IJMSERH

International Journal of Multidisciplinary and Scientific Emerging ResearcH (IJMSERH)

Volume 13, Issue 2, April-June 2025

Impact Factor: 9.274

ijmserh@gmail.com

www.ijmserh.com

International Journal of Multidisciplinary and Scientific Emerging ResearcH (IJMSERH)

| ISSN: 2349-6037 | www.ijmserh.com ||Impact Factor: 9.274||Quarterly, Peer Reviewed & Refereed Journal|

|| Volume 13, Issue 2, April-June 2025 ||

DOI: 10.15662/IJMSERH.2025.1302030

Bank Locker Security System with Machine Learning, Face Detection, and OTP-Based Authentication

K. Keerthana

Arulmigu Meenakshi Amman College of Engineering, Tamil Nadu, India

ABSTRACT: Face recognition implementation and design are essential for a wide range of applications, including biometrics, authentication, security, surveillance, and identification. This study proposes the design and implementation of a bank locker security system that allows access to individuals whose faces are stored in the training database. The first step in face detection is to identify human motions. Then, facial recognition is employed to verify the individual's authorization to access the sensitive region. At the same time, track the coordinates of the detected motion. When the face is eventually not recognized, the estimated coordinate is finally passed to the anesthetic cannon, which targets the invader automatically. The outcomes of the experiments show how well the proposed bank locker security system works to prevent unauthorized access and improve reliability through the use of authentic facial recognition.

KEYWORDS: Face Detection, Feature Extraction, OTP Authentication, Machine Learning.

I. INTRODUCTION

Human face detection is the most promising field of image processing and has a vast area of research-oriented real-life applications. The idea is commonly applied in real life for potential discrimination on the internet, access control, profiling, and content annotation. There is always constructive scope for new inventions in the field of technology, which is as vast as a galaxy on its own. This leads to a better future. There has been a supportive development in the field of technology by humans since the beginning of mankind. The goal was to ensure that the risk was minimized by recent advances and technological improvements, as well as through the creation of new technologies that would improve and speed up life. The main intention of face detection is to find the human face in the given input. It is also feasible to locate the human face in the visual frame psychologically. It falls within the category of an object-class detection-specific case as well. The Haar Cascade algorithm approach is considered a promising technique for face detection. Facial image detection is a popular marketing tool among users. For access control and information security in general, physical security has always been necessary to address the problem of personal authentication. Researchers found that there is a problem with face detection that has to be addressed. In terms of appearance, the human face has a high degree of variability, making it a dynamic object of study. Face detection has applications in biometrics, videoconferencing, and crowd surveillance, among other fields. Computer vision faces difficulties because of the concept of human face detection. A detected face is stored with a high level of secrecy and certainty. Ensuring the security of the data is the primary topic of discussion. Properties include a high level of redundancy, bulk capacities, and a high correlation between the pixels that form the image data.

II. LITERATURE SURVEY

Face physiological property detection [1] has been planned to reinforce the dependability and security of face recognition system. The faux faces are distinguished from the 000 ones exploitation totally different classification techniques. during this paper, we tend to propose one image-based faux face detection methodology supported frequency and texture analyses for discriminating 2-D paper masks from the live faces. For the frequency analysis, we have got applied power spectrum primarily based methodology [2] that exploits not solely the low frequency info however conjointly the info residing among the high frequency regions. Moreover, wide used native Binary Pattern (LBP) [3]. In face recognition, the quality attack strategies may even be classified into many classes. the idea of classifying depends on what verification proof is give to face verification system, sort of a purloined picture, purloined face photos, recorded video, 3D face models with the abilities of blinking and lip moving, 3D face models with numerous expressions and so on [4] the most goal of this paper is to vogue and implement a bank locker security system supported RFID and GSM technology which could be organized in bank, secured offices and homes. Throughout this method solely authentic person is recovered cash from bank locker. In face recognition, the quality

| ISSN: 2349-6037 | www.ijmserh.com ||Impact Factor: 9.274||Quarterly, Peer Reviewed & Refereed Journal|

|| Volume 13, Issue 2, April-June 2025 ||

DOI: 10.15662/IJMSERH.2025.1302030

attack strategies may even be classified into many classes. the idea of classifying depends on what verification proof is give to face verification system, sort of a purloined picture, purloined face photos, recorded video, 3D face models with the abilities of blinking and lip moving, 3D face models with numerous expressions and so on [5]. the most goal of this paper is to vogue and implement a bank locker security system supported RFID and GSM technology which could be organized in bank, secured offices and homes.

Sr No.	Title	Year	Author	Advantage	Limitations/Gap	Scope of improvement
1	Survey on face recognition for security system.	2023	Om Korde, SwastikThorat, RohitShendkar, RohanBorkar.	Face-recognition intelligent system	The system has low processing speed and less reliability.	This image detection model makes use of the surveillance system to create a trained database.
2	Face recognition openCV-based ATM Security System.	2022	Prof.Anil.d.Gujar, Nikita.B.Sawant, ShreekarDeshmukh.	Automated Viola Jones analysis method and OpenCV	Less effective of non-frontal image. Varied results from the given image under different lighting conditions	Intruder should be avoided and less secure.
3	Autonomous Face Detection System from Real time Video Streaming for Ensuring the intelligence Security System	2020	Tanvir Ahmed , Al Amin , Mohammad AshrafulHoque	Multiple faces detection	In this system, video quality absolutely depends on the camera	Tedious Work will Be handle
4	Enhancing bank security system using Face Recognition, Iris Scanner and Palm Vein Technology	2018	Raj Gusain, Hemant Jain , ShivendraPratap	Vascular Pattern thinning is high speed and compact technique	In this system, video quality absolutely depends on the camera.	Palm vein Technology can be used in future c overing security systems login control and in banking and financial sector
5	Design of Face Detection and Recognition System for Smart Home Security Application	2017	Dwi Ana RatnaWati , DikaAbadiant	In this face detection has good performance in the variation of light source distance position as well as angle	The use histogram as a feature is considered to have poor accuracy	Resolve the distance between the person and the camera which is less than 240 cm

Table 1. Literature Survey

| ISSN: 2349-6037 | www.ijmserh.com ||Impact Factor: 9.274||Quarterly, Peer Reviewed & Refereed Journal|

|| Volume 13, Issue 2, April-June 2025 ||

DOI: 10.15662/IJMSERH.2025.1302030

III. PROPOSED METHODOLOGY AND DISSCUSSION

A block diagram is a visual representation of the flow of information and processes in a system. In the context of a Bank Locker System Using Face Recognition with Machine Learning, the following key points can be explained using a block diagram:

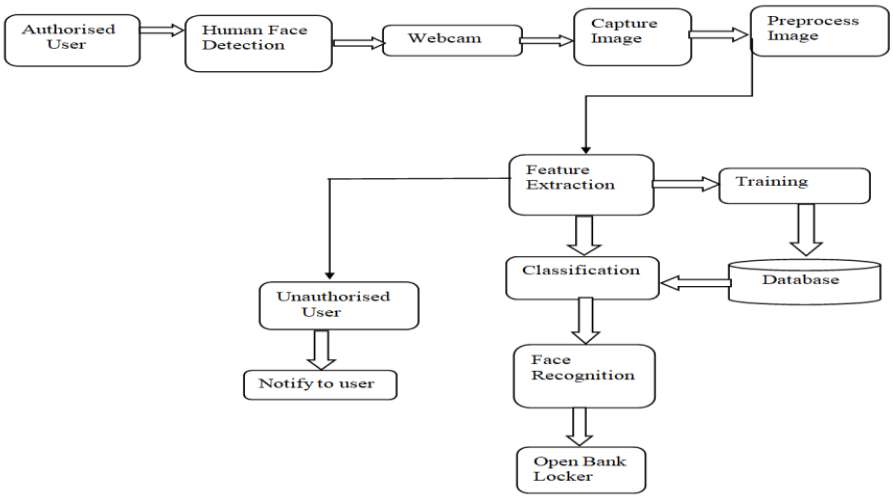

Fig1. System Architecture of Bank Locker Security System

- **Image Acquiring**

The process starts with the user standing in front of a camera or another image-capturing device. An image of the user's face is acquired.

- **Pre-processing**

The acquired image may undergo pre-processing steps to enhance its quality and remove any noise. This may include tasks like noise reduction, resizing, and image enhancement.

- **Feature Extraction**

Feature Extraction is a crucial step to ensure that the presented image is from a live person and not a static image. Techniques like facial movement analysis blink detection, or 3D depth analysis can be employed for this purpose.

- **Face Image Normalization**

The acquired image is then normalized to ensure uniformity and consistency in terms of size, resolution, and orientation. This step prepares the image for feature extraction and comparison.

- **Face Image**

This is the processed and normalized facial image of the user, ready for recognition.

- **Face Training Database**

The face training database contains a collection of facial images of authorized users. This database serves as a reference for comparing and verifying the user's face image. It is a key component of the machine learning system.

- **Classification**

The normalized face image is compared to the images in the face training database. A classification algorithm, often based on machine learning techniques, is used to determine the similarity between the user's face and the reference images. This process assigns a confidence score or probability that the presented face matches an authorized user's face.

- **Face Recognition**

Face recognition is a type of biometric method where an individual is identified by comparing live capture of image with the stored record for that person. Facial recognition systems are majorly used for security purposes which can be used in different varieties of applications.

- **Bank Locker**

The bank locker is the physical storage unit that contains the user's valuable assets. Access to the locker is controlled by the face recognition system. If the classification step verifies the user's identity with a sufficient confidence score, access to the locker is granted, and it can be opened.

International Journal of Multidisciplinary and Scientific Emerging ResearcH (IJMSERH)

| ISSN: 2349-6037 | www.ijmserh.com ||Impact Factor: 9.274||Quarterly, Peer Reviewed & Refereed Journal|

|| Volume 13, Issue 2, April-June 2025 ||

DOI: 10.15662/IJMSERH.2025.1302030

Advantages of Proposed System

- System used for locker security.
- Security against vulnerabilities such as spoofing, tampering, masquerade attack etc.
- There is no retention of the template or image
- Improved authentication, security assurance.

IV. ALGORITHM

Haar Cascade is a feature-based object detection algorithm to detect objects from images. A cascade function is trained on lots of positive and negative images for detection. The algorithm does not require extensive computation and can run in real-time. We can train our own cascade function for custom objects like animals, cars, bikes, etc. Haar Cascade can't be used for face recognition since it only identifies the matching shape and size. Haar cascade uses the cascade function and cascading window. It tries to calculate features for every window and classify positive and negative. If the window could be a part of an object, then positive, else, negative.

The Haar Cascade Algorithm is used in several varieties of fields. Some of the applications are:

1) **Facial recognition:** Like how iPhone users use facial recognition like other electronic devices use the Haar Cascade Algorithm for security login to know about the validity of the user.
2) **Robotics:** These Robotics Machines can see the surroundings and perform tasks using Object Detection.
3) **Autonomous Vehicles:** These Autonomous Vehicles requires knowledge, and this Cascade algorithm can be able to identify the objects like pedestrians, traffic lights, etc., for safety purpose.
4) **Image Search and Object Recognition:** with the help of this Haar Cascade Algorithm, facial recognition expansion and different types of objects can be searched.
5) **Industrial Use:** Haar Cascade Algorithm allows machines to pick up and identifies objects.

V. EXPERIMENTAL RESULTS

In result we will see following steps:

a) Registration
b) Create Face Data with liveliness detection
c) Train face Data
d) Authenticate User
e) Verification of User
f) OTP Authentication

Results

Fig 2. Result for Authenticated user

| ISSN: 2349-6037 | www.ijmserh.com ||Impact Factor: 9.274||Quarterly, Peer Reviewed & Refereed Journal|

|| Volume 13, Issue 2, April-June 2025 ||

DOI: 10.15662/IJMSERH.2025.1302030

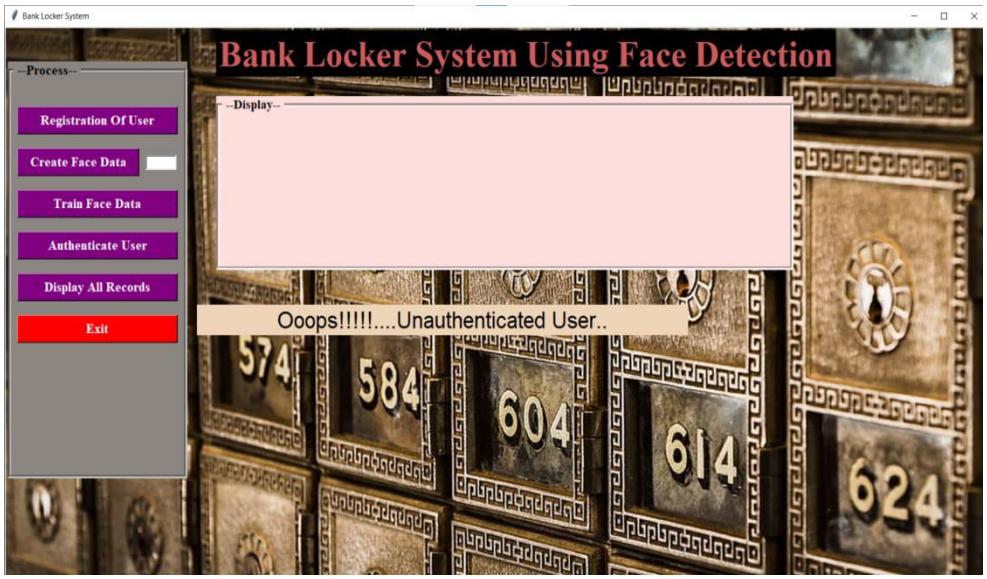

Fig 3. Result for unauthenticated user

VI. CONCLUSION

We have implemented the Bank Locker Security System developed using Machine Learning with Face Detection and OTP Authentication provides a robust and secure solution for protecting bank lockers. The system leverages facial recognition technology to ensure only authorized users can access lockers, and OTP authentication adds an additional layer of security. The integration of these technologies enhances the overall security of bank lockers, mitigating the risk of unauthorized access and theft. Further research and development in this area can lead to even more advanced and secure solutions for protecting valuable assets stored in bank lockers.

REFERENCES

[1] Zhang, Y., & Liu, S. (2019). Face detection using deep learning: An improved faster RCNN approach. IEEE Access, 7, 128655-128663.

[2] Karim, A., &Kaur, M. (2020). Secure OTP authentication using machine learning for online banking. 2020 11th International Conference on Computing, Communication and Networking Technologies (ICCCNT) (pp. 1-6). IEEE.

[3] Kumar, A., & Swain, B. (2021). IoT based smart security system for bank locker using face recognition. 2021 3rd International Conference on Computing, Communication, Control and Automation (ICCUBEA) (pp. 1-5). IEEE.

[4] J. Kaur and N. Kaur, "A Secure Bank Locker System using Facial Recognition and OTP," 2020 3rd International Conference on Computing, Mathematics and Engineering Technologies (iCoMET), 2020, pp. 1-4.

[5] R. Vijayalakshmi and M. Aramudhan, "Smart Security System for Bank Lockers using Face Recognition and OTP," 2019 3rd International Conference on Electronics, Communication and Aerospace Technology (ICECA), 2019, pp. 1432-1436.

[6] L. Gaikwad, A. R. Upla, V. A. Patil, and A. S. Jadhav, "Secure Bank Locker System Using Face Recognition and OTP," 2020 6th International Conference for Convergence in Technology (I2CT), 2020, pp. 1-4.

[7] S. V. Bhoyar, P. S. Godase, and S. A. Dhale, "Secure Bank Locker System using Facial Recognition and OTP," 2020 5th International Conference on Inventive Computation Technologies (ICICT), 2020, pp. 1-5.

[8] N. Bansal and A. Sharma, "Secure Bank Locker System using Face Recognition and OTP," 2019 5th International Conference on Advanced Computing & Communication Systems (ICACCS), 2019, pp. 690-695.

[9] Gonzalez, R. C., Woods, R. E., &Eddins, S. L. (2009). Digital image processing using MATLAB. Gatesmark Publishing.

[10] LaurindoBrittoNeto, FelpieGrialva, Vanessa Regina Margareth Lima Malike, Luiz Cesar Martini, Dinei Florencio, "A kinect based wearable face recognition system to aid visually impaired users," IEEE, vol. 47, Feb. 2017.

[11] Hailin Shi, Xiaobo Wang, Dong Yi, and Zhen Lei, "Cross modality face recognition via heterogeneous joint Bayesian," IEEE, vol. 24, no. 1, Jan. 2017.

| ISSN: 2349-6037 | www.ijmserh.com ||Impact Factor: 9.274||Quarterly, Peer Reviewed & Refereed Journal|

|| Volume 13, Issue 2, April-June 2025 ||

DOI: 10.15662/IJMSERH.2025.1302030

[12] Jian Yang, Lei Luo, JianjinQian, Ying Tai, Fanlong Zhang, and Yong Xu, "Nuclear norm based matrix regression with applications to face recognition with occlusion and illumination changes," IEEE, vol. 39, no. 1, Jan. 2017.

[13] Jinwoo Kang, David V. Anderson, and Monson H. Hayes, "Face recognition for vehicle personalization with near infrared frame differencing," IEEE, vol. 62, no. 3, Aug. 2016.

[14] S. Nishanthini, M. Abinaya, and Dr. S. Malathi "smart video surveillance system and alert with image capturing using android smart phones," in International Conference on Circuit, Power and Computing Technologies [ICCPCT], p. 201.

[15] Alpika Gupta and Dr.RajdevTiwari, "Face detection using modified Viola Jones algorithm," March, International Journal of Recent Research in Mathematics Computer Science and Information Technology, vol. 1, no. 2, pp. 59–66, Month: October 2014 – March, Available at: www. paperpublications.org Page | 59.2015.

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

INNO SPACE SJIF Scientific Journal Impact Factor

doi cross ref

निस्केयर NISCAIR

International Journal of Multidisciplinary and Scientific Emerging Research (IJMSERH)

Impact Factor: 9.274

ijmserh@gmail.com

www.ijmserh.com