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# High Protection Bank Locker Security System Using Live Image and Voice Authentication

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**ABSTRACT:** Encountering the real time challenges in the “security” arena and enhancing the existing criteria by designing an advanced technology. Implicit guarantee of your money in the bank being safe has always been the fact of concernment. With huge development people felt a need to secure their earnings. Here we are using Fingerprint sensor for identifying the person and his voice (i.e., Authentication Key). We can compare with the registered images of fingerprints if it matches with the register fingerprints and based on the voice command(i.e., Authentication Key) the locker will open otherwise locker will not open.

**KEYWORDS:** Node MCU, Arduino, DC Motor, Motor Driver, Face recognition, voice recognition Etc...

## I. INTRODUCTION

Bank is an organization which renders economic efficiency and extends financial services like issuing cash, saving belongings and further on. The critical aspect in an individual’s life is saving and securing the money earned to pertain one’s economic popularity. It is necessary to maintain the valuables under secure custody because burglars nowadays have a whole lot of modern-day equipment with them. As according to one citation, if one loses health it could be regained, but if one loses his valuable wealth it takes an excessive amount of time to remember it. To defend our valuables banks, provide some other advantages like offering their clients with protection lockers to store their valuables. The want for secure locker structures isn’t only in banks however additionally in diverse different institutes like in Offices, stores, commercial enterprise institutions, monetary establishments, Petrol stations, Hotels and Hospitals. This need is increasingly felt in these days due to the increase inside the protection issues. In current scenario, financial institution and locker robberies are often taking place, this indicates our locker is vulnerable to robbery since it has no ultimate safety rather than a lock and key. Currently, most of the banks use keys to open the lockers. One secret is with the purchaser and some other secret is with the financial institution manager. This machine is having a few drawbacks. There is a possibility of losing the important thing which make the device to be insecure and duplication of keys can also cause unauthorized get entry to of the locker. So, in order to conquer that we’re introducing Locker Security System based totally on Face Recognition and GSM (Global System for Mobile) generation, which may be utilized in Banks, Security Offices and Homes for giving protection to highly-priced possessions. In this device, only the legal character can get admission to the treasured such things as cash, licenses and jewels from locker.

Bank is a financial institution which provides us financial services like issuing money, saving cards, etc. Earning money and saving it is very important part in man’s life for enjoying a comfortable economic status and hence banking sector plays a vital role for all of us. It is necessary to keep the cash, ornaments and other valuable under safe custody because burglars now days have a lot of modern equipment with them. As per one quotation if one loses health it can be regained, but one loses his valuable wealth it takes too much time to recollect it. To protect our valuables banks provide some other benefits like providing their customers with safety lockers to store their valuables. The need for safe locker systems is not only in banks but also in various other institutes like in Offices, shops business establishment, financial institutions, Petrol stations, Hotels and Hospitals. This need is increasingly felt in these days due to the increase in the security concerns.

This paper is organized in five sections. After this introduction, in Section II, literature survey discussed of the paper, section III about the Existing system, Section IV about Proposed System, as well as the novel feature of the proposed method. Finally, Sections V and VI provide the simulation results and the conclusions and Future work, respectively..

## II. RELATED WORK

[1] Security is a defense against threats which provides an assurance of safety. Now and before security is one of the major concern in places like home, offices, institutions, laboratories etc. in order to keep our data confidentially so that no other unauthorized person could have access on them. In olden days the security mechanisms are less in order to prevent unauthorized access. Nowadays lot of security mechanisms have been introduced for such places and applications. But along with a wide variety of security methods, the techniques of theft are also changing and it's increasing day by day. With the available systems we can protect home and institutions to some extent. But that's not the case for critical places like military offices and scientific laboratory. These places require highly secure systems at every point of time in order to protect the valuable data and money.

[2] The safety locker is a convenient way provided by the financial institution or the bank to place the valuable belongings and documents of the user. This system operates using the concept of dual keys - one provided to the user and the other held by the branch head. The main aim of this dual key system is to efficiently operate the entire safety locker system under the control of one head of a branch allotted by that particular bank's central head office. The entire system hinges on the authenticity provided and assured by the branch head. There is lot of tedious process involved in the current system of operation of the safe deposit lockers. The manual allocation of responsibility to the branch head by central head office (in a daily basis) based on the availability and the on-spot branch head approval for operation of the safety lockers by the customer are some cumbersome process involved in the current system. The main intention behind the branch head on-spot approval is to manually authenticate each individual before operation of the respective locker.

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[4] For a common human being the bank means a place which represents a top level of security. On a daily basis we are involved in banking transaction. To secure our expensive jewellery, important documents or cash, we use to use bank locker rooms. It has become an important part of our life. To survive in this competitive world and for a continuous growth, the banking industry needs to provide a high degree of security. Because of the public interest every day new branches are opening. The more number of branches required more security. Current systems and services are becoming more and more autonomous and the banking sector is not too far from it. Video surveillance [1] in moving areas has become a current topic of interest in computer vision technology. You can see all the branches are under the surveillance of CCTV cameras, alarm systems, emergency buttons etc. The CCTV cameras are used to monitor the unauthorized activity. It needs to be monitored continuously by a human being which is very difficult work; especially in nights.

[5] Now day's security of assets is the main concern for any person. This paper aims at providing a reliable security system. It provides a way for identifying authorized and unauthorized persons, by using RFID, keypad password and finger print technology. Atmega168 microcontroller used for controlling the hardware. The main contribution of this paper is to provide a multi stage security so that unknown person will not be able to breach the security. In Conventional security system, there is either an RFID system or a password based system or a biometric based system (which could either be a finger print based system, retina scanner or voice recognition system), there is a greater chance to break such one stage security system. To improve such systems, a multistage security system consisting of microcontroller based matrix keypad & GSM network in addition to RFID technology and finger print module can be used.

[6] Hand gesture is a non verbal way of communication. Today hand gesture has been used for human-robot interaction. Gesture recognition is also implementing using artificial neural network . Image Processing

has tremendous areas of application such as watermarking, discrete wavelet transform etc. Hand Gesture recognition has been widely used for various applications but in this system we have used hand gesture recognition to provide security to banks which has never used before. In our implemented system, hand gesture is recognized using five processes such as image acquisition, skin color information for recognizing hand gesture which is obtained from the arm region of the hand, background removal, canny edge detection and contour detection. This system is used for banking security. It is very important for every bank to provide security to their customers and employees. The cases of robbery in bank risks the life of employees and customers at the bank, so the main purpose of this system is to provide security to the customers and employees in the bank.

[7] One of the most effective methods for the sake of security is biometrics. The term biometrics is the combination of two words Bio & Metric. It is an emerging technology for recognizing the individuals based on their physical or behavioral attributes. The physical attributes are more reliable than behavioral attributes and has no risk of being used by anyone else or forgetting it or losing it and these attributes include fingerprint, hand geometry, handwriting, face, iris, voice, retina, vein etc. As far as security importance is considered, there is a need to guaranty that only authorized persons can enter to the restricted areas like bank, R&D etc. and this need is satisfied by the use of biometric technologies. Biometric identification systems are valid alternatives to traditional identification systems such as showing identity cards, use of passwords, making signatures etc.

[8] At whatever point individuals sign onto PCs, get to an ATM, go through air terminal security, utilize charge cards, or enter high-security ranges, they have to confirm their characters. Individuals commonly utilize client names, passwords, and recognizable proof cards to demonstrate that they are who they claim to be. In any case, passwords can be overlooked, and recognizable proof cards can be lost or stolen. Thus, there is tremendous interest in improved methods of reliable and secure identification of people. Biometric methods, which identify people based on physical or behavioral characteristics, are of interest because people cannot forget or lose their physical characteristics in the way that they can lose passwords or identity cards.

[9] Automatic digit recognition system aims at recognizing human speeches, which has words and sentences using algorithm's that can be evaluated by the computer without human intervention. Digit identification is to design a recognition task, which takes digit signal, and classify it as a sequence of previously learned patterns, e.g. words or sub-word units such as phonemes. This system is indicated by the parameters, such as speaking style, vocabulary, speaking model etc. A constant speech recognition system does not pause the speaker between the words, where as an isolated digit identification system does.

[10] In telephony, Interactive Voice Response, or IVR, is a computerized system that allows a person, typically a telephone caller, to select an option from a voice menu. In some of the applications like bank account balances, transfers and accessing databases of strategic organizations etc. require high level of security. In such applications the information to be provided is made secure by the use of Personal Identification Number (PIN). However, this approach is not secure and is prone to tampering and misuse. To overcome this problem a pattern recognition approach based on neural network is proposed. User specific patterns such as fingerprint, retina, facial features, DNA sequence identification and voice etc. can be used for authentication.

### III. EXISTING METHOD

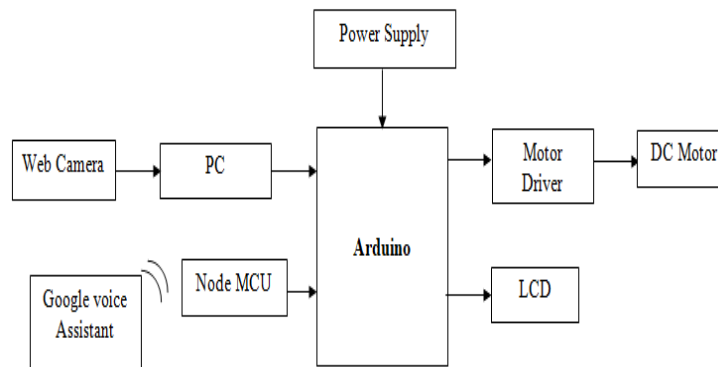
In existing system, we have used buzzer alerts in case of any unauthorized persons tries to open door. And we have used RFID for detecting authorized persons. For this RFID can be used by anyone so that no safety and security is available. If RFID tag is stolen then the person needs to worry about as the tag can be used to open door.

### IV. PROPOSED METHOD

The High Protection Bank Locker Security System using Live Image and Voice Authentication using Node MCU, Arduino, Web Camera, Voice Module, Motor Driver, Motor, and LCD is a security system that aims to improve the reliability and security of bank lockers. The system utilizes live image and voice authentication to verify the identity of the user, ensuring that only authorized individuals can access the locker. The system uses a motor driver and motor to lock and unlock the locker, and an LCD to display important information about the status of the locker. The system's main controller is the Node MCU, which provides a secure and reliable connection to the internet. Overall, the system

provides an extra layer of security and real-time monitoring of the locker, making it an ideal solution for the banking industry and other industries where the storage of valuable items is required.

**A. BLOCK DIAGRAM**



**Fig.1: Proposed System Block Diagram**

Fig.1 showed the proposed system block diagram. We use facial recognition and voice recognition Based Device in this proposed system. To open a locker, the face and voice of the individual must be matched otherwise the locker will not open. In any door security system, the most crucial aspect is the accurate detection of visitors who enter and pass the door. The most natural way to ensure security is to detect visitors at the door and warn users via a cell phone. The system presented has additional capabilities such as speech, camera live feed. The high protection bank locker security system using live image and voice authentication utilizes Arduino, Node MCU, webcam, LCD, motor driver, and motor, along with facial recognition technology, to provide secure access to bank lockers. The system utilizes facial recognition and voice recognition technologies to authenticate users, ensuring only authorized users can access the lockers. The system is designed to provide high-level security with real-time monitoring and alerts. The abstract highlights the key features and components of the system, emphasizing its ability to prevent unauthorized access to bank lockers through the use of advanced biometric identification techniques.

**Methodology**

1. **Designing the system architecture:** The first step is to design the system architecture, which involves defining the components required for the system to function, such as the Node MCU, webcam, LCD, motor driver, and motor.
2. **Developing the image and voice recognition algorithms:** The second step is to develop the image and voice recognition algorithms using appropriate libraries and frameworks. In addition, the facial recognition algorithm needs to be implemented using appropriate libraries and frameworks.
3. **Integrating the hardware and software components:** Once the algorithms are developed, the next step is to integrate the hardware and software components of the system. This involves connecting the Node MCU, webcam, LCD, motor driver, and motor to work together.
4. **Testing the system:** After integrating the hardware and software components, the system needs to be tested for its accuracy and reliability. The testing involves checking the system's ability to recognize authorized users through their image and voice.
5. **Adding facial recognition:** The last step is to integrate facial recognition into the system. This involves developing and integrating the facial recognition algorithm with the hardware and software components of the system. Once integrated, the system will use facial recognition to authenticate users, in addition to image and voice recognition.

## B. HARDWARE USED

### 1. Arduino Uno

Arduino Uno shown in figure is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller shown in fig.2.



Fig.2: Arduino Micro Controller

### 2. Node MCU

Node ESP32 can perform as a complete standalone system or as a slave device to a host MCU, reducing communication stack overhead on the main application processor. ESP32 can interface with other systems to provide Wi-Fi and Bluetooth functionality through its SPI / SDIO or I2C / UART interfaces. It contains everything needed to support the microcontroller shown in fig.3.

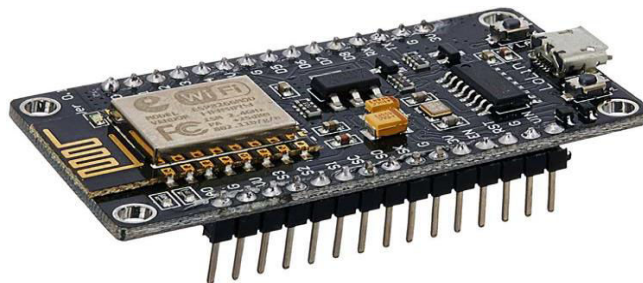


Fig.3: Node MCU Micro Controller

### 3. DC Motor

DC motors are widely used, inexpensive, small and powerful for their size. They are most easy to control. One DC motor requires only two signals for its operation. They are non-polarized, means you can reverse the voltage without any damage to motor. DC motors have +ve and - ve leads. Connecting them to a DC voltage source moves motor in one direction (clockwise) and by reversing the polarity, the DC motor will move in opposite direction (counter clockwise). The maximum speed of DC motor is specified in rpm (rotation per minute). It has two rpms: no load and loaded. The rpm is reduces when moving a load or decreases when load increases. Shown in figure 4.



Fig.4: DC Motor

#### 4. Power Supply

Power Supply shown in figure 5. The system is powered by a battery source of 9 V that is connected to the input pin of voltage regulator (L7805) to get a proper output voltage at the output pin of voltage regulator equal to 5 V or to step down the voltage from 9 V to 5 V, which is required for Arduino microcontroller, one RFID readers and RFID Cards.



Fig.5: Power Supply

#### 6. Motor Driver

Motor driver takes the low-current signal from the controller circuit and amps it up into a high-current signal, to correctly drive the motor. It basically controls a high-current signal using a low-current signal. There are different types of motor drivers available in the market, in the form of ICs. The driver device shown in fig.6.

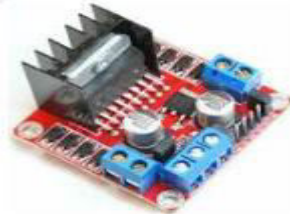


Fig.6: Motor Driver

#### 7. Web Camera

Web Camera is used to take the Face image to get the door unlock and locking system of the bank shown in Fig.7. According to the images available through the camera we can send these images to the Arduino to perform door control action.



Fig.7: Web Camera

#### 4. LCD Display

LCD stands for liquid crystal display, which is used to show the status of an application, displaying values, debugging a program, etc. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. The 16 x 2 intelligent alphanumeric dot matrix display is capable of displaying 224 different characters and symbols. This LCD has two registers, namely, Command and Data. Shown in fig.8.



Fig.8: 16x2 LCD Display

### C. SOFTWARE DESCRIPTION

#### 1. Embedded C Language

Embedded C is generally used to develop microcontroller-based applications. C is a high-level programming language. Embedded C is just the extension variant of the C language. This programming language is hardware independent.

#### 2. Arduino IDE

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them.



Fig.9:Arduino Logo

### V. EXPERIMENTAL RESULTS

The High Protection Bank Locker Security System using Arduino, Node MCU, Face Recognition, Voice Recognition, LCD Module, DC Motor, and Buzzer is designed to provide high-level security for bank lockers. The system shown in fig.10.

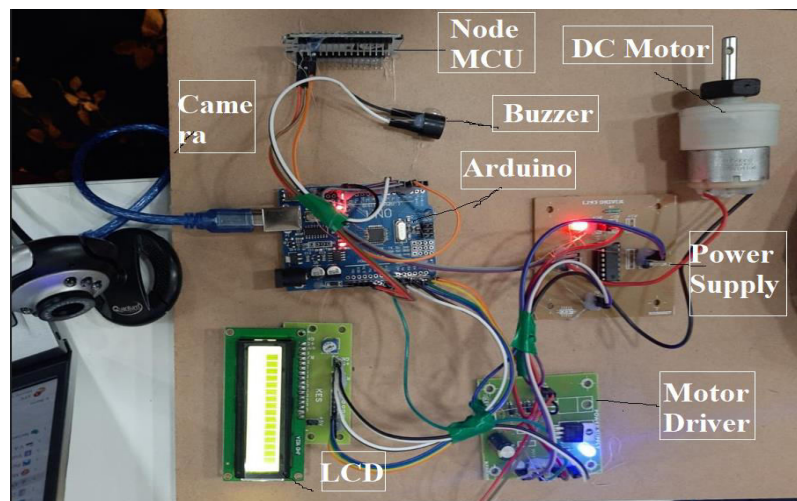
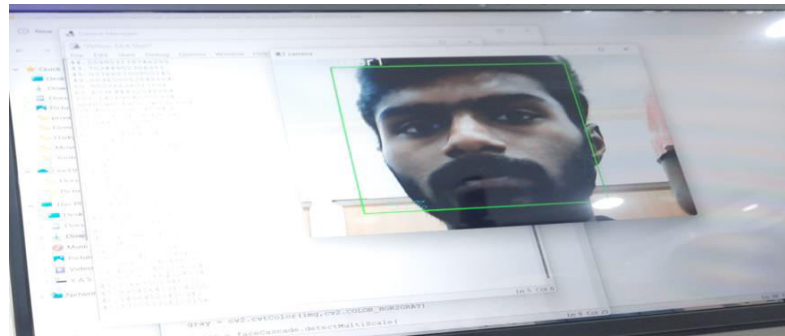


Fig.10: Experimental Setup

1. Face Recognition: The user is required to authenticate their identity using Face Recognition technology. The user stands in front of the camera, and the system captures an image of their face. The image is then compared to a database of pre-registered images to verify the user's identity.



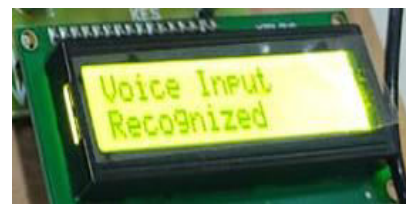


**Fig.11: Face Recognized through Camera**

2. Voice Recognition: The system also uses Voice Recognition technology to authenticate the user's identity. The user is required to speak a specific passphrase, and the system matches the user's voice against a pre-recorded voice sample to verify their identity.
3. LCD Module: The system has an LCD module that displays various messages to guide the user through the authentication process. The LCD module displays messages such as "Authorized Face Recognized," "Voice Input recognized," and "Authentication Failed." Shown in below figures 12 and 13.



**Fig.12 : LCD Shows that Authorized Face Recognition**



**Fig.13: LCD Shows that Voice Input Recognized**

4. DC Motor: The system uses a DC motor to unlock the bank locker door once the user's identity has been verified. The motor is controlled by the Arduino board.
5. Buzzer: The system also has a buzzer that sounds an alarm if the authentication fails. This alarm alerts security personnel that someone is attempting to access the bank locker without proper authorization.

Experimental results for the system would include testing the accuracy and reliability of the face and voice recognition technologies. The system's ability to correctly match pre-registered images and voice samples to the user's face and voice would be evaluated. The response time of the system would also be tested to ensure that it provides timely feedback to the user. The LCD module's display messages and the buzzer's alarm would be evaluated for clarity and effectiveness. The DC motor's ability to unlock the bank locker door would also be tested. The motor's response time and reliability in unlocking the locker door would be evaluated. Overall, the experimental results would demonstrate the system's effectiveness in providing high-level security for bank lockers, as well as its reliability and ease of use for bank customers.

## VI. CONCLUSION AND FUTURE WORK

In conclusion, the high protection bank locker security system using live image and voice authentication, Arduino NODEMCU, face recognition, motor driver, motor, and LCD is an advanced and effective approach to securing bank lockers. The system integrates several cutting-edge technologies, including biometric authentication, motor control, and real-time image processing, to provide a highly secure and reliable access control system. The integration of face recognition technology ensures that only authorized individuals can access the bank lockers, while the use of NODEMCU and motor driver technologies ensures efficient and smooth control of the motor that opens and



closes the locker. The inclusion of an LCD display also provides users with a clear and user-friendly interface for controlling the system.

#### VII.FUTURE SCOPE

In future Block chain technology can be integrated into the security system to provide an additional layer of protection. This will help to prevent fraud and ensure the security of the locker.

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