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AI POWER SMART EXAM INVIGILATION USING ESP-32 CAM

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ABSTRACT

The ESP32-CAM based AI-powered smart exam invigilation system is an advanced solution designed to improve security, fairness, and monitoring during examinations. Traditional exam invigilation methods require continuous human supervision and may lead to errors, malpractice, and increased workload. This system uses the ESP32-CAM module along with Artificial Intelligence (AI) techniques to automatically monitor students during exams in real time. The camera captures live video streams and detects suspicious activities such as mobile phone usage, multiple faces, head movement, cheating behavior, or absence from the seat. The collected data can be processed using machine learning and computer vision algorithms to generate alerts and maintain exam integrity.

KEYWORDS: AI-based Invigilation, Smart Exam Monitoring, ESP-32CAM, IOT, Face Detection, Camera Module

INTRODUCTION

With the rapid growth of the Internet of Things (IoT), smart systems are transforming traditional security solutions into intelligent, automated systems. Conventional CCTV surveillance systems require continuous human monitoring and suffer from limitations such as blind spots and delayed response

The Smart Surveillance System using ESP32 Camera addresses these issues by integrating IoT and embedded systems to provide: Real-time video streaming,Motion detection, Remote monitoring,Automated .

MATERIALS AND METHODS

Hardware

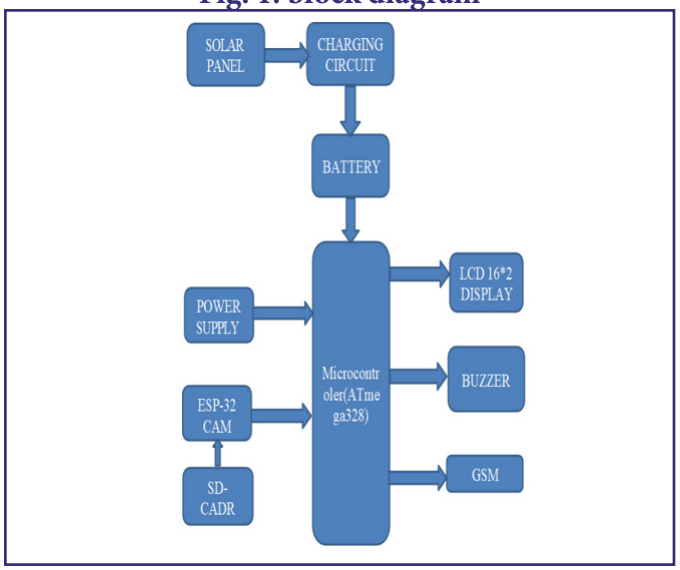
- ESP32-CAM Module :Main microcontroller with inbuilt camera for video monitoring and image capture.
- Breadboard – Helps in temporary circuit connections and testing
- Image Capturing:The ESP32-CAM captures real-time images and videos of students during the examination process.
- Material-ESP32-CAM,Jumper Wires,Breadboard,USB Cable,Power Supply

Core Method / Workflow

- System Initialization: The ESP32-CAM is connected to the Wi-Fi network and initialized using the Arduino IDE program
- Image and Video Capture:The ESP32-CAM continuously captures real- time images and video streams of students during the examination

Research Paper

Fig. 1: block diagram



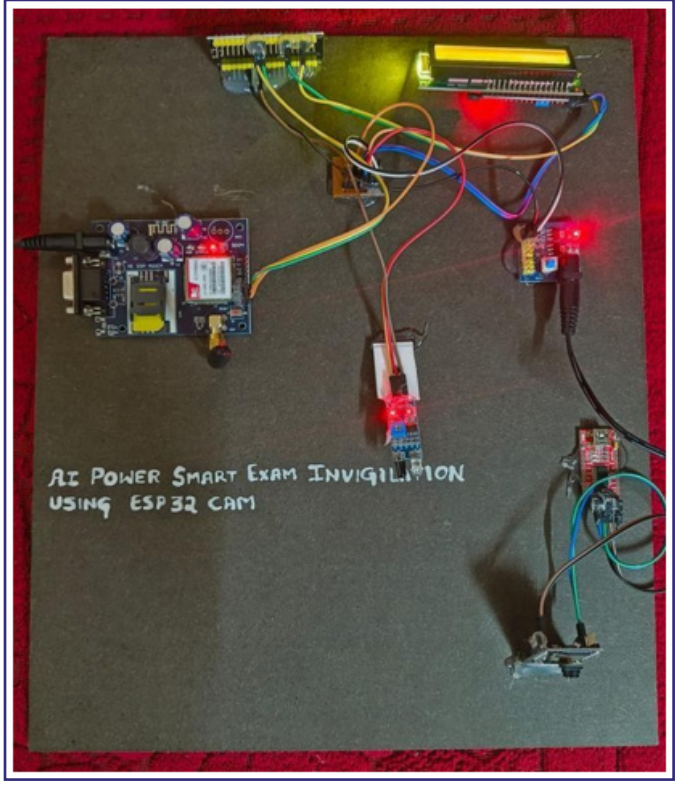
DISCUSSION

The AI-powered smart exam invigilation system using the ESP32-CAM is designed to improve the efficiency and reliability of examination monitoring. Traditional invigilation methods require continuous human supervision, which can sometimes lead to errors, unfair practices, or difficulty in monitoring large examination halls. This project addresses these challenges by integrating artificial intelligence and real-time camera monitoring into a compact and afordable system.

One of the major advantages of this system is its low cost and easy implementation compared to advanced surveillance systems. It also reduces the workload of invigilators and supports automated monitoring in both offline and online examinations. However, the project may face limitations such as internet dependency, lighting conditions, camera angle issues, and processing limitations of the ESP32-CAM module.

The result of the IoT-based Smart Invigilation System project demonstrates a successful implementation of automation and monitoring features using ESP32-CAM and sensors. The system effectively detects unusual student behavior through motion detection and camera-based monitoring, sends alerts to the invigilator through network communication, and provides realtime video streaming for continuous observation of the examination environment. Real-time data is transmitted to the monitoring interface, allowing remote supervision and instant notifications. Movement detection and image capturing systems function reliably, triggering immediate alerts to ensure examination integrity.The integration of IoT enhances the overall monitoring process by providing timely information and critical updates during examinations.The project further demonstrated scalability, as the same framework can be extended to commercial laundries, hostel facilities, hotels, and smart home applications

Fig. 2: Working Model



CONCLUSIONS:

The ESP32-CAM based AI-powered smart exam invigilation system provides an efficient and modern This system can automatically detect suspicious activities such as unauthorized movements, multiple faces, or absence of students, reducing the dependency on continuous human supervision. It also improves accuracy and saves time for exam authorities. Overall, the AI-powered smart exam invigilation system using ESP32-CAM

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time video monitoring, the smart exam invigilation using the ESP32-CAM. We are system helps reduce malpractice, improve transparency, thankful to our guide, faculty members, and institution for and support fair examination practices. The ESP32-CAMtheir valuable guidance, encouragement, and technical module makes the project cost-effective, compact, and support throughout the project development.easy to implement in schools, colleges, and online examination environments.

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