Project Report

Name: Face recognition system using ESP32

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Class: SYBSc(CS)

INTRODUCTION

In the modern world, security has become a major concern, and traditional lock-and-key mechanisms are no longer sufficient to ensure safety. With advancements in technology, smart security systems have gained popularity due to their convenience and effectiveness. One such innovation is the ESP32-CAM Smart Lock, which utilizes facial recognition to grant access, eliminating the need for physical keys or passwords.

This project is designed to enhance home and office security by integrating an ESP32-CAM module, a servo motor, a relay module, and an SD card for image storage. The ESP32-CAM is a powerful microcontroller with an in-built camera, making it ideal for image processing and recognition tasks. When a person attempts to access the system, the camera captures an image, processes it, and compares it with stored facial data. If a match is found, the servo motor activates, unlocking the door; otherwise, access is denied.

Working

1. The ESP32-CAM captures a live video stream.

2. When a person approaches, the system takes a still image.

3. The image is processed for face detection.

4. If the face matches the stored data, the servo motor rotates to unlock the door.

5. The image is stored in the SD card for logging.

6. If no match is found, the lock remains closed, and an alert can be triggered using the relay module.

ADVANTAGES

Contactless and secure authentication.

Cost-effective compared to commercial smart locks.

Can be integrated with IoT for remote monitoring.

Logs entry attempts for security tracking.

DISADVANTAGES

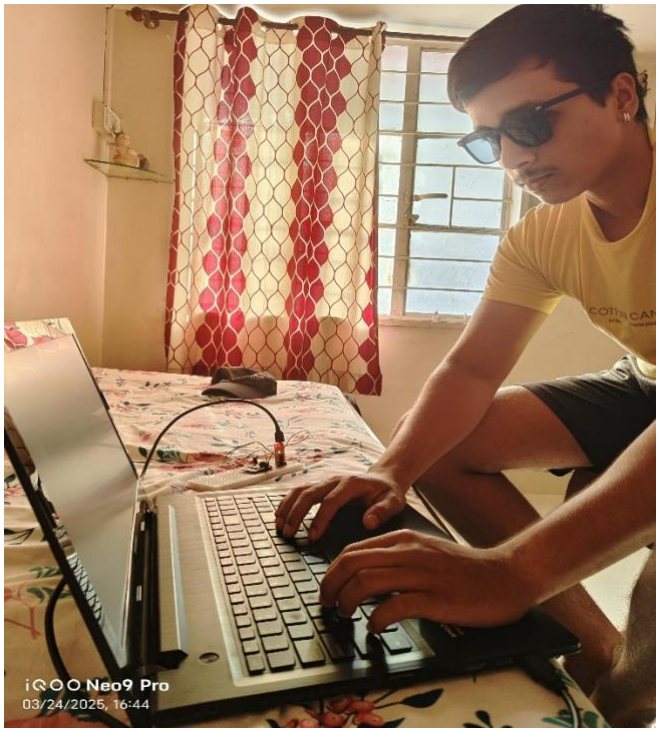
Requires good lighting for accurate recognition.

Processing power limitations of ESP32-CAM.

May have delays depending on WiFi and face-matching speed.

Limited storage capacity on SD card.

IMAGES


iQOO Neo9 Pro
03/24/2025, 16:44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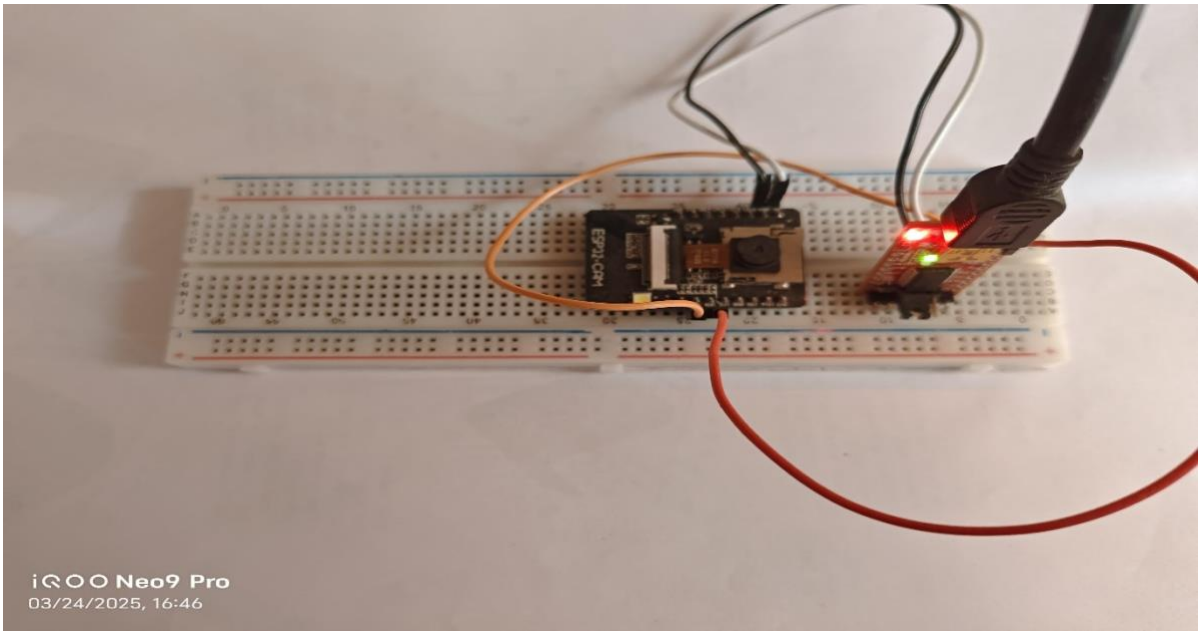
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Applications

Home security systems.

Office and industrial access control.

Attendance tracking in schools or workplaces.

Secure storage lockers.

QUESTIONS

1. What is the main purpose of the ESP32-CAM Smart Lock system?
2. How does the ESP32-CAM capture and process images for face recognition?
3. What role does the servo motor play in the smart lock mechanism?
4. Why is an SD card used in this project, and what data does it store?
5. How does the relay module contribute to the system's functionality?
6. What are the key advantages of using a facial recognition-based locking system?
7. What challenges or limitations does the ESP32-CAM face in real-world applications?

8. How does the system handle an unrecognized face or authentication failure?
9. Can this project be integrated with other IoT devices for enhanced security?
10. What improvements or additional features can be added to this project in the future?