

REAL-TIME FACE DETECTION AND SECURITY SYSTEM FOR ATM MACHINE

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ABSTRACT

Face recognition play a vital role in variety of applications from biometrics, surveil-lance, security, identification to the authentication. In this paper we design and implement a Bank locker security system where access people whose faces are available in the training database. First, we are going to detect the face by de- testing the human motion. Then face recognition is performed to determine the authority of the person to enter the sensitive area. At the same time, we track the coordinate of detected motion. Failing to recognize the face finally passes the estimated coordinate to anesthetic gun for targeting the intruder automatically. Experimental results demonstrate the effectiveness of proposed Bank locker security system in order to restrict the unauthorized access and enhanced reliability by use of Liveness face recognition.

Human face detection is the most promising field of image processing that has a vast area of research oriented real life applications. In the real world the concept is widely used for the content annotation, access control, profiling and potential discrimination in the web world.. It has been extensively adopted by the applications including biometrics, surveillance, security, identification, and authentication. Face recognition usually exploit high-dimensional information which makes it computationally intensive. Face plays a big role in conveying identity and emotion, being the primary focus of attention in social life. Also, familiar faces can be identified at a glance even after years of separation. Computational model of face recognition can be applied to criminal identification, security systems, image and film processing and human computer interaction. The Psychological process of locating the human face in the visual frame is also possible. It is also categorized as a special case of object class detection. This project introduces an innovative solution to enhance ATM security using machine learning technology. By implementing a real-time face detection and recognition system, we aim to significantly reduce the risk of unauthorized access and fraudulent activities at ATMs.

Keyword :- Computer Vision, Object Detection, Real Time Detection, Image Processing, Machine Learning, Openface, Human Detection.

1. INTRODUCTION

Automatic face recognition has been a challenging task for the research community. It has been extensively adopted by the applications including biometrics, surveillance, security, identification, and authentication. Face recognition usually exploit high-dimensional information which makes it computationally intensive.

Human face detection is the most promising field of image processing that has a vast area of research oriented real life applications. In the real world the concept is widely used for the content annotation, access control, profiling and potential discrimination in the web world. There is always constructive scope of new inventions in the

field of technology which is as vast as galaxy on its own. This leads to the better future. There has been a supportive development in the field of technology by the humans since the beginning of mankind. The motive was in rapid development and also in the advancement of technology to ensure the minimization of risk that is prone along with the new inventions which would make life easier, better and much faster. The main intention of face detection is to find out the human face in the given input. The Psychological process of locating the human face in the visual frame is also possible. It is also categorized as a special case of object class detection. The Eigen face approach is considered as a promising technique of face detection. In the field of marketing the facial image detection is playing a role of huge interest for the users. It has always been an issue of personal authentication that needs to be fixed for the purpose of access control of the info- security in the wider context via physical security.

2. OBJECTIVES

- 1. Accurate Face Detection:** Develop a robust and accurate face detection algorithm that can identify and locate human faces in real-time, even under varying lighting and environmental conditions.
- 2. User Authentication :** Implement facial recognition technology to authenticate ATM users, ensuring that only authorized individuals can access their accounts and perform transactions.
- 3. Real-time Processing:** Achieve low-latency processing to provide real-time responses for face detection and authentication, enabling seamless user interactions at the ATM.
- 4. Security:** Ensure that the system is highly secure to prevent unauthorized access and potential fraud, incorporating encryption, secure data transmission, and anti-spoofing measures.
- 5. Database Integration :** Integrate the system with a secure database of authorized users to match detected faces against stored profiles, enabling account access.
- 6. Alerts and Notifications:** Implement an alert system to notify security personnel or ATM operators in the event of suspicious activities or multiple failed authentication attempts.
- 7. Privacy Compliance:** Ensure that the system complies with data privacy regulations and guidelines to protect user information and maintain their privacy.
- 8. User-Friendly Interface:** Design a user-friendly interface for the ATM screen that guides users through the authentication process and provides clear feedback.
- 9. Redundancy and Fail-Safe Measures:** Develop redundancy and fail-safe mechanisms to ensure the system remains operational even in the event of hardware or software failures.

3. LITERATURE SURVEY

Paper Name:- Enhanced security feature of ATM's through facial recognition.

Author Name:- Ms. Soundari D V, Aravindh R, Edwin Raj K,

Description: This research paper focuses on creating an autonomous face detection system using real-time video streaming for enhancing security. The system aims to detect human faces in live video streams and trigger alarms for surveillance purposes. It employs an Arduino Uno with a Pan-Tilt mechanism, controlled by an ATmega328p Microcontroller. Open Source Computer Vision System (OpenCV) is used for image processing.

Paper Name:- Credit Card Fraud Detection And Prevention By Face Recognition IEEE(2020)

Author name:- Ashwini.M.Zinjurde,Vilas.B.Kamble

Description:- This approach aims to enhance online banking security by implementing a two-step authentication process. First, users verify their identity with a One-Time Password (OTP). Once validated, the system employs face

recognition technology to ensure the user's identity. The collected data is then used to authorize transactions and combat credit card fraud effectively. The system is designed for userfriendliness and security, offering a convenient and efficient electronic banking experience.

Paper Name:- Face Detection Open CV Based ATM Security System ResearchGate(2021)

Author name:- Praveena.P,Savithri.V,Saratha.R,Monisha.M,Ashwini.R

Description:- Automated Teller Machines are widely used nowadays by people. But It's hard to carry their ATM card everywhere, people may forget to have their ATM card or forget their PIN number. This proposal suggests improving ATM security by replacing PINs and physical cards with biometric authentication, with a focus on Face ID. The system captures the user's face image at the ATM and compares it to stored images. If a match is found, the user gains access to their account. OpenCV and Haar Cascade Classifier are used to detect faces, and Local Binary Pattern is employed for face recognition, enhancing security and user convenience.

Paper Name:- Autonomous Face Detection System from Real-time Video Streaming for Ensuring the Intelligence Security System IEEE (2020)

Author name:- Mohammad Ashraful Hoque, Thouhidul Islam, Tanvir Ahmed, Al Amin

Description:- Face detection is a popular research topic to the researchers at present in the Biometric system. The aim of this research is to develop a system which can detect human face or faces from a live video streaming and warn by giving the siren for ensuring the significant role in the surveillance security aspects. The core of this control system includes ATMega328p Microcontroller based Arduino Uno with Pan-Tilt mechanism and Open Source Computer Vision System (OpenCV) is the platform for the image processing system.

Paper Name:- Design of Face Detection and Recognition System for Smart Home Security Application.IEEE(2017)

Author name:- Dwi Ana Ratna Wati, Dika Abadianto

Description:- This research paper presents a Face Detection and Recognition System for Smart Home Security. It's implemented on MyRIO 1900, connected via WiFi to a computer. Images are captured from a webcam connected to MyRIO. Face detection relies on template matching, and face recognition uses principle component analysis. Testing shows good face detection performance at close distances, without face-obstructing accessories, non-skincolored shirts, and different background colors.Real-time face recognition achieves 80% accuracy.

4. EXISTING SYSTEM

Fraud is one of the big legal problems in the credit score card industry. The main goals are, first of all, to recognize the unusual forms of credit score card fraud and, secondly, to test the different methods used to detect fraud [4]. The sub- purpose is to provide, evaluate and analyze recently published findings in the detection of credit score card fraud. This article describes specific terminology for credit score card fraud and highlights important facts and figures in this field. Based on the nature of theft encountered by banks or credit card companies, a variety of steps can be implemented and enforced. The recommendations made on this paper may have valuable characteristics in terms of price reductions and time efficiency. The importance of the use of the methods examined right here lies in the minimization of credit report card theft. However, there are still legal issues when good credit report card consumers are misclassified as dishonest. In addition to the ethical nature of dishonest actions, there has been a growing interest in banking ethics for some time. A critical venture to help businesses and Political institutions, along with banks, must take measures to deter and resolve theft quickly and correctly.

5. PROPOSED SYSTEM

Problem Identification

Define the problem clearly, state the goals and objectives of the project, and identify the tasks required to achieve them.

Data Collection

Collect image datasets of food items that will be used for the project. The datasets should be pre-labeled with the correct recipes for each image.

Data Pre-Processing

Pre-process the dataset by cleaning and normalizing the data to reduce any noise.

Model Selection

Choose an appropriate deep learning model to detect recipes from the User images. Popular models for image recognition tasks include OpenFace.

Model Training

Train the model with the pre-processed and augmented datasets. This step involves defining the model architecture, setting up a training routine, and adjusting the model hyper parameters to obtain optimal results.

Model Testing

Test the model on a separate testing dataset to evaluate the accuracy of the model.

Model Deployment

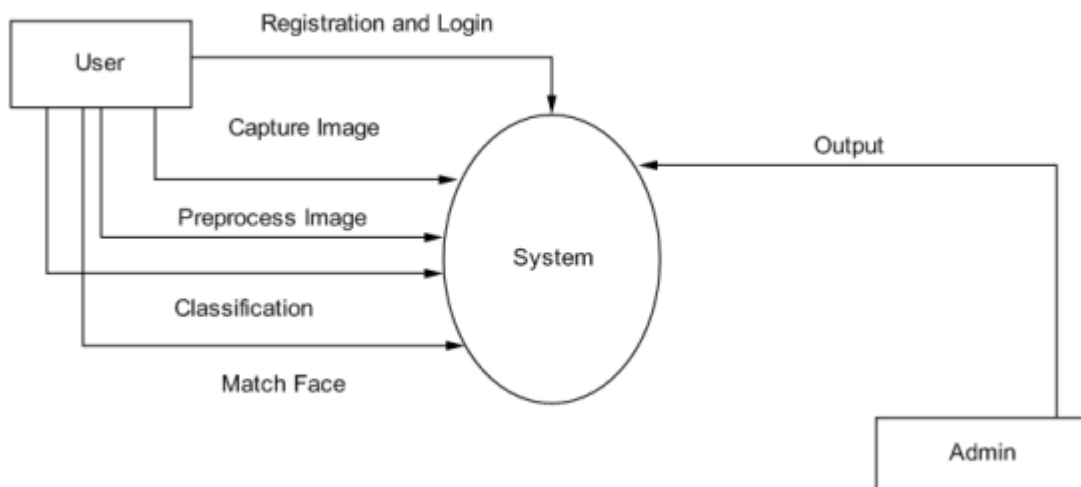
Finally, deploy the trained model as a web service or API that can receive User images as input and return the detected recipes as output.

Model Optimization

Continuously monitor and optimize the performance of the model by updating the datasets to include new recipes and using feedback from users to improve the system.

Maintenance

Maintain the system to ensure it remains functional and up-to-date. This step involves regular updating and patching of the code base, implementing security measures, and managing the system resources to ensure optimal performance.

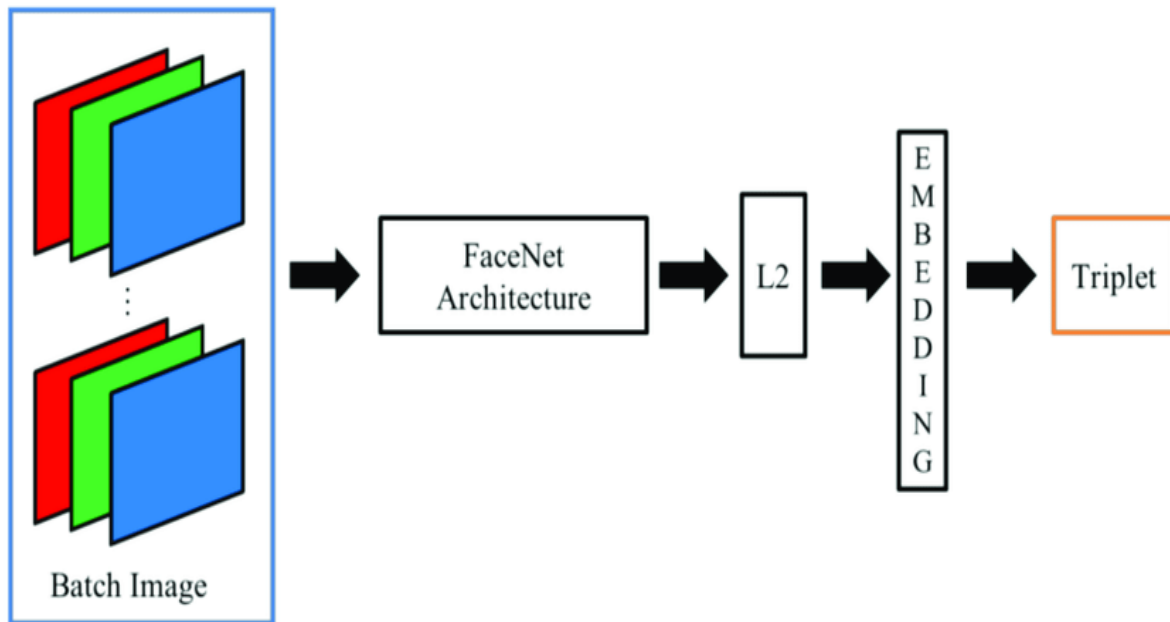


6. USED ALGORITHMS :

1. FACENET :

FaceNet is a cutting-edge facial recognition system developed by researchers at Google. This system revolutionizes the way we identify and authenticate individuals by harnessing the power of deep learning. At its core, FaceNet operates by first detecting a face within an input image, utilizing advanced techniques like convolutional neural networks (CNNs) or the Viola-Jones algorithm. Once a face is detected, the algorithm aligns it to a standardized pose, mitigating variations caused by head orientation and lighting conditions. Then, employing a deep CNN architecture,

typically based on the inception model, FaceNet extracts discriminative features from the aligned face image. These features are transformed into a numerical representation known as an embedding, which resides in a high-dimensional hypersphere. This embedding serves as a unique fingerprint for the face, capturing its distinguishing characteristics. To recognize a face, FaceNet compares the embedding of the input face with those stored in a database, using distance metrics such as cosine similarity. If the distance falls below a certain threshold, the faces are considered a match, enabling accurate identification. FaceNet's robustness and accuracy make it invaluable for a variety of applications, from face verification and clustering to classification, even in challenging conditions like varying lighting and facial expressions.



7. TECHNOLOGIES USED

7.1 Python

Python, renowned for its user-friendly syntax and extensive library support, serves as a versatile tool across diverse domains, ranging from web development and data science to artificial intelligence and automation. Its innate simplicity and readability empower developers to express complex ideas concisely, fostering rapid prototyping and seamless collaboration. Python's ecosystem boasts a plethora of libraries and frameworks tailored to specific needs, augmenting its utility in various applications. Whether crafting dynamic web applications, unraveling intricate data patterns, training sophisticated machine learning models, or orchestrating automated workflows, Python's adaptability and robustness make it a stalwart ally in the ever-evolving landscape of modern technology.

7.2 Visual Studio

Visual Studio Code (VS Code) is a versatile and widely-used code editor developed by Microsoft, renowned for its extensive feature set and active community support. Available across Windows, macOS, and Linux, it offers a comprehensive suite of tools to enhance the coding experience. Features such as syntax highlighting, code completion, and intelligent code suggestions through IntelliSense streamline development workflows. Furthermore, VS Code boasts a vast ecosystem of extensions covering various functionalities, including language support, version control

systems, debugging, and themes, allowing developers to customize and extend its capabilities to suit their needs. Its integrated terminal facilitates running command-line tools and scripts directly within the editor, while seamless Git integration enables efficient management of code repositories. Additionally, developers benefit from built-in debugging support, customizable user interface elements, and a task runner for automating repetitive tasks. Overall, Visual Studio Code provides a lightweight yet powerful environment for coding, catering to the diverse requirements of developers across different programming languages and platforms.

7.3 Anaconda

Anaconda serves as an open-source platform specialized in meeting the demands of scientific computation, data analysis, and machine learning endeavors, offering comprehensive support for both Python and R programming languages. It simplifies package management and deployment by offering a comprehensive collection of preinstalled libraries and tools commonly used in these fields. Anaconda includes Conda, a package manager for easy installation and management of packages, Anaconda Navigator for graphical management of environments and projects, and Anaconda Cloud for sharing and distributing packages and environments. Additionally, it provides Spyder IDE, an integrated development environment designed for scientific computing and data analysis. Overall, Anaconda is widely favored by data scientists and researchers for its simplicity, extensive library support, and ease of use in setting up Python and R environments for various data-related tasks.

7.4 SQLite

SQLite, a lightweight and self-contained relational database management system, stands as a versatile solution for various applications requiring data storage and management. Unlike traditional client-server databases, SQLite operates directly on local files, eliminating the need for a separate server process. Its simplicity and ease of use make it an ideal choice for embedded systems, mobile applications, and small to medium-scale web projects where low overhead and minimal configuration are paramount. Despite its lightweight nature, SQLite supports a rich set of SQL features, including transactions, indexes, and triggers, facilitating efficient data manipulation and retrieval. Whether powering mobile apps, managing website content, or serving as a reliable backend for desktop applications, SQLite offers a robust and efficient solution for storing and accessing structured data across a myriad of platforms and use cases.

7.5 Python Libraries

- 1) Tkinter
- 2) Numpy
- 3) OpenCV
- 4) Pillow
- 5) Pickle
- 6) Imutils
- 7) Video stream
- 8) Pandas

8. CONCLUSION

The authentic face detection for security assurance is the method implemented that generalizes the privacy concerns of the confidential data that requires secrecy conviction. The proposed method can be improved in terms of security assurance i.e. working in the area of face recognition for high level data authentication and security. In conclusion, a

real-time person detection project has several potential applications in various industries such as security, surveillance, retail, and healthcare. The project involves using computer vision techniques to detect people in real-time video streams, and it can be achieved through various methods such as Haar cascades, deep learning, and other machine learning algorithms.

9. REFERENCE

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