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ATM THEFT DETECTION AND AUTO ARRESTING AND INTIMATION SYSTEM

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ABSTRACT

ATM (Automated Teller Machine) theft has become a growing concern, leading to significant financial losses and security threats. To address this issue, we propose an Arduino Microcontroller-based ATM Theft Detection and Prevention System that efficiently detects unauthorized access and takes immediate action to prevent robbery. The system is designed to monitor real-time data from vibration and MEMS (Micro-Electro-Mechanical System) sensors, ensuring that any attempt to tamper with the ATM is promptly identified.

The system operates by continuously analyzing sensor data for unusual vibrations or movements. If suspicious activity is detected, the buzzer is immediately activated, producing a loud alarm to alert people nearby. Simultaneously, a DC motor, acting as the ATM door, is triggered to close, preventing the intruder from accessing the cash vault. This physical obstruction serves as a deterrent and delays the robbery attempt, increasing the chances of law enforcement intervention.

To enhance ATM security, the system integrates vibration and MEMS sensors to detect unauthorized access. Under normal conditions, the LCD display shows "ATM Security ON", and the motor remains operational. When an intrusion is detected, the buzzer activates, the motor stops immediately, and the LCD updates to "Intrusion Alert!". A GSM module sends a message to the nearest police station and bank authorities for quick intervention. The Arduino Uno board is programmed using Embedded C in Arduino IDE, with Proteus for simulation. The L293D motor driver ensures reliable motor control. By combining real-time detection, automatic motor stoppage, a buzzer alarm, and GSM (Global System for Mobile)-based messaging, this proactive security system effectively prevents ATM theft and ensures rapid response.

INTRODUCTION

Automated Teller Machines (ATMs) provide essential banking services, allowing customers to perform transactions conveniently. However, ATMs are frequently targeted by criminals for theft and vandalism, resulting in financial losses and infrastructure damage. Traditional security measures often rely on surveillance cameras and alarms, which may not be sufficient to prevent theft in real time. To enhance ATM security, this project proposes an Arduino-based ATM Theft Detection and Auto Arresting & Intimation System, designed to detect, obstruct, and notify authorities about theft attempts immediately.

The system works by continuously monitoring real-time data from vibration and MEMS sensors. These sensors detect any unauthorized attempts to tamper with or physically damage the ATM. If a theft attempt is detected, the system takes immediate preventive action by activating a buzzer alarm and stopping a DC motor, which acts as a

security mechanism to obstruct further intrusion. This mechanism serves as a deterrent and delays the robbery attempt, increasing the chances of the intruder being caught.

To ensure quick response from law enforcement, the system integrates a GSM module, which instantly sends an alert message to the nearest police station and corresponding bank authorities, informing them about the attempted robbery. Additionally, a 16x2 LCD display provides real-time status updates, such as "ATM Secure" during normal operation and " Intrusion alert!" when an intrusion is identified. The project is developed using Arduino IDE with Embedded C for programming and Proteus for schematic design and simulation. The L293D motor driver controls motor operation effectively. Sensor-based detection ensures real-time monitoring, while automated alerts and a buzzer alarm enhance security. Upon detecting intrusion, the motor stops, and a GSM module sends alerts to authorities. The LCD display updates the status in real time. This automated theft detection system improves ATM security.

The system operates in a loop, where the Arduino constantly checks sensor inputs. If tampering or movement is detected, it immediately activates the buzzer, locks the ATM door, sends an alert via GSM, and updates the LCD display. This real-time response mechanism ensures that unauthorized access is prevented and security personnel are informed promptly.

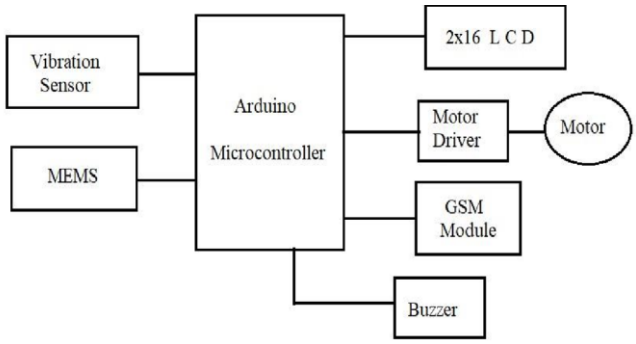


Figure.1 Block Diagram

LITERATURE SURVEY

ATM theft has become a serious issue, leading to significant financial losses and security threats. Criminals employ various techniques such as brute force attacks and explosive break-ins to gain unauthorized access to ATMs. To combat these threats, researchers have developed security solutions incorporating both hardware and software-based technologies. Traditional security measures, including CCTV surveillance, biometric authentication, and alarm systems, have been implemented to enhance ATM safety. However, these methods often fail to prevent physical break-ins, necessitating the need for advanced real-time detection and prevention systems.

Recent developments in embedded systems have facilitated the integration of various sensors such as vibration and MEMS (Micro-Electro-Mechanical System) sensors, enabling effective detection of unauthorized tampering. Studies have demonstrated that vibration sensors are capable of identifying mechanical tampering attempts like drilling or hammering. Additionally, MEMS sensors provide extra security by detecting changes in acceleration and angular motion, which are indicative of forced entry. The incorporation of these sensors in ATM security systems enhances real-time monitoring and improves the chances of preventing theft attempts.

PROPOSED SYSTEM

The proposed ATM security system utilizes an Arduino microcontroller to monitor and secure ATMs from theft. The system uses a combination of sensors and actuators to detect tampering, lock the ATM door (which is controlled by a DC motor), and send real-time alerts. The system incorporates an L293D motor driver to control the DC motor, which physically operates the ATM door. Additionally, MEMS sensors and vibration sensors are used to detect tampering, while the GSM module sends alerts to authorities, and the LCD screen displays real-time status.

This system provides a robust and cost-effective solution for ATM security. By using MEMS and vibration sensors, DC motor control, and real-time alerts via GSM, the system ensures rapid detection of tampering and locks the ATM door. The 16x2 LCD display offers continuous feedback, ensuring the system's status is always visible. This methodology enhances ATM security while remaining affordable and efficient.

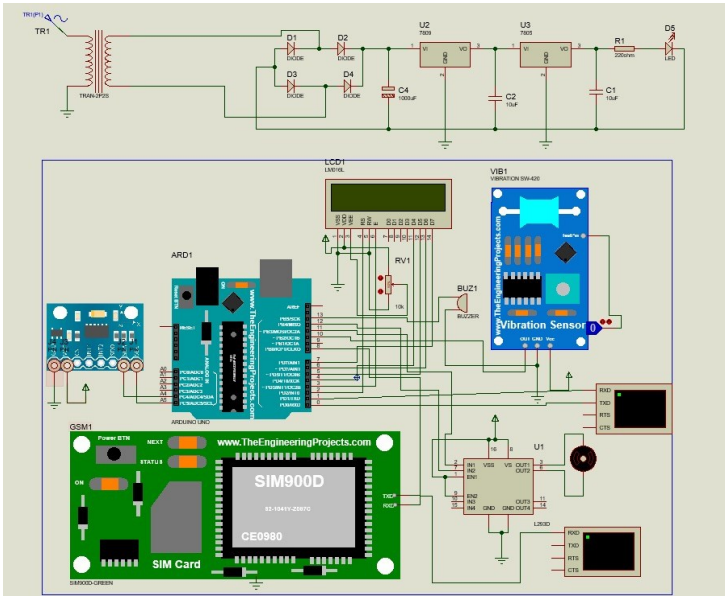


Figure.2 Schematic Diagram

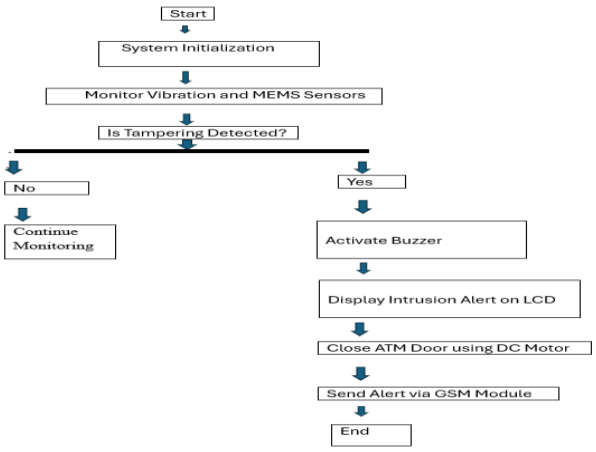


Figure.3 Flow Chart

RESULTS

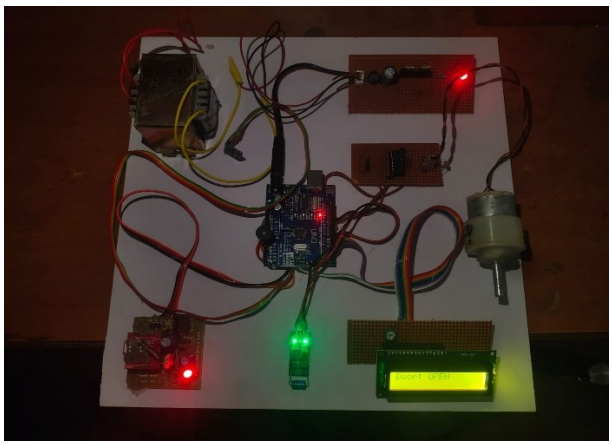


Figure.4 Normal Condition

In normal condition the motor will rotate and displays Door: open in LCD and all the components will start initialize. The GSM module is having a sim card so that the message will be sent to the authorities and to the respective bank. The vibration and MEMS sensors are in on state and continually monitors the data these sensors are analog and digital in monitoring data. MEMS is analog and Vibration sensor is digital.

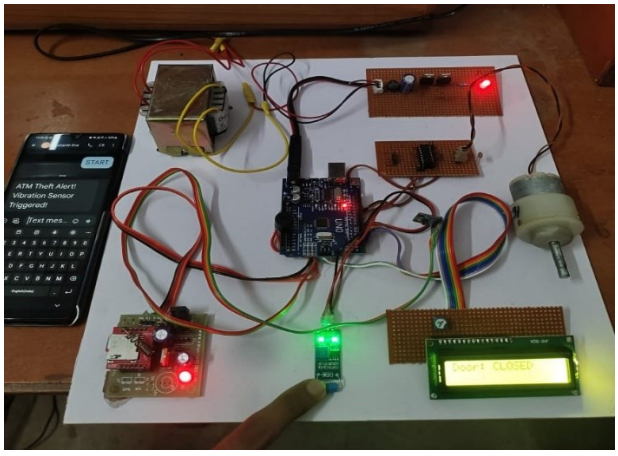


Figure.5 Vibration detection and alarm trigger

When the vibration sensor detects any abnormal activity, the system triggers the buzzer to alert nearby individuals. This serves as an immediate indication of a potential theft attempt, notifying anyone in the vicinity of suspicious activity. Simultaneously, the system commands the DC motor to close the ATM door.

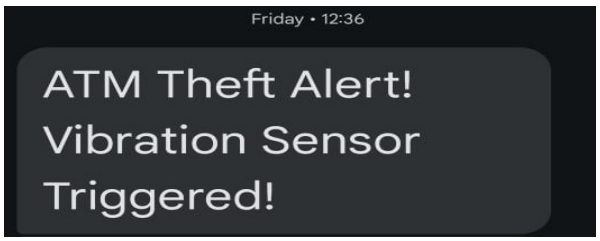


Figure.6 Vibration detection SMS sent in real time

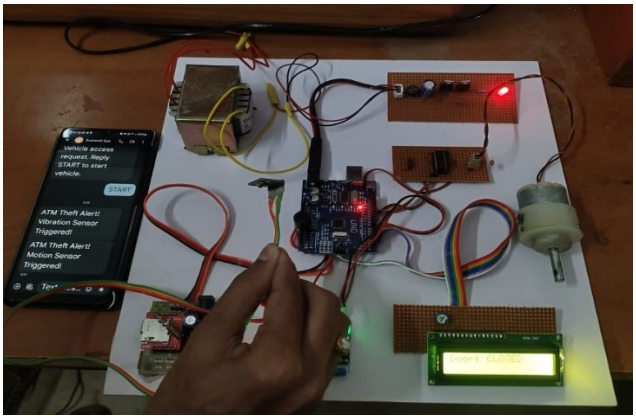
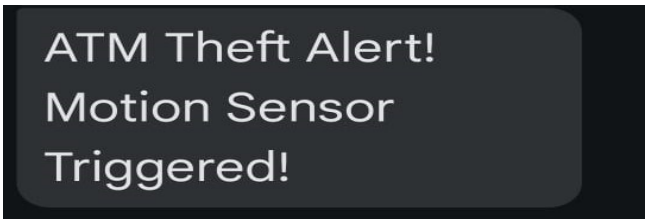


Figure.7 MEMS sensor detection and alarm trigger

The MEMS sensor, which is highly sensitive to minute physical changes, detects subtle vibrations that may occur during a theft attempt. This dual-sensor approach ensures higher accuracy in detecting tampering or break-in attempts. The MEMS sensor adds an additional layer of precision to the ATM theft detection and auto arresting and intimation system. MEMS sensors can sense acceleration and changes in position along x, y, and z axes. Any unusual movement, such as an attempt to open the ATM, is detected by the sensor.



. Figure.8 Motion detection SMS sent in real time

When movement is detected by MEMS sensor then GSM module will send SMS to authorities in real time and locks the ATM door

ADVANTAGES

- **Reduced Emergency Response Time –** Ensures ambulances reach hospitals faster by minimizing traffic delays at signals.
- **Automated Traffic Management –** Uses RF communication to control signals without human intervention, improving efficiency.
- **Minimizes Traffic Congestion –** Dynamically adjusts signals to create a clear path for emergency vehicles without disrupting overall traffic flow.
- **Improved Road Safety –** Reduces accidents by preventing unnecessary lane switching or aggressive driving by ambulances.
- **Cost-Effective Solution –** Uses existing RF and traffic light infrastructure, making implementation affordable.
- **Scalability –** Can be integrated into smart city systems with IoT and GPS for future enhancements.

APPLICATIONS

- **Urban Traffic Management –** Ensures ambulances can pass through congested city roads efficiently.
- **Smart City Infrastructure –** Can be integrated with IoT and cloud-based traffic monitoring for real-time control.
- **Hospital Emergency Response –** Improves patient survival rates by reducing transit delays.
- **Law Enforcement and Fire Rescue –** Similar priority systems can be used for police and fire trucks in emergencies.
- **Highway and Expressway Management –** Can be extended to major highways to ensure uninterrupted ambulance movement.
- **Disaster and Crisis Management –** Useful in flood-prone or earthquake-affected regions where emergency response is crucial.
- **Autonomous and AI-Based Traffic Systems –** Can be linked with AI-based traffic prediction models for enhanced decision-making.

CONCLUSION

The "ATM Theft Detection and Auto Arresting and Intimation System" offers a robust security solution by integrating Arduino Uno, MEMS sensors, vibration sensors, DC motor, GSM module, buzzer, LCD display, and L293D motor driver. The Arduino Uno processes data from sensors, detecting abnormal vibrations and triggering preventive actions, such as activating a buzzer and locking the ATM door using the L293D motor driver. The L293D ensures efficient motor control, allowing the system to securely lock and unlock the ATM door. The GSM module sends an SMS to the nearest police station and bank authorities in case of intrusion, while the LCD display provides real-time status updates. By using MEMS and vibration sensors, the system accurately detects tampering or physical movement around the ATM. This Arduino-based system is a cost-effective, scalable, and reliable solution to enhance ATM security and reduce the risk of theft.

Future Scope:

1.Advanced Sensor Integration:

- Infrared Sensors & Motion Detection: Enhance detection accuracy by integrating infrared and motion detectors to detect unauthorized movement around the ATM.
- Face Recognition: Add a camera module for face recognition to identify suspects and provide law enforcement with stronger evidence.

2. Improved Communication:

- Wi-Fi/IoT Integration: Replace GSM with Wi-Fi or IoT modules for faster communication, enabling real-time alerts via email, mobile apps, or cloud-based platforms.
- Cloud Data Storage: Use the cloud for storing sensor data and generating detailed incident reports for future analysis.

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