

Biometric and Iot Integrated Smart Locked System for Question Paper Protection

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Abstract

This project presents an IoT-based smart security and monitoring system that integrates fingerprint authentication, GPS tracking, ESP-CAM surveillance, and a cloud dashboard. The system allows only authorized users to access the device using a fingerprint sensor. Once verified, a servo motor unlocks the system. An ESP-CAM module provides live monitoring, while the GPS module sends real-time location data. All information such as access status, location, and camera monitoring can be viewed remotely through a Blynk IoT dashboard using an IP address connection. The LCD display shows important system information locally. Notifications with location and camera monitoring are sent to authorized users if unauthorized access attempts occur.

Keywords: Internet of Things (IoT), Fingerprint Authentication, ESP32-CAM, GPS Tracking, Smart Security System, Blynk IoT Dashboard, Remote Monitoring, Embedded Systems

1. Introduction

- In today's world, security plays a vital role in protecting sensitive information and valuable assets, especially in environments such as examination centers, offices, and restricted areas. Traditional security systems mainly rely on keys, passwords, or RFID cards, which can be easily lost, stolen, or duplicated. These systems also lack real-time monitoring, remote access, and immediate alert mechanisms, making them less reliable in modern applications
- With the rapid advancement of the Internet of Things (IoT), it has become possible to design intelligent security systems that provide enhanced protection and monitoring capabilities. IoT enables the integration of various hardware components such as sensors, cameras, and communication modules with cloud platforms, allowing users to monitor and control systems remotely.
- The proposed IoT-enabled smart examination paper security system is designed to overcome the limitations of conventional systems. It uses fingerprint authentication to ensure that only authorized users can access the system. Additionally, the integration of an ESP32-CAM module allows real-time video monitoring, while the GPS module provides accurate location tracking.
- The system also includes a cloud-based IoT platform (Blynk) for remote monitoring and control. Users can view system status, access information, and receive instant notifications in case of unauthorized

access attempts. An LCD display is used to show system information locally.

- Overall, this system enhances security, improves monitoring efficiency, and provides a reliable solution for modern access control and surveillance applications.

2. Literature Survey

- Security of sensitive information, particularly in examination systems, has become a major concern due to increasing incidents of unauthorized access and data leakage. Several researchers have proposed different methods to enhance security and ensure safe handling of confidential materials.
- M. Uma Rani et al. (2025) developed an electronic protection system aimed at preventing exam paper leakage. Their approach incorporates multiple authentication techniques such as fingerprint recognition, passwords, and OTP verification. This multi-level security mechanism ensures that only authorized users can access the system. The study demonstrates that combining biometric authentication with other verification methods significantly improves the reliability and effectiveness of security systems.
- J. W. Githaiga (2015) investigated the prevalence and effects of examination cheating and paper leakage. The research highlights that traditional security systems, which rely mainly on manual processes and basic authentication, are insufficient in preventing malpractice. The findings emphasize the need for advanced technological solutions that can provide better monitoring and control over access to examination materials.
- Kinyua and Mureithi (2019) studied the impact of exam leakage on academic performance. Their work reveals that such malpractices negatively affect fairness and student evaluation. The study concludes that secure systems are essential to maintain integrity and trust in the education system.
- In summary, the reviewed literature clearly indicates the importance of implementing modern security techniques such as biometric authentication, real-time monitoring, and automated access control systems. These technologies can effectively overcome the limitations of traditional systems and provide a more secure and reliable solution.

3. Existing System

- In traditional security systems, access is usually controlled using keys, passwords, or RFID cards. These systems do not provide real-time monitoring or location tracking. Most conventional systems also lack remote access capabilities and cannot send alerts when unauthorized access occurs.
- Camera monitoring is often not integrated with the access control system, making it difficult to verify the identity of the user. The user cannot track the device or its location through any IoT platform.
- These systems work independently without cloud connectivity or centralized monitoring, which reduces their efficiency and overall security.

4. Proposed System

- The proposed system integrates fingerprint authentication, ESP-CAM monitoring, GPS tracking, LCD display, and a Blynk IoT cloud dashboard.
- Only registered fingerprints can unlock the system, which controls a servo motor for locking and unlocking. The ESP-CAM module provides live camera monitoring through an IP address.

- The GPS module continuously sends the location to the IoT dashboard and displays it on the LCD screen.
- Notifications are sent to authorized users whenever access occurs or when an unauthorized attempt is detected.
- The entire system can be monitored remotely through the internet, improving security and control.

5. Block Diagram



Fig. 1. Block diagram of the Existed IoT enabled smart examination paper security system.

6. Modified Architecture

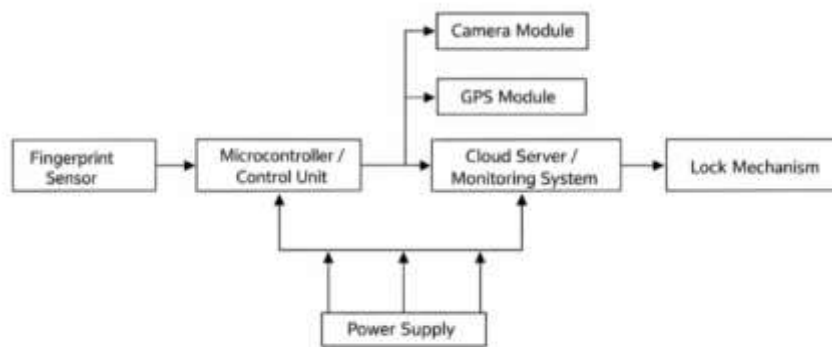


Fig. 2. Modified IoT Enabled Smart Examination Security System

7. Conclusion

- The IoT-based smart secure access monitoring system provides an effective solution for modern security requirements. By combining fingerprint authentication, camera surveillance, GPS tracking, LCD monitoring, and IoT cloud connectivity, the system ensures secure and reliable access control.
- The integration of ESP-CAM allows users to monitor activities remotely, while the GPS module provides accurate location information. Notifications and alerts help users respond quickly to unauthorized access attempts.
- The system also improves convenience by allowing remote monitoring through the Blynk IoT platform. Overall, the project demonstrates how IoT technology can enhance security, monitoring, and automation in various environments.
- With further improvements and integration of advanced technologies, this system can become a powerful solution for smart security applications.

8. Future Scope

- In the future, this system can be improved by integrating advanced technologies such as face recognition along with fingerprint authentication for dual security. Artificial intelligence and machine

learning algorithms can be used to detect suspicious activities automatically.

- Cloud storage can be added to store captured images and video recordings from the ESP-CAM for later analysis. A dedicated mobile application can be developed to provide a better user interface for monitoring and control.
- The system can also be integrated with smart home automation systems to control lights, alarms, and other appliances. Additional sensors such as motion sensors, fire sensors, and gas sensors can be included to improve safety and monitoring.
- The project can also support multiple user roles with different access permissions. Integration with Google Maps can help users easily view the real-time GPS location.
- Future versions can also include battery backup and solar power support for uninterrupted operation.

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