Next Generation ATM: Biometric and Face Authentication for Secure Banking

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Abstract: *The advancement of banking security systems is crucial in mitigating fraud and ensuring user confidence in financial transactions. This study presents a prototype for a Next Generation Automated Teller Machine (ATM) that enhances security through biometric and facial authentication using readily available hardware components: Arduino, a laptop webcam, an RFID sensor, RFID tags, and an R307 fingerprint sensor. The RFID tag and sensor ensure secure cardless transactions, while the fingerprint sensor(Fingerprint Scanning) and face recognition algorithm (utilizing the laptop webcam) verify the user's identity. The Arduino board integrates and processes data from these sensors, ensuring secure and accurate authentication. Traditional ATM security mechanisms, such as PIN codes and debit cards, have inherent vulnerabilities that can be exploited by malicious actors. To address these challenges, the proposed system integrates multi-factor authentication combining RFID technology, fingerprint biometrics, and facial recognition. The RFID sensor and tag facilitate the initial user identification, while the R307 fingerprint sensor and laptop webcam ensure that only authorized users can access the ATM services. This abstract outlines the development and functionality of the system, emphasizing its potential to significantly reduce unauthorized access and transaction fraud. The implementation involves interfacing Arduino with the various sensors to create a robust and efficient security solution. This study also discusses the challenges related to hardware integration, real-time data processing, and the reliability of biometric verification in various conditions. The proposed system represents a step forward in secure banking technology, utilizing affordable components to create an ATM prototype that can serve as a model for future developments in the banking industry. The implementation could lead to increased security, user convenience, and trust in ATM transactions, paving the way for broader adoption of biometric authentication in financial systems. This next-generation ATM system enhances banking security, prevents unauthorized access, and provides a seamless user experience. The proposed system can be easily integrated with existing ATM infrastructure, making it a viable solution for secure banking transactions.*

Keywords: Biometric Authentication, Face Recognition, Arduino-based Banking Security, Laptop Webcam Integration, RFID Sensor and Tag,R307 Fingerprint Sensor, Secure ATM Transactions, Multi-factor Authentication, Arduino Security Systems, Real-time Face Authentication, Contactless ATM Access, Biometric Access Control, RFID-enabled ATM Security, Embedded Systems in Banking, ATM Fraud Prevention, IoT ,Microcontroller-based ATM Security.