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FACE DETECTION BASED ATM SECURITY SYSTEM USING EMBEDDED LINUX PLATFORM AND RFID SYSTEM

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Abstract – *The extended capacity of the open source computer version of the software used for the image processing function for this system is implemented on the credit card size Raspi board. Initially the system captures the human face and check if the human face is correctly detected. If the person's face is correctly identified, movement will be detected. The door will open if both are detected correctly. Warns the user twice to detect the face if the person's face is not detected correctly. The computer locks the door of the ATM cabin for security purposes. The door is locked and the system will automatically generate a 3-digit OTP. The OTP code will be sent via SMS to the guard's registered mobile number. Enter the OTP generated by Watchman. Enter the guard OTP correctly and then the door will open, otherwise it will be locked.*

Key Words: Raspberry Pi 3, 16 GB SD Card, 16*2 LCD display, 4*3Numeric Keypad, Raspi-Camera, GSM Module, RFID Module, DC Motor with Driver IC

1.INTRODUCTION

An Automatic Teller Machine (ATM) is a computerized machine that is used to withdraw money from a customer's respective bank account. Banks are paying more attention to the security of ATMs as the financial user prefers ATMs for cash withdrawals, cash deposits and many other transactions. The ATM must be properly protected from criminal activity or unwanted content. Some existing ATM securities are discussed as follows:

1.1 ALART BASED MONITORING SYSTEM

When anyone enters the ATM room, it triggers the sensor which sends an alert to the monitoring station. In case of any unwanted activities, sensor send alarm alert signal to monitoring station. After this the monitoring centre will have the immediate access of voice and video of the ATM room. Video verification is done and if any unwanted activity is confirmed a strong signal is send to the ATM and security is send to the ATM room to bust the thieves.

1.2 MOTION BASED MONITORING SYSTEM

Special watch is kept during the night hours as chances of any burglary attempt is more at that time. When anyone enters the room during this time an alert signal is send to the monitoring station and the control system will have the access to the video and audio of the room. They will check for the activities in the ATM. If it is a customer the alert will be closed and in case of unwanted activities two way communication channels are created to warn the person in the room to stop them from stealing.

1.3 LIVE SITE MONITORING SYSTEM

The ATM room is kept under surveillance as whole time. In case of any unwanted activities, sirens are deployed and two way audio is used to warn the user. The security is send to the place immediately. The current existing system cannot be deployed as, It is very time consuming. Lots of people need to be deployed for constant monitoring purpose. The cost for setting up this system is high. In case the internet is down and then the whole system will be dead, which will be a total waste.

2.LITERATURE SURVEY

2.1 AUTOMATED VEHICLE IDENTIFICATION (AVI)

The process of determining the identity of a vehicle subject to customs duty. Most customs facilities record the passage of vehicles through a small number of toll gates. In such facilities, the task is to identify the vehicle in the gate area. Some early AVI systems used barcodes affixed to each vehicle. Optical systems have proven to have poor reading reliability, especially when faced with inclement weather and dirty vehicles. Most current AVI systems rely on radio-frequency identification, where an antenna at the toll gate communicates with a transponder in the vehicle via dedicated short-range contacts (DSRC). RFID tags have proven to be of excellent accuracy and can be read at highway speeds. The big disadvantage is the cost of equipping each vehicle with a transponder, which is a huge

starting cost. Therefore, technologies were time consuming or had to sacrifice accuracy if processing time was to be minimized. Therefore, the scheme is to consider both dimensions and bring about a nominal exchange between the two dimensions.

2.2 LICENSE PLATE RECOGNITION (LPR)

License plate detection methods offered the maximum opportunity these years. Basically the number plate characters are recognized by the margin detection. In, the amount of vertical gradients used to locate candidate license plate areas. Shapiro et al. Used Robert's edge operator to emphasize the vertical edges and used the plan of vertical edges to locate the license plates. Zheng proposed a license plate extraction method, which uses a rectangular shift window to search for the license plate in an alternative release image. Although this method is window-sensitive, only one license plate can be detected on any image. Jia et al. Proposed a regional-based method for LPD, which uses an average-change approach to separate a color vehicle image and uses margin density information for license plate verification. Anagnostopoulos and others. Proposed an adaptive image segmentation technique to expedite license plate detection. In, a block-based margin density forecasting system was used to identify candidate license plate areas, and the voting system was used for license plate verification based on a number of features. Although the detection method of this method is fast, its location accuracy depends primarily on the volume size. Lalimi et al. Modified the regional basis and used image filtering to separate candidate areas. Kay lee et al. Proposed a vertical margin detection algorithm to speed up LPD methods. However, improved computational efficiency is achieved at the cost of reduced margin information. In, margin clustering was used for license plate localization. Wang et al. Trained layer detection model for used slope information and license plate detection.

2.3 MAXIMALLY STABLE EXTERNAL REGION (MSER)

Attachment of writing parts is another important point for license plate extraction. Dinosaur et al. Proposed the LPD algorithm based on the concept of maximum fixed external area (MSER), which simultaneously implements localization and segmentation of individual characters. Li et al. Used the MSER approach to detect text areas using bright and dark MSERs to handle all types of Chinese license plates. These MSER-based methods can achieve greater localization accuracy in relatively simple displays. However, they have difficulty locating written parts in the most complex, e.g., scenes where some parts of the license plate are contaminated.

2.4 THE MORPHOLOGY TECHNIQUE

An important tool that is widely used in image processing tasks such as key regional detection and subject division, it has been successfully used by many authors for license plate detection. Morphological technique is commonly used to find structural information on license plates. Hsieh et al. Used differences between a 7 × 1 open operator and a 7 × 1 closed operator to detect license plates. In Shen's license plate extraction, a morphological gradient system was introduced to extract license plate candidates, which reached an average extraction rate of 96.6%. However, the morphological technique is time consuming and not suitable for license plate detection against complex backgrounds.

2.5 AN EDGE-BASED COLOR-AIDED METHOD FOR LICENE PLATE DETECTION

Many previous approaches make extensive use of the color features of the LPD, based on the observation that the license plate usually reveals the typical color appearance of both its background and its characters. P.R. Lee and b. K. In Kim's project, a neural network was used to separate color features from hue, concentration, and light channels. Kim et al. It is proposed to combine color and texture features to identify license plates in images. Tian provided a license plate localization method based on the standard color palette for the license plate characters and background areas. V. Apolcosemi, a. Ashtari introduced a method based on a modified template-matching technique for localizing the Iranian license plate in an image through the analysis of target color pixels. In this project, color salinity and margin features for license plate detection.

3. PROPOSED SYSTEM

This project mainly focuses to improve the security of banking system to use ATM. This Project is demonstrated by means of Raspberry Pi 3 which is an ARM based Mini-PC. Further RFID module, Camera and Keypad are employed for authentication purposes. The Raspberry Pi3 is an embedded mini-PC which works on embedded-Linux. It's high processing speed makes it best suits for Image Processing and Open CV applications. Further it can be connected with Internet through either LAN or Wi-Fi. The Raspberry Pi board is deployed as the CPU in ATM. Each ATM user is provided with an RFID-Tag which resembles the ATM-Debit Card. The RFID Reader is interfaced with Raspberry Pi through Serial Port. A Keypad is interfaced with Raspberry Pi by means of GPIO through which the ATM Pin is entered. Initially when a person brings the RFID Tag near the RFID Reader for ATM Banking Services, he is requested for the entry of the ATM Pin which is displayed in a 16*2 alphanumeric LCD display. On successful verification of ATM Pin with the Database stored in the Raspberry Pi system,

further verification is processed else warning is given alerting the guards. On entering the correct pin the Camera interfaced with Raspberry Pi starts capturing the image of the ATM user. If the user's face is not detected properly he is warned to face the camera. After the image is captured, the system is processed for further face detection algorithms. If the captured samples match the training data stored for that user, the system generates a 3 digit OTP which is send to the registered Mobile number by means of a GSM Module interfaced with the Raspberry Pi. And. And the display prompts for entering the OTP which is valid only for two minutes. If the OTP entered by the user through keypad matches with the generated OTP, the user is able to withdraw cash or process other ATM services. All the helpline instructions are given through voice command which is driven through a speaker. If either of the authentications fails, the ATM door closes for security reasons which is controlled by a DC motor driven by a Motor driver IC.

4. BLOCK DIAGRAM

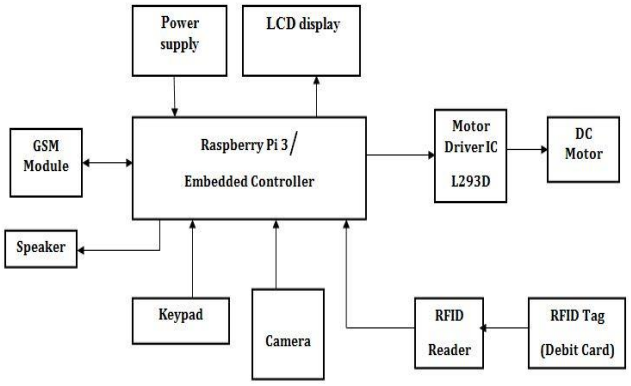

Figure 1: Block diagram

The system contains Raspberry Pi board as the main processor. The SD card is used to contain the dedicated operating system which is compatible with the raspberry pi board. The Human face is captured by the pi camera which can be directly interfaced with the Raspberry Pi board. The 16 * 2 LCD is used to display the validation message. To make the validation process more sophisticated, the Speaker is also interfaced with the raspberry pi board. The speaker is used to announce alert messages. GSM module can be directly interfaced with the pi board using serial communication protocol. GSM module is used for OTP mechanism. The Matrix keypad is interfaced with the pi board which is used to input the OTP to the system. The door locks and unlocks mechanism is implemented using the Stepper motor.

5. CIRCUIT DIAGRAM

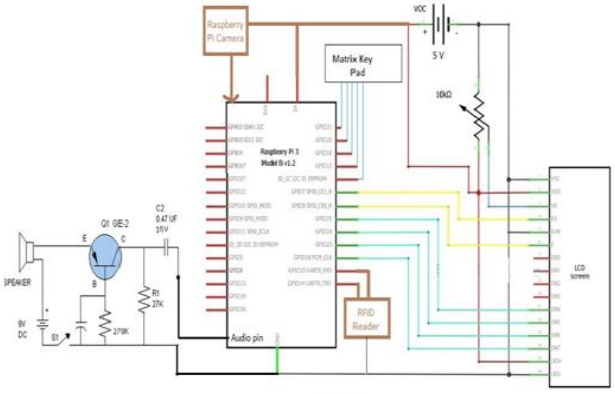

Figure 2: Circuit diagram

6. RESULT

The Test results are divided into two phase. One when a person access the ATM and his/her face is detected. Another case when the face is not detected, the door lock & unlock mechanism.

6.1 When Person's Face is detected

In this phase, initially the motion is detected in the ATM room. If there is any motion it will start the process of face detection and after face detection output is shown in the terminal and the user is allowed to access the ATM.

Figure 3: First Validation Message

Figure 4: Motion Detected in ATM Room

Figure 5: Output of Detected Face

Figure 6: End of Program

Figure 7: Output of the Terminal

6.2 WHEN PERSON'S FACE IS NOT FACES DETECTED

In this phase, when person's face is not detected the system will give two times warning message through display and speaker and even after that no face is detected the door of the ATM will be locked and OTP will be generated which can unlock the door. If correct OTP is entered, the door will unlock else it will remain lock.

Figure 8: No Face is detected

Figure 9: Door locked using DC Motor

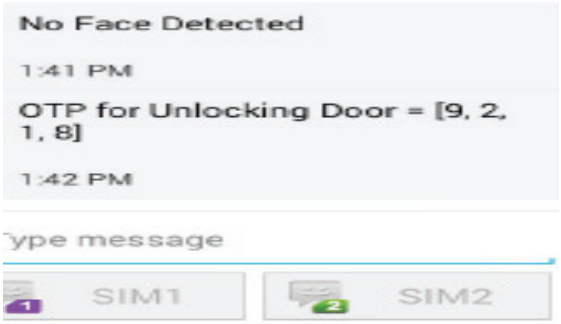

Figure 10: Generated OTP received

Figure 11: Waiting for the OTP Input

Figure 12: False OTP entered

Figure 13: Door remains closed

7. CONCLUSION

The smart ATM security system based on embedded Linux platform is suggested here. Security is provided by detecting the face of the person in a systematic way. The system is smart in the way that if the person tries to cover his / her face, it gives warning message for proper detection of face. Still the face of a person is not detected properly; the main door of ATM cabin will be locked till corrected OTP is not given by the person outside the cabin. The whole system is safe, reliable, less human interactive & easy to use. High level security is provided by sending any malfunctioning activity based information to the server and set high level protective environment to the existing system. System is easy to construct on the embedded Linux platform as Raspberry Pi board because, the raspberry pi board is highly compatible for image processing based application.

REFERENCES

[1] S. Monk, 1st Ed., Raspberry Pi Cookbook, O'REILLY, 2013.

[2] D. Shan, M. Ibrahim, M. Shehata, W. Badawy, "Automatic license plate Recognition (ALPR): A State-of-the-Art Review," IEEE Trans. CircuitsSyst. Video Technol., (Vol.23, no. 2, pp.311-324, (2013).

[3] K. Kadir, M. Kamaruddin, H. Nasir& S. Safie, "4th InternationalConference on Engineering Technology and Technopreneuship(ICE2T)", 2014, p. 335

[4] A. H. Ashtari, M. J. Nordin, and M. Fathy, "An Iranian License Plate Recognition System Based on Color Features," IEEE Trans. Intell. Transp.Syst., (Vol.15, no.4, pp.1690-1704, (2014).)

[5] Yen-Yi Wu and Chun-Ming Tsai, "Pedestrian, bike, motorcycle, and vehicle classification via deep learning: Deep belief network and small training set" IEEE Trans. Applied System Innovation (ICASI), 2016

[6] Open CV Website. [Online]. Available: http://www.opencv.org

[7] Homepage on Open CV : Face Detection using Haar Cascades. [Online].Available.http://docs.opencv.org/master/d7/d8b/tutorial_py_fa ce_detection.html#gsc.tab=0

[8] R. H. Brasil and A. M. C. Machado, Member, "Automatic Detection of Red Light Running Using Vehicular Cameras", IEEE Latin America Transactions (Vol.: 15, Issue: 1, Jan. 2017).

[9] Yule Yuan,WenbinZou, Yong Zhao, Xinan Wang, Xuefeng Hu, and Nikos Komodakis, "A Robust and Efficient Approach to License Plate Detection" IEEE Transactions on Image Processing (Vol.: 26, Issue:3, March 2017).

[10] LingHu,Qiang Ni, "IoT-Driven Automated Object Detection Algorithm for Urban Surveillance Systems in Smart Cities", IEEE Internet of Things Journal (Vol.: PP, Issue: 99, 18 May 2017).

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