ATM SECURITY SYSTEM

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ABSTRACT

The inspiration for the Design and Implementation of a Security-Based ATM Theft Project came from the things we see happening in our daily lives. The goal of this initiative is to make ATMs less vulnerable to robberies. Resolve the limitations of the technology that is now used in our culture. Here, a MEMS sensor is employed by the suggested system to detect vibrations emanating from an ATM machine. Additionally, a MQ2 sensor is employed to trigger fire alarms. To handle data acquired in real-time by the sensors, this system makes use of a wireless sensor network based on the ESP32 controller platform. The system will send out notifications whenever it detects something out of the ordinary or suspicious. To close the door of an ATM, a servo motor is utilized. For the purpose of live streaming, the ESP32 CAM is utilized. In order to put the thief into unconsciousness, the spray mechanism is utilized to release gas from within the ATM. Also, use the IoT to notify the local police station and the bank management when a robbery has occurred. Smartly conveying the ATM status to clients using RED and GREEN led signals is another feature of the suggested system.

Keyword: *ESP32 microcontroller, MEMS sensor, MQ2 sensor, spray mechanism, servo motor, ESP32cam, internet of things (IOT),*

1. INTRODUCTION

Our daily lives revolve on the paramount need of security. The goal of life should be to feel as safe as possible. A security chain cannot be complete without an access control system. Present here is an access control system—a microcontroller-based digital lock—that grants entrance to a limited area only to authorized individuals. Businesses, automated teller machines, and private residences are the ideal settings for this technology. For the sake of safety, we are employing an IoT modem here. After the microcontroller has processed the data,

it is transmitted to the owner or user via the IoT modem. The MEMS technology was used to develop the paper ATM security system that uses the Internet of Things and MEMS modules. This method relies on a two-way conversation between a microcontroller and a microelectromechanical system (MEMS). When an ATM experiences tilt as a result of the unauthorized user's erratic movements, a MEMS sensor can detect this and alert the authorities. In order to detect the tilt caused by the ATM's erratic movement, this article makes optimal use of MEMS as a sensor device. A microelectromechanical system (MEMS) sensor detects machine tilt and triggers a microcontroller to initiate a series of events, including the closing of the door via a stepper motor and the transmission of an SMS to a monitoring system over a GSM network. There has to be a drastic improvement in ATM security immediately because of the current spate of thefts. Because it only records video footage of what has been happening in the ATM without taking any action, the lone CCTV camera placed at the corner of the machine is insufficient to offer adequate protection, leading to the thief's incarceration and eventual surrender to the authorities. Since the thief shouldn't be able to get out of the ATM machine, this project's goal is to catch him and turn him over to the authorities by preventing him from leaving the ATM cabin (thanks to the machine's damage), rendering him unconscious (with toxic gas), and then reporting the incident to the bank and police station.

2. LITERATURE SURVEY

It would be convenient for consumers to be able to perform quick transactions at any time because the number of ATM centers is now growing. Manipulation and other crimes like ATM thefts occur when people fail to follow numerous essential processes inside the facility. Even though there are several DOs and DONTs posted outside of an ATM location, individuals sometimes neglect to notice them due to their hectic schedules. Even minor mistakes can have far-reaching and expensive effects. To paraphrase an old English saying, "LOOK BEFORE YOU LEAP" means to take all necessary safety precautions before venturing into potentially hazardous areas. Here we have the basic case of smoking, which is a known fire hazard that may cause serious harm to people and their possessions. As may be seen in figure 1, smoking is thus absolutely forbidden inside ATMs. Additionally, the graphic shows a ban on cell phones, which communicate via electromagnetic radiation. According to first principles physics, a machine's efficiency can be negatively or positively affected by interference between two electromagnetic waves. As with other electrical devices, ATMs employ electromagnetic waves. It is prohibited to use a cell phone in order to resolve electromagnetic interference and conduct high-level transactions. There is no sense in having the CCTV cameras placed at the entrance to the center if the consumer comes while wearing a helmet, as shown in Figure 1. The perpetrators of a crime committed within the premises will be able to evade capture regardless of the amount of evidence collected. When it comes to biometric authentication,

fingerprint technology is head and shoulders above the competition. Not only is it easy to use, but it also puts a high degree of security at your fingertips. Installing and learning one's fingerprint using a fingerprint identification device is easy and requires minimal effort [1]. Based on this, fingerprint identification is one of the most non-invasive biometric authentication methods. Law enforcement organizations have been used fingerprint identification since the late 1800s, while authorities from ancient times utilized thumbprints to seal papers thousands of years ago. This is where our digital platform comes in; we have the same technologies. Fingerprint images are taken, but they are not saved anywhere in the system. To prevent any potential exploitation of the technology, fingerprints are instead transformed into templates that cannot be used to replicate the original fingerprints.

A desktop program that uses a user's fingerprint as authentication is the fingerprint-based ATM. Because each person's fingerprint has unique characteristics, it is possible to identify them by their unique fingerprint. It is safer and more secure to use a fingerprint-based ATM instead of one that uses ATM cards. You can stop stressing about misplacing your ATM card and stop carrying it about in your wallet. Any financial transaction may be completed with the simple usage of your fingerprint [3].

3. METHODOLOGY

The Security-Based ATM Theft Project is robust and addresses various aspects of security enhancement. By using MEMS and MQ2 sensors, you aim to detect both physical tampering and potential hazards like fire. The utilization of a wireless sensor network based on the ESP32 platform ensures efficient real-time data handling and notification systems. Incorporating a servo motor to close the ATM door adds a physical barrier to thwart robbery attempts. The inclusion of the ESP32 CAM for live streaming enhances surveillance capabilities. Introducing a gas release mechanism to incapacitate thieves and leveraging IoT for alerting authorities and bank management demonstrates a proactive approach to security. Lastly, utilizing LED signals to communicate ATM status to clients enhances transparency and reassures users. Overall, your methodology appears comprehensive and proactive in mitigating ATM theft risks.

4. BLOCK DIAGRAM

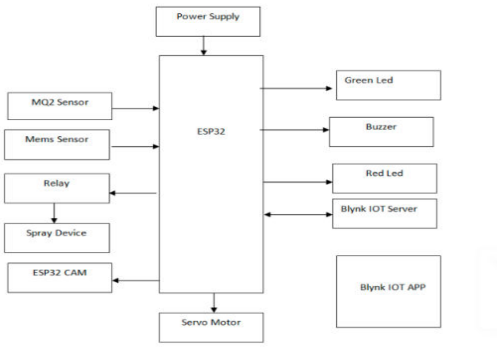

Fig.1.block diagram

4.1 ESP32 CONTROLLER

Our first thought when considering a microcontroller for a project is typically an Arduino. In addition to a small number of analog inputs and a plethora of digital I/O ports, it is cheap, simple, and straightforward to use. Despite its many advantages, the Arduino is deficient in certain respects. One is speed; the widely used Arduino AVR boards operate at 16 MHz. While that may be quick enough to

construct hundreds of apps, it becomes a stumbling block for others. The Arduino's digital inputs and outputs are more than enough to meet most needs, and the analog inputs are handy as well. On the other hand, you'll need to buy extra parts to add features like Bluetooth and WiFi. The Arduino, come on! It's been around since 2005. In technological terms, that's one hundred and fifty years. Espressif Systems of Shanghai really manufactures a family of microcontroller chips called the ESP32. It comes in a variety of affordable packages. The ESP-WROOM-32 module, which houses a 32-bit LX6 microprocessor with Tensilica Xtensa® Dual-Core technology, is equipped with the development board. This processor is somewhat similar to the ESP8266, except it runs at a clock frequency of 80 to 240 MHz, has two independently controllable CPU cores, and can achieve a maximum performance of 600 DMIPS.

Fig. 2. ESP-WROOM-32 Module

4.2 MQ2 SENSOR

Modular Gas Sensor MQ2 The versatile and inexpensive MQ2 gas sensor can identify a variety of gases, including hydrogen, propane, methane, and other flammable steam, among others. The smoke and combustible gas detector is quite sensitive. The smoke detector is powered by 5 volts. The voltage generated by a smoke detector is an indication of the presence of smoke. Smoldering increases production. To fine-tune the sensitivity, a potentiometer is included. The Sn02 sensor is utilized because, in clean air, it has a low conductivity. The sensor, however, gives an analog resistive output proportional to the smoke concentration whenever smoke is present. A heater is part of the circuit. The heater receives electricity from the power source via VCC and GND. There is a variable resistor in the circuit. How much smoke there is in the sensor determines the resistance across the pin. Increasing the content will decrease the resistance. Additionally, the sensor and load resistor are connected to an elevated voltage.

Fig 3. MQ2 Sensor

4.3 MEMS SENSOR

Micro electro-mechanical systems (MEMS) technology has evolved from a cool scholarly pursuit to a ubiquitous component of several everyday items. However, MEMS technology's actual deployment has been delayed, as is typical with most new technologies. In this essay, Harvey Weinberg from Analog Devices describes the design problems involved in creating a successful MEMS device, namely the ADXL335. Initially, MEMS systems utilized a multi-chip design, with the signal conditioning circuitry located on a separate chip from the sensing element (MEMS structure).

Fig 4. MEMS sensor

4.4 Relay

Without the need for a person to physically turn it on or off, an electromechanical switch known as a relay may do these tasks. In figure, we can see a schematic of a double contact relay. As long as there is total electrical isolation between the control and controlled circuits, a low-power signal can control a circuit using a relay. Alternatively, a single signal can control several circuits. The typical components of a relay are an inductor coil, a spring (not seen in the diagram), a swing terminal, and two high-power contacts, namely normally closed (NC) and ordinarily opened (NO). The electromagnet in a relay transfers current from the swing terminal to the NO and NC contacts. With the relay turned off, the inductor coil's spring-loaded swing terminal is connected to the neutral contact.

Fig.5. realy

4.5 ESP32 Cam

A highly competitive small-size camera module, the ESP32 CAM WiFi Module Bluetooth with OV2640 Camera Module 2MP For Face Recognition has a footprint of just 40 x 27 mm, a deep sleep current of up to 6mA, and finds widespread usage in various IoT applications. Internet of Things (IoT) uses such as wireless monitoring, industrial control, and smart home gadgets are a good fit. The module's high-reliability connection mode and DIP packaging make it ideal for use in a wide range of Internet of Things (IoT) hardware terminals, and the module's ability to be immediately placed into the backplane speeds up product manufacturing. ESP incorporates WiFi, conventional Bluetooth, and BLE Beacon, and it has a 7-stage pipeline design and 2 powerful 32-bit LX6 CPUs. Features such as an on-chip sensor, Hall sensor, temperature sensor, and an adjustable main frequency range of 80 MHz to 240 MHz are included.

Fig:6. ESP32 CAM

4.6 SERVOMOTOR

One way to precisely regulate the position, velocity, acceleration, and angle of a mechanical system is via a servomotor, often known as a servo motor or just servo. These actuators can be either rotational or linear.

Fig.7.servomotor

5. SCHEMATIC DIAGRAM

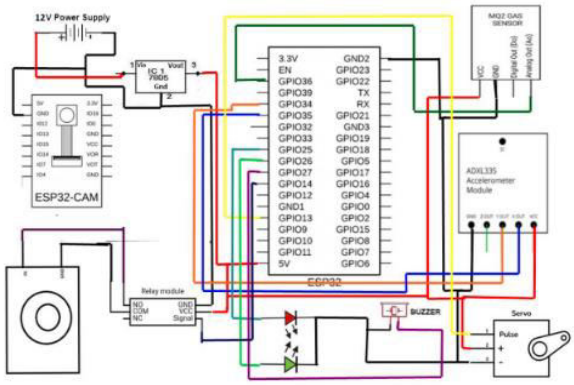

Fig.8. Schematic diagram

6. Flow chart

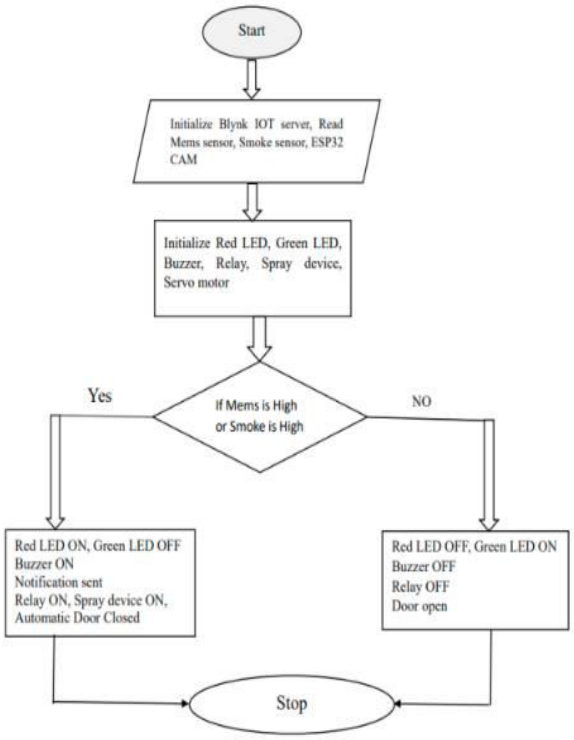

Fig 9. Flow chart

7. RESULT AND DISCUSSION

When the individual's details are input into the automated teller machine. The Mems sensor will detect whether he damaged or moved the ATM. Smoke and combustible gases might trigger this sensor. After passing this data to the esp32 microcontroller, which processes it, the owner or user receives the results via an IoT modem. If the owner or user is sleeping or their phone is not inside the service area, the buzzer will make a beep. Additionally, the surrounding region can be alerted by means of this buzzer. When this ATM's green light is on, it means everything is OK. The red LED will glow if the ATM detects an anomaly or if an event occurs within the ATM. To close the door of an ATM, a servo motor is utilized.For the purpose of live streaming, the ESP32 CAM is utilized. In order to put the thief into unconsciousness, the spray mechanism is utilized to release gas from within the ATM.

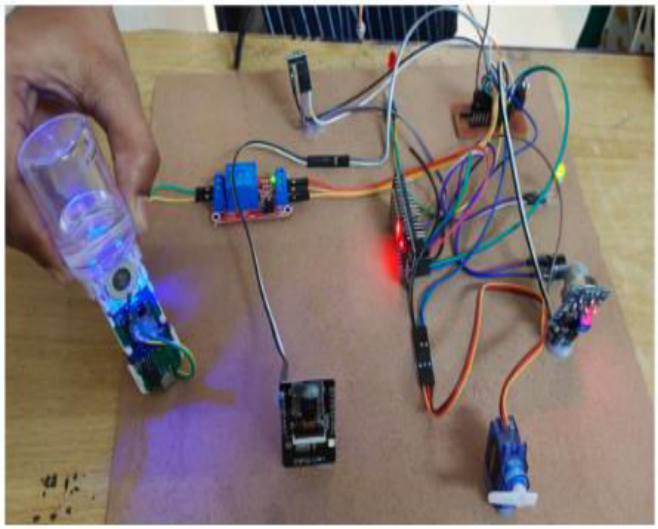

Fig 7.1: Configuration of components

Fig 7.2: Live streaming of ATM

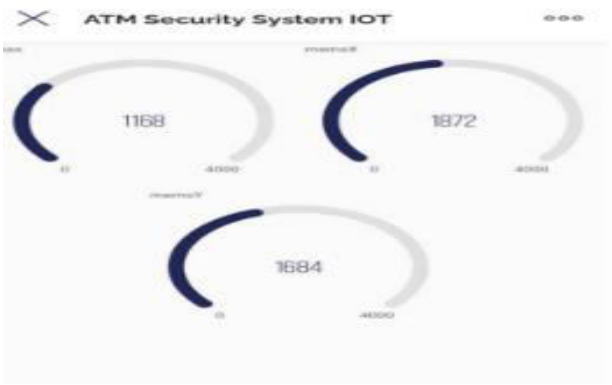

Fig 7.3: ATM alert System through Blynk app

8. CONCLUSION

The security of automated teller machines is now being adequately addressed by a number of methods. Even with relatively straightforward security measures, such as installing CCTV cameras in ATMs, there was still a significant risk of unauthorized access. This is where the Internet of Things came into play. The ATM first detects an assault or danger, and then at the same time, it encodes and sends the information to the receiver by radio frequency signals. You may put these radio frequency signals wherever because of their long transmission range. Because the door is shut, the robber is unable to flee. The thief is rendered unconscious when the toxic gas generating unit is activated, thereby prohibiting any further internal activity within the ATM. A lot of electricity is saved by using power saver mode. If the ATM detects any unusual behaviour, the alarm production unit will sound a warning to the persons in the area. When it comes to holidays, IoT provides a mechanism for the messages to be delivered to two separate recipients. The only person who can reset the bistable is the head of the bank. The focus here was on making owner recognition more stable and reliable, thus we beefed up the security elements. One may say that the approach of securing the ATM machine has no drawbacks. The system is more secure, dependable, and user-friendly since it is based on embedded system technology.

8.1 FUTURE SCOPE

This opens the door to the incorporation of a number of cutting-edge technologies that can improve security measures and provide consumers a more streamlined banking experience, among other potential future expansions of the applications that have already been put into place. Security and legitimate permission can be enhanced with the inclusion of fingerprint technology. It is also possible to include retina scan and heartbeat scanning technology. Taking AC power straight from the source and converting it to DC power before storing it in the battery. Since there are often several ATMs in a given area, a GPS module can be installed to determine their precise location.

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