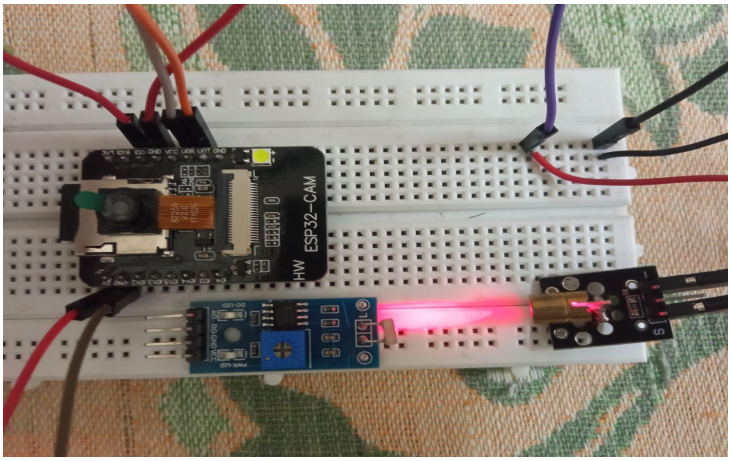

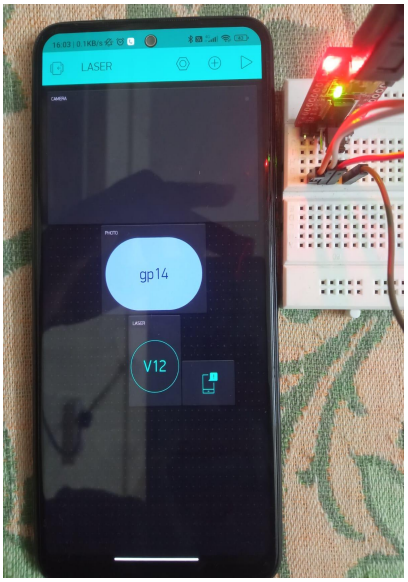

Content

List of Figure

ABSTRACT

This project presents a Laser Security Alarm System that utilizes an ESP32 camera module, a laser module (KY008), a UART TTL module, an LDR module, and the Blynk IoT app. The system detects intrusions by using a laser beam as a barrier, and the LDR module senses disruptions in the beam caused by potential intruders. When an intrusion is detected, the system triggers an alarm, captures images using the camera module, and sends real-time notifications to the user's mobile device via the Blynk IoT app. The proposed system offers a cost-effective and customizable solution for enhancing security measures.

CHAPTER 1

INTRODUCTION

The Laser Security Alarm System represents an innovative and efficient solution for bolstering security measures in both residential and commercial settings. Traditional security systems often have limitations in terms of reliability and ease of use. This project addresses these concerns by combining various components, including the ESP32 microcontroller, camera module, laser module (KY008), UART TTL module, LDR module, and the Blynk IoT app, to create a comprehensive and advanced security system.

The laser module (KY008) forms an invisible barrier that acts as the primary line of defense. Any disturbances or interruptions in the laser beam caused by potential intruders are detected by the LDR module, which serves as a reliable sensor. When an intrusion is detected, the system promptly triggers an alarm and activates the camera module to capture images of the event, providing valuable visual evidence.

To enhance the system's functionality and convenience, the ESP32 microcontroller is employed as the central control unit. It orchestrates the operations of the various components, ensuring seamless integration and efficient communication between them. The UART TTL module facilitates data exchange between the ESP32 and the Blynk IoT app, enabling remote monitoring and control.

LITERATURE SURVEY

Title of the paper	Author	Source & Year of Publication	Outcome of the paper
"Design and Development of a Laser Security System"	S. Anbazhagan and R. Sudhakaran	International Journal of Computer Applications, January 2014.	The system detects intrusions using a laser module and triggers an alarm.
Low Cost Laser Light Security System in Smart Home	Ashis Rai, Manjil Rai, Nisha Jogi	2017 Second International Conference on Electrical, Computer and Communication Technologies (ICECCT) , IEEE	When the laser beam is interrupted, an alarm is triggered to alert the user of a potential security breach.
Design and Implementation of Laser-Based Security System"	A. Srinivasan, K. Ganeshkumar, and G. Gokul.	International Journal of Engineering Research & Technology, Volume 2, Issue 6, June 2013	The design and implementation of a laser-based security system using a laser transmitter and a receiver

COMPONENTS DESCRIPTION

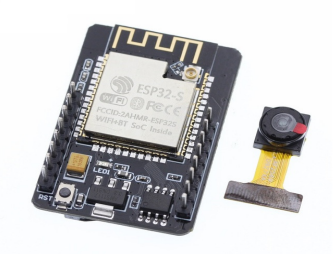

Fig. 1.1

1. **ESP32Cam:** It is a compact module based on the powerful ESP32 microcontroller. It features an integrated camera module with a resolution of 2 megapixels or higher, allowing for high-quality image and video capture. With built-in Wi-Fi and Bluetooth capabilities, the ESP32 Cam offers connectivity options for wireless communication and integration with networks and other devices. It provides GPIO pins that enable the connection of external components and sensors, expanding its functionality as per project requirements.

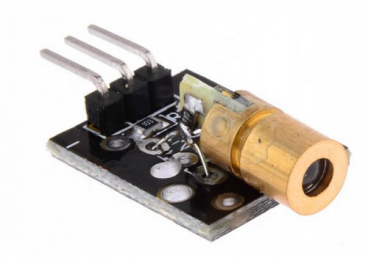

Fig. 1.2

2. **Laser KY-008**: This module is a compact laser module designed for various applications. It consists of a laser diode, a resistor, and a control circuit, all enclosed in a small housing. The module emits a visible red laser beam. The Laser KY-008 module

operates at low power and is commonly used for distance measurement, positioning, and alignment purposes.

Fig. 1.3

3. **LDR (Light Dependent Resistor):** module is a sensor that detects changes in light intensity. It consists of an LDR, also known as a photoresistor, and supporting circuitry. The LDR module's resistance changes based on the amount of light falling on it. When exposed to light, the resistance decreases, and when in darkness, the resistance increases. This property allows the LDR module to be used in various applications such as light sensing, brightness control, and in our case, for detecting disruptions or interruptions in the laser beam in the Laser Security Alarm System

Fig. 1.4

4. **UART TTL:** This module is also known as a USB to TTL converter module, facilitates communication between a computer and TTL-level devices. It is based on the FTDI FT232RQ chip, which provides USB connectivity and TTL-level serial communication capabilities. The module is often used for programming and debugging microcontrollers, updating firmware, and interfacing with various TTL-level devices, offering a convenient and reliable solution for serial communication between a computer and TTL devices.

Fig. 1.5

5. **Bread Board**: A breadboard is a versatile prototyping tool for creating and testing electronic circuits without soldering. It features a grid of holes that allow components and wires to be easily inserted and connected. It offers a convenient and reusable platform for temporary circuit design and experimentation.

Fig. 1.6

6. **Jumper wires**: Jumper wires are flexible and insulated wires with connectors at each end, used for making temporary connections within electronic circuits. They are essential for linking components on a breadboard, Arduino board, or other prototyping platforms. With their versatility and ease of use, jumper wires facilitate quick adjustments, prototyping, and experimentation in circuit design.

SOFTWARE

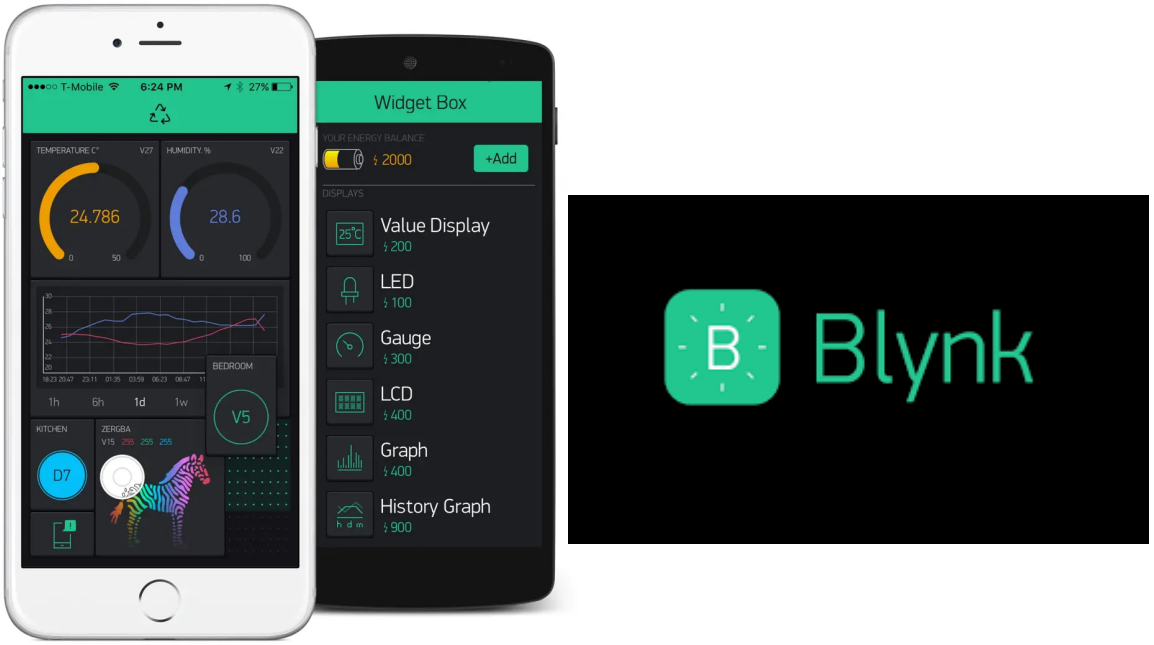

Fig. 1.7

BLYNK IOT

Blynk is an IoT (Internet of Things) mobile application that enables users to control and monitor their connected devices remotely. With Blynk, users can create a customized mobile interface with buttons, sliders, and widgets to interact with their IoT projects. The app supports a wide range of hardware platforms and communication protocols, allowing seamless integration with various IoT devices and sensors. Blynk provides secure communication through encrypted connections and offers features like real-time data visualization, push notifications, and data logging. It simplifies the process of building IoT applications by providing an intuitive interface and comprehensive functionality for remote control and monitoring of connected devices.

CHAPTER 2

BLOCK DIAGRAM

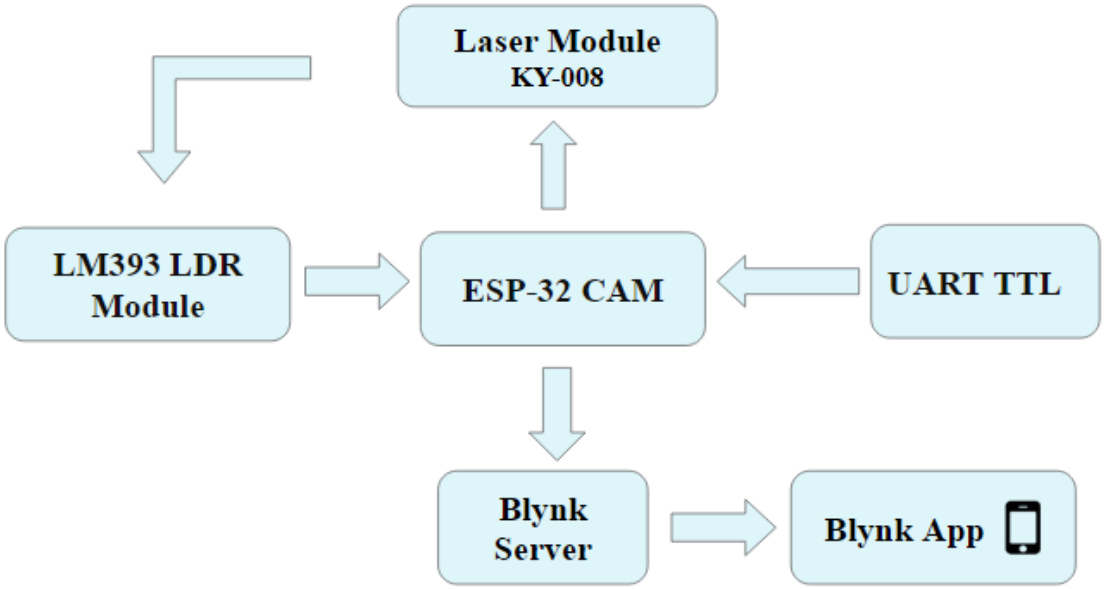

Fig. 1.8

Block Diagram Explanation

1. ESP32 CAM: The ESP32 CAM serves as the central control unit of the system. It coordinates the operations of all the components and facilitates communication between them.The camera module captures images and provides visual surveillance. It is triggered by the ESP32 when an intrusion is detected.

2. Laser Module (KY008): The laser module emits a laser beam that forms an invisible barrier. It acts as the primary security component, and any disturbances in the beam are detected by the LDR module.

3. LDR Module: The Light Dependent Resistor (LDR) module senses disruptions or interruptions in the laser beam caused by potential intruders. It detects changes in light intensity and sends a signal to the ESP32 when a break in the beam is detected.

4. UART TTL Module: The UART TTL module facilitates communication between the ESP32 and external devices. It allows data exchange and enables connectivity with the Blynk IoT app.

5. Blynk IoT App: The Blynk IoT app provides a user-friendly interface for remote monitoring and control. It receives real-time notifications from the ESP32 and allows users to monitor security events, receive alerts, and manage the system using their mobile devices.The block diagram illustrates the flow of information and control within the Laser Security Alarm System. The ESP32 microcontroller acts as the central hub, receiving signals from the LDR module and triggering the camera module when an intrusion is detected. The UART TTL module enables communication.

CHAPTER 3

CIRCUIT DIAGRAM

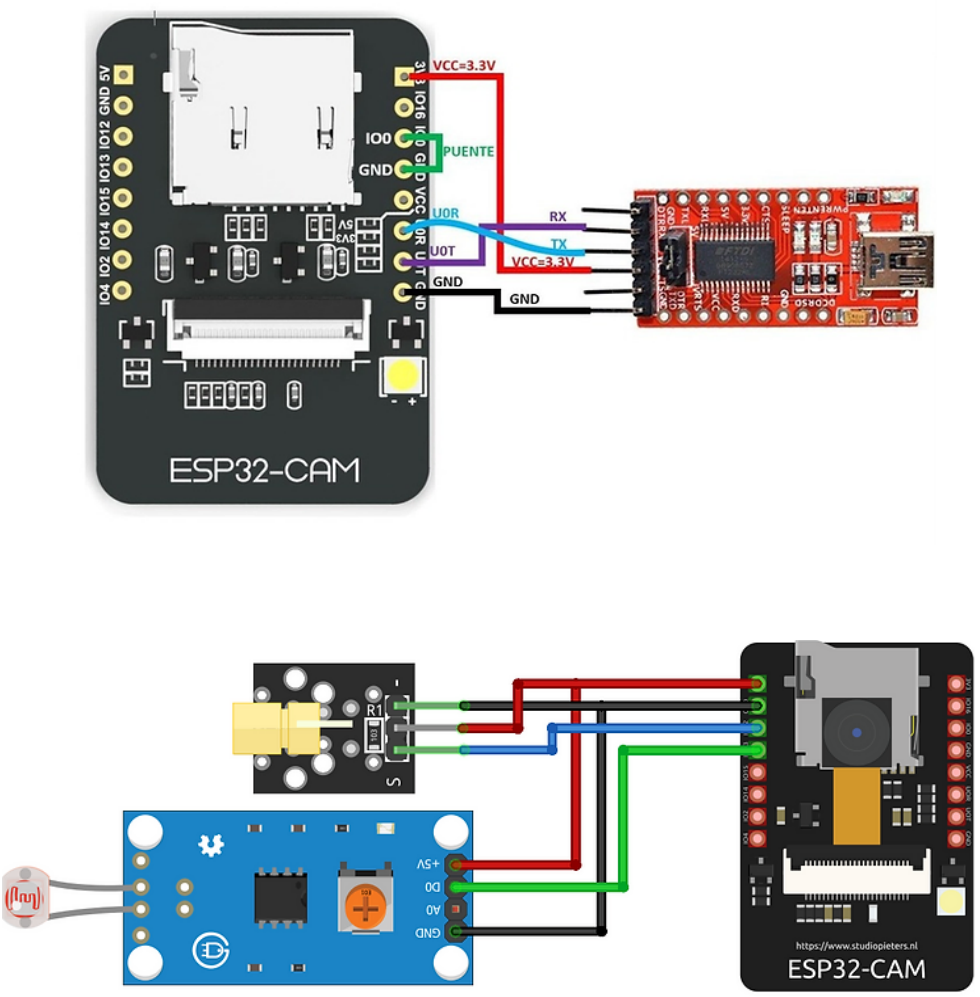

Fig. 1.9

WORKING

Setup of Hardware:

1. The ESP32 Cam integrates the ESP32 microcontroller and a camera module, providing a compact and convenient solution for capturing images and controlling the system.

2. The ESP32 Cam serves as the central control unit of the system, responsible for coordinating the operations of all the components. It communicates with the camera module to capture images when an intrusion is detected. The integration of the ESP32 microcontroller and the camera module into a single device reduces the complexity of the overall hardware setup and simplifies the wiring and connectivity aspects.

3. To set up the hardware, the ESP32 Cam needs to be powered using an appropriate power supply. It typically requires a 5V power source, which can be provided through a USB connection or an external power supply. The camera module is integrated into the ESP32 Cam, allowing for seamless image capturing without the need for additional wiring or connections.

4. Additionally, other components such as the laser module (KY008), UART TTL module, and LDR module may need to be connected to the ESP32 Cam as per their respective specifications. The specific wiring and connections for these components will depend on the individual module's requirements and can be determined by referring to their datasheets or user manuals.

PROGRAM CODE

```
//Blynk ESP32 CAM Laser Security System

#include "esp_camera.h"

#include <WiFi.h>

#include <WiFiClient.h>

#include <BlynkSimpleEsp32.h>


#define CAMERA_MODEL_AI_THINKER // Has PSRAM


#include "camera_pins.h"


#define LDR 13

#define PHOTO 14

#define LED 4

#define Laser 12


const char* ssid = "LASERSECURITY";  //Wifi Name

const char* password = "12341234";  //Wifi Password

char auth[] = "oj3G_mZR3H1h3ZhdHOhTnjgXuMMsbizy";   //Authentiation code sent by Blynk


String local_IP;


void startCameraServer();

void takePhoto()

{

  digitalWrite(LED, HIGH);
```

```
  delay(200);
  uint32_t randomNum = random(50000);
  Serial.println("http://"+local_IP+"/capture?_cb="+ (String)randomNum);
                                                    Blynk.setProperty(V1,          "urls",
"http://"+local_IP+"/capture?_cb="+(String)randomNum);
  digitalWrite(LED, LOW);
  delay(1000);
}
void setup() {
  Serial.begin(115200);
  pinMode(LED,OUTPUT);
  pinMode(Laser,OUTPUT);
  Serial.setDebugOutput(true);
  Serial.println();
  camera_config_t config;
  config.ledc_channel = LEDC_CHANNEL_0;
  config.ledc_timer = LEDC_TIMER_0;
  config.pin_d0 = Y2_GPIO_NUM;
  config.pin_d1 = Y3_GPIO_NUM;
  config.pin_d2 = Y4_GPIO_NUM;
  config.pin_d3 = Y5_GPIO_NUM;
  config.pin_d4 = Y6_GPIO_NUM;
  config.pin_d5 = Y7_GPIO_NUM;
  config.pin_d6 = Y8_GPIO_NUM;
  config.pin_d7 = Y9_GPIO_NUM;
  config.pin_xclk = XCLK_GPIO_NUM;
  config.pin_pclk = PCLK_GPIO_NUM;
  config.pin_vsync = VSYNC_GPIO_NUM;
  config.pin_href = HREF_GPIO_NUM;
```

```
 config.pin_sscb_sda = SIOD_GPIO_NUM;
 config.pin_sscb_scl = SIOC_GPIO_NUM;
 config.pin_pwdn = PWDN_GPIO_NUM;
 config.pin_reset = RESET_GPIO_NUM;
 config.xclk_freq_hz = 20000000;
 config.pixel_format = PIXFORMAT_JPEG;
.
 if(psramFound()){
  config.frame_size = FRAMESIZE_UXGA;
  config.jpeg_quality = 10;
  config.fb_count = 2;
 } else {
  config.frame_size = FRAMESIZE_SVGA;
  config.jpeg_quality = 12;
  config.fb_count = 1;
 }

 // camera init
 esp_err_t err = esp_camera_init(&config);
 if (err != ESP_OK) {
  Serial.printf("Camera init failed with error 0x%x", err);
  return;
 }
 sensor_t * s = esp_camera_sensor_get();
 // initial sensors are flipped vertically and colors are a bit saturated
 if (s->id.PID == OV3660_PID) {
  s->set_vflip(s, 1); // flip it back
  s->set_brightness(s, 1); // up the brightness just a bit
  s->set_saturation(s, -2); // lower the saturation
```

```
  }
  // drop down frame size for higher initial frame rate
  s->set_framesize(s, FRAMESIZE_QVGA);

  WiFi.begin(ssid, password);

  while (WiFi.status() != WL_CONNECTED) {
   delay(500);
   Serial.print(".");
  }
  Serial.println("");
  Serial.println("WiFi connected");

  startCameraServer();

  Serial.print("Camera Ready! Use 'http://");
  Serial.print(WiFi.localIP());
  local_IP = WiFi.localIP().toString();
  Serial.println("' to connect");
  Blynk.begin(auth, ssid, password);
}
void loop() {
  // put your main code here, to run repeatedly:
  Blynk.run();

  if((digitalRead(Laser) == HIGH)&&(digitalRead(LDR) == HIGH)){
  Serial.println("Send Notification");
  Blynk.notify("Intruder Alert!");
  Serial.println("Capture Photo");
```

```
  takePhoto();
  delay(3000);
  }

  if(digitalRead(PHOTO) == HIGH){
  Serial.println("Capture Photo");
  takePhoto();
  }
}
```

CHAPTER 4

ADVANTAGES

1. **Invisible Barrier**: Unlike traditional security systems that rely on visible physical barriers, the Laser Security Alarm System uses an invisible laser beam as its primary line of defense. This creative approach makes it difficult for potential intruders to detect and circumvent the security system, providing an element of surprise and increasing the overall effectiveness of the system.

2. **Real-Time Image Capture**: The integration of the camera module in the Laser Security Alarm System enables real-time image capture upon detecting an intrusion. This creative advantage provides visual evidence of the security event, which can be crucial for identification, evidence gathering, and subsequent actions. It allows for better situational awareness and assists in post-incident analysis.

3. **Mobile Connectivity**: The integration of the Blynk IoT app allows users to receive real-time notifications and remotely monitor the security system on their mobile devices. This creative advantage offers convenience and flexibility, enabling users to stay connected and informed about security events from anywhere. It empowers users to take immediate actions, such as contacting authorities or neighbors, in response to alerts.

4. **Customization and Expandability**: The Laser Security Alarm System offers a high level of customization and expandability. Users can tailor the system to their specific security needs by adjusting parameters such as the sensitivity of the LDR module or integrating additional components for enhanced functionality

DISADVANTAGES

1. **False Alarms**: The Laser Security Alarm System may be susceptible to false alarms triggered by environmental factors such as animals, strong winds, or sudden changes in lighting conditions. These false alarms can lead to unnecessary disturbances, potentially causing inconvenience and desensitizing users to genuine security events.

2. **Limited Range and Coverage**: The effectiveness of the Laser Security Alarm System is dependent on the range and coverage of the laser beam. In larger or outdoor spaces, maintaining a consistent and extensive coverage area may be challenging. The system may require additional laser modules or complex positioning to ensure comprehensive coverage, increasing the complexity and cost of implementation.

3. **Vulnerability to Laser Interference**: Laser-based security systems like the Laser Security Alarm System can be susceptible to interference from external lasers. Intruders with knowledge of the system's operation could potentially disable or manipulate the alarm system by projecting a laser onto the LDR module, resulting in false readings or the system being bypassed altogether.

4. **Environmental Limitations**: The Laser Security Alarm System may be influenced by environmental factors such as fog, rain, or dust particles, which could interfere with the laser beam and affect the system's accuracy and reliability. Extreme weather conditions or environmental obstructions could further impact the system's performance, reducing its effectiveness in certain situations.

CHAPTER 5

RESULT

The Laser Security Alarm System offers an innovative and efficient solution for enhancing security measures. By utilizing an invisible laser beam, real-time image capture, mobile connectivity, customization options, and integration capabilities, it provides a unique approach to security. However, potential challenges such as false alarms, limited range and coverage, vulnerability to laser interference, environmental limitations, and associated costs should be carefully considered during implementation. Overall, the Laser Security Alarm System presents a creative solution that combines advanced technology with personalized customization for improved security outcomes.

CHAPTER 6

FUTURE SCOPE

The future scope for the Laser Security Alarm System holds exciting possibilities for further advancements in security technology. One potential area of growth lies in enhancing the system through advanced machine learning algorithms, enabling it to learn from previous data and make more accurate predictions. Integration with artificial intelligence (AI) can empower the system to autonomously adapt to evolving security needs and respond proactively to potential threats. Additionally, incorporating advanced image recognition and facial recognition technologies can improve identification and verification processes. The integration of multi-layered security measures, such as motion sensors, biometric access control, and video analytics, can create a comprehensive and robust security ecosystem. Cloud integration and data analytics offer opportunities for secure storage, real-time monitoring, and actionable insights, enabling proactive threat detection. Lastly, focusing on energy efficiency and sustainability aspects can lead to the development of eco-friendly security solutions that optimize power consumption and minimize environmental impact. These future advancements hold the potential to revolutionize security systems and provide even greater protection for residential and commercial environments.

CHAPTER 7

CONCLUSION

The Laser Security Alarm System presents a unique and innovative approach to enhancing security measures. With its invisible laser barrier, real-time image capture, mobile connectivity, and potential for future advancements, it offers a versatile solution for personalized and effective security. While there may be challenges and areas for improvement, the system's capabilities and potential for customization make it a valuable asset in strengthening security infrastructure. Overall, the Laser Security Alarm System represents a promising advancement in security technology with the potential to provide enhanced protection and peace of mind.

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