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Advanced ATM Security based on Occluded Image Processing

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Abstract: *An ATM is an automatic teller machine that verifies user information using an ATM card reader before dispensing the necessary amount of cash at anytime, anyplace, and even without contacting the bank. Currently, all banks offer a significant number of ATMs for use by the general public. The protection of these machines from theft and robbery presents a significant difficulty. The primary goal of this project is to offer high levels of security against theft. The project's major goal is to secure the current ATM system by detecting and identifying the offender through the use of vibration sensors, chemical spray, and occluded (masked) image processing techniques.*

Keywords: ATM, Vibration sensor, Chemical spray, Occluded image

I. INTRODUCTION

Automated Teller Machines, or ATMs, are computerized tools that let users manage their own financial transactions. It fulfils a vital function in daily life by doing away with the need for human tellers. ATMs were first introduced to India by HSBC in 1987, revolutionizing banking services. ATMs are increasingly offered at retail establishments and airports in addition to their usual locations in banks, credit unions, and other financial organizations. Customers can conveniently make cash withdrawals, deposits, balance checks, money transfers, and other financial transactions. Modern banking has grown significantly more efficient and accessible thanks in large part to the widespread use of ATMs.

ATMs are crucial because they give users a quick and easy way to access their accounts and complete a variety of transactions without having to go to a bank branch or speak to a teller. Checking account balances, taking cash out, depositing cash or checks, moving money between accounts, paying bills, changing PINs, and requesting account statements are some of these transactions. By enabling people to manage their funds independently, self-service alternatives offered by ATMs have revolutionized banking. Due to their broad accessibility, ATMs have established themselves as essential components of contemporary life, enabling users to manage a variety of banking operations easily and safely.

In many places, ATMs are employed to offer convenient access to banking services. ATMs can frequently be found in the following locations:

- Banks: Customers can conduct transactions without a teller's assistance thanks to ATMs, which are frequently found in bank branches.
- Credit Unions: Much like banks, credit unions offer their members access to their accounts through ATMs.
- Financial Institutions: Other financial institutions, such as investment businesses, insurance companies, and brokerage houses, frequently have ATMs available.
- Retail businesses: As a convenience for their consumers, many retail businesses provide ATMs, enabling people to withdraw cash or complete certain transactions while shopping.
- Airports: Travelers can frequently visit ATMs at airports to withdraw cash or use other financial services.
- Shopping Centers: Large shopping centers or malls frequently have ATMs for shoppers' convenience.
- Gas Stations: Some gas stations have ATMs on their premises to provide cash withdrawal options to customers.
- Convenience Stores: Certain convenience stores may have ATMs available for customers' use.

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Overall, ATMs are designed to be easily accessible, and they can be found in a variety of locations to cater to the needs customers in different situations.

ATMs are highly required for several reasons:

1. Convenience: ATMs provide a convenient way for customers to access their accounts and perform various transactions at any time, even outside of traditional banking hours. They eliminate the need to visit a bank branch or rely on the availability of a human teller.
2. Accessibility: ATMs are widely available in multiple locations, making banking services accessible to individuals in urban and remote areas alike. This accessibility ensures that customers can manage their finances regardless of their location.
3. Time-saving: With ATMs, customers can quickly perform transactions such as cash withdrawals, deposits, and transfers without waiting in long teller queues. This saves valuable time, especially during busy periods.
4. 24/7 Availability: ATMs are available 24 hours a day, seven days a week, providing round-the-clock access to banking services. This is particularly beneficial for individuals who work irregular hours or need immediate access to cash or other transactions outside of normal business hours.
5. Privacy and Security: ATMs offer a secure and private environment for customers to conduct transactions. They typically include security features such as PIN codes, encryption, and surveillance cameras, ensuring the confidentiality and safety of customer information.
6. Self-Service Options: ATMs empower customers to take control of their financial transactions. They can check account balances, request account statements, change PINs, and perform other transactions independently, reducing the reliance on bank personnel for routine tasks.

In whole, ATMs are essential because they give users a quick, easy, secure, and time-saving way to manage their money on their own, improving the whole banking experience

II. LITERATURE REVIEW

Rishabh Gupta et.al proposed "Advance ATM security system" (2022), which provides surveillance and protects the ATM from the intruders. It is MCU ESP 8266 based project with different sensors, LCD display, alarm etc. Solar panels are used in case of no electricity. Live threat detection system is implemented.IR LED works as a receiver, IR sensor only detects infrared radiation. Node MCU is the basic backbone of the project.

Deepak Kumar et.al proposed "IoT Based Smart Framework for ATM security with electricity saver"(2022), with the help of Arduino uno kit, IR and vibration sensor. Arduino uno kit R3 microcontroller provide interface between sensor and other end devices, it also stores programs. Servo motors help in closing and opening of the door. LED lights are used for the purpose of light, inside the ATM.

Dr. P M Dinesh et.al proposed "Multi-level safe security system for ATM using face Recognition and GSM Module"(2021), one time password module, LDR and motion detection module with IoT, with an Automatic lock system and usage of vibration Sensors to detect the theft and an alert message to be sent when an unusual event takes place using GSM Module.

K Gavaskar et.al proposed "A novel Design and Implementation of IoT based real- Time ATM Surveillance and Security System"(2021), GPS with Automatic door lock System and Buzzer alarm. The author has introduced mobile application through which Sprayer can be operated. There is a Camera [ESP32] for live a transmission of Video.

Prajakta S. Patil et.al proposed "ATM Surveillance and security using image processing" (2020). Face recognizing algorithm to unlock the door. system provides better security and low cost. IoT is used and time saving also done. Live streaming of video is done through camera to internet connected device. SWH42O (Vibration sensor), accelerometer, ultrasonic sensor and DHT11 sensor perceive theenvironment of the ATM booth.

B. Saranraj proposed "ATM Security using Arduino"(2020), by considering an example of biometric authentication. Uses RFID tag rather than ATM card, of with the help ARDUINO NANO, he also uses fingerprint sensor for enhancing security. One time OTP this allows the user to withdraw the money.

Ramesh Kumar. P et.al proposed" Automatic teller machine theft detection and location tracking using GSM and GPS module"(2019), Arduino helps to monitor the status and movement detected by the vibration sensor. If frequency range is >15000 Hz buzzer alert is created. DC motor is used for automatically closing the door. Author also proposed an

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application that is developed to analyser feedback of users using SIM900A GSM module and uses liquidator chloroform to spread the chloroform to make the intruder unconscious. This prototype model can be incorporated into design of new ATM.

V. Prasanan et.al proposed an" IoT based ATM maintenance and security system "(2019), with the help of various sensors and relay circuits acting as output to ON/OFF. Were added RFID tags and web camera for verification. IoT based monitoring and control

system,SMOKE sensor, Iris recognition, the most promising biometric methodology are used. Raspberry Pi with ARM11 microprocessor with LINUX operating system. The proposed method reduces the cost and increases the efficiency.

Mahalakshmi T.K et.al proposed" Implementation of ATM security using IoT"(2018), with the help of IPv6, then compared with the account user database present in the cloud using image recognition and openCV. The IP camera is connected using ethernet or Wi-Fi. Image sensor used electronic imaging devices and Raspberry Pi controller.

Swetha B Obulakshmi V et.al proposed "ATM security monitoring using IoT"(2017), for theft prevention using sensors like gas sensor, vibration sensor, Temperature sensor, IR sensor (if one of the sensors detects the MC will send the information to person), Author has used the RFID [radio frequency identification] card with Door locking system and spraying of Chloroform gas through the AC to make thief unconscious.

III. PROBLEM STATEMENT

Physical attacks on ATM have increased due to both difficult economic circumstances and access to technology to break into the machines. Therefore, ATMs are robbed in many places due to the easy access to the public usage. ATMs will be high profile target for thief due to the volume of cash that they hold. To overcome this problem our proposed project idea gives the high-level security to the ATM by using the image processing techniques.

IV. BLOCK DIAGRAM

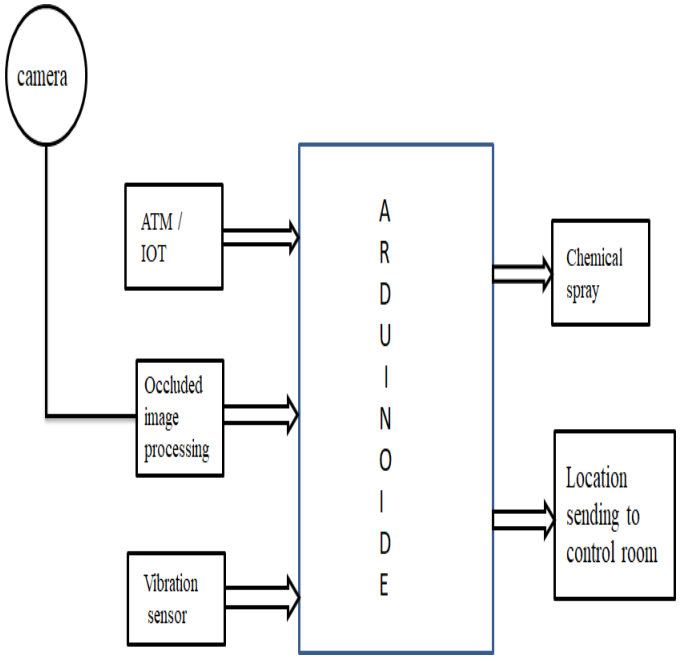

Fig: Block Diagram

As the recent study we have come across biometric system, In this paper block diagram consist of ARDUINO IDE as the main software through the Iot the ATM has connected to Mahalakshmi T.K et.al proposed" Implementation of ATM security using IoT"(2018), with the help of IPv6, then compared with the account user database present in the

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V. THE PROPOSED SYSTEM MODEL

Automatic teller machines (ATMs) are self-service machines that allow customers to perform financial transactions, such as withdrawing cash or checking their account balance. The proposed system of the ATM security system based on the IoT deals with the safety of the ATM by the theft by using IoT. The proposed system model consists of the installation of the camera in order to monitor the person entering the ATM. The camera that is used is the webcam. Occluded image processing refers to the techniques and algorithms used to analyze and interpret images that are partially or completely occluded, or blocked, by an object. Occluded images can be difficult to interpret because important information is hidden or not visible. The camera captures the image of the person who enters the ATM and if the captured image is the occluded image then it the image processing is done on the captured image and if the person is an authorized person then it will be sent to the Arduino Controller for the further process. The Arduino Integrated Development Environment (IDE) is a software application that you can use to write and upload code to an Arduino board. Whenever the theft tries to harm the ATM machine by hitting it the Vibration sensor placed in the ATM machine will sense the vibrations and the chemical spray containing the chloroform gets sprayed into the ATM making the person faint in few minutes. Vibration acts like the input to the Arduino as the vibration is sensed the chemical spray gets activated and sprayed. And the location of the particular ATM is sent to the nearby Police station or the assigned location.

VI. CONCLUSION

In order to improve the security mechanisms in place for automated teller machines (ATMs), our ATM security system project effectively integrated IoT technology with occluded image processing. We were able to develop a strong and intelligent system that addressed various security issues related to ATMs by implementing IoT devices including sensors, cameras, and network connectivity. Occluded image processing was essential in identifying and evaluating potential threats or illegal actions close to the ATM. We were able to spot instances of concealed or obscured objects as well as suspicious behavior patterns utilizing cutting-edge image processing techniques, all of which helped to create a more thorough security framework

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