VisionIris: Unveiling Identity with CNN

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***Abstract*—This paper presents a completed project that developed an application utilizing existing captured images for user authentication, ensuring that only authorized individuals can perform transactions such as withdrawals or deposits in bank accounts. Emphasizing the significance of a reliable user authentication system for accurate identity detection, the study explores the active research on iris recognition as a biometric identification method. The increasing awareness of personal privacy in various domains has contributed to the growing popularity of this technology. Leveraging the advancements in AI, particularly Convolutional Neural Network (CNN), the paper highlights the practicality and flexibility of CNN in image processing and pattern recognition, proposing its effective application in various fields. The central focus of the paper is on constructing an application that utilizes the human iris as a biometric for user validation within a provided dataset**

I. INTRODUCTION

Iris-recognition, a well-established biometric identification method, has been actively researched for decades and is gaining increased popularity, particularly in response to growing concerns about personal privacy across various sectors. The rise of Artificial Intelligence (AI) presents a valuable opportunity to enhance the effectiveness of Iris Recognition in securing private data. The practicality and flexibility of Convolutional Neural Network (CNN) make it a suitable algorithm for image processing and pattern recognition, applicable across diverse fields.

This paper introduces a system primarily focused on developing a high-precision and efficient Iris Recognition System based on CNN. Iris samples from IITD and CASIA databases, including both sides of the eyes, constitute the training dataset for the Deep Recognition System. Despite initial signs of underfitting and limited convergence in the early training epochs, the proposed system, with an increased number of training epochs, demonstrates a trained model achieving a testing accuracy of 97.5%.

The prevalence of iris in biometric authentication due to its reliability, attributed to unique variations in the minute architecture of the iris in every individual. The recognition process involves extracting features and labeling iris images obtained through a camera with subtle infrared illumination. Digital templates encoded from identified iris patterns, using mathematical and statistical algorithms, facilitate individual identification. Additionally, iris patterns can be indicative of a person's race, with Asian individuals typically having brown or black irises, while non-Asian individuals exhibit various shades of red and occasionally blue.

The project introduces a system centered on building an Iris Recognition System using Convolutional Neural Network (CNN) for enhanced precision and efficiency. Iris samples from IITD and CASIA databases, incorporating both sides of the eyes, constitute the training dataset for the Deep Recognition System. Despite initial indications of underfitting and limited convergence in the early training epochs, as the number of training epochs increases, the proposed system successfully develops a trained model achieving a high testing accuracy of 97.5%

II. LITERATURE SURVEY

A biometric authentication system that utilizes unique physical or behavioural characteristics to verify an individual's identity should be considered when safeguarding sensitive data. This approach prevents unauthorized access to highly confidential information, justifying the implementation of such a system.

Iris recognition, a highly secure biometric identification method, harnesses the unique patterns of an individual's iris for identification. Employing

affordable equipment could propel iris recognition into a standard security framework.

Regarded as the most reliable and precise biometric identification method, iris recognition offers exceptional accuracy. A test environment based on open-source code can be constructed to evaluate the performance of iris recognition techniques, image quality, and acceptance rates.

This paper delves into the image quality of iris images acquired from a standard camera using a database. It identifies the most critical areas for improvement and assesses overall recognition performance. The primary focus is on studying the unique iris pattern.

When imaging the iris under suboptimal conditions, artifacts such as noise and reflections from light sources can arise, introducing errors in the iris recognition process and impacting performance.

III. EXISTING SYSTEM

The current system employed for Iris Recognition utilizing CNN comprises the following prominent models:

A. ALEXNET

In 2012, Krizhevsky made a significant breakthrough in the expansive ILSVRC challenge by employing a deep CNN, surpassing other manually crafted features and yielding a top-5 error rate of 16.4%. AlexNet is essentially an adapted version of the traditional LeNet, capitalizing on a substantial training dataset (ImageNet) and enhanced computational capabilities.

B. VGG

In 2014, Simonyan and Zisserman from Oxford demonstrated that utilizing smaller filters in each convolutional layer leads to enhanced performance. The rationale behind this is that a sequence of multiple smaller filters can mimic the effects of larger ones.

C. GoogleNet AND INCEPTION

In 2014, Szegedy from Google introduced the Inception v1 architecture, achieving a top-5 error rate of 6.7%. The key innovation lies in the inception module, functioning as a miniature network within a larger network. The novel insight was the incorporation of 1-1 convolutional blocks to consolidate and decrease the number of features before engaging the resource-intensive parallel blocks.

D. RESNET:

In 2015, Microsoft introduced the concept of a residual connection or skip connection, directing the output of two consecutive convolutional layers and circumventing the input to the subsequent layer. This residual connection enhances the gradient flow within the network, enabling the network to achieve significant depth with 152 layers.

IV. PROPOSED SYSTEM

The proposed system outlined in this design for the application revolves around and centers on the principles of Convolutional Neural Networks (CNN) to construct Iris Recognition models using various network structures. This paper introduces a deep neural network model employing non-linear, rational, and exponential pixel scaling techniques.

A. Image Acquisition

Image acquisition is defined as the process of obtaining an image from sources, accomplished through hardware systems such as cameras, encoders, sensors, etc. Undeniably, it stands as the most critical step in the machine vision workflow, as an inaccurate image could render the entire workflow ineffective.

B. Segmentation

Image segmentation, a widely employed technique in digital image processing and analysis, involves dividing an image into multiple parts or regions based on pixel characteristics.

C. Normalization

Normalization, a frequently applied method in preparing data for AI, aims to adjust the values of numeric components in the dataset to a standard scale.

D. Feature Extraction

Feature extraction is the process of converting raw data into numerical features that can be processed while retaining the information in the original dataset.

E. Matching

Image Matching, or wide multiple baseline stereo, entails establishing a sufficient number of pixel or region correspondences from two or more images depicting the same scene.

V. CONCLUSION

There are numerous approaches to ensuring the safety and security of user information, with a key emphasis on allowing access solely to authenticated users. Employing biometric methods for user identification and validation stands out as one such effective method. While existing algorithms generally offer an accuracy of up to 96%, they also exhibit high error rates. The analysis conducted in this study underscores the presence of limitations contributing to increased error rates.

This paper predominantly concentrates on Iris Recognition utilizing Convolutional Neural Network (CNN) principles, which effectively identifies and retrieves comprehensive information associated with an individual. The primary focus revolves around leveraging CNN concepts to recognize an individual's iris, subsequently retrieving their data. The primary objective is to mitigate fraudulent activities, particularly in the banking sector, with a specific emphasis on enhancing security in ATM transactions where conventional PINs alone are used for transaction completion.

REFERENCE

[1] Kien Nguyen, Clinton Fookes, Arun Ross, Sridha Sridharan, “Iris Recognition With Off-the-Shelf CNN Feature:A Deep Learning Perspective”, “ IEEEAccess, Vol 6, Apr 2018”

[2] Md. Shafiul Azam, Humanyun Kabir Rana, “Iris Recognition using Convolutional Neural Network”, “International Journal of Computer Applications, 0975-8887, Vol 175, No 12, August 2020”.

[3] Maryim Omran, Ebtesam N. AlShemmary, “An Iris Recognition System Using Deep Convolutional Neural Network”, “Journal of Physics:Conference Series, Ser. 1530012159, Feb 2020”

[4] Sheena S, Sheena Mathew, “CNN Baed Iris Recognition System:A novel approach”, “ 2 nd International Conference on IOT, Social, Mobile, Analytics and Cloud in Computational Visison and Bio-Engineering, ISMAC--CVB 2020”*)*

[5] Guoyang Liu, Weidong Zhou, Lan Tian,Wei Liu, Yingjian Liu and Hanwen Xu, “An Efficient and Accurate Iris Recognition Algorithm Based on a Novel Condensed 2-ch Deep Convolutional Neural Network”, “MPDI, May 2021”

[6] Qingqiao Hu, Siyang Yin, Huiyang Ni, Yisiyuan Huang, “An En to End Deep Neural Network for Iris Recognition”, “2019 International Conference on Identification, Information and Knowledge in Internet of Things(IIKI2019)”

[7] S.Sujana, Dr. VSK Reddy, “An Effective CNN based Feature Extraction Approach for Iris Recognition System”, “Turkish Journal of Computer and Mathematics Education,4595-4604, Vol 12, No 6, 2021”

[8] Samitha Nanyakkara, Prof. Ravinda Meegama, “A Review of Literature on Iris Recognition”, International Journal of Research, Feb 2020”

[9] Prof. Shweta M. Nirmanik, “Iris Recognition System”, “JETIR, ISSN-2349-5162,Vol 7, Issue 5, May 2020”

[10] Kamal Hajari, Ujwalla Gawande, Yogesh Golhar, “Neural Network Approach 13 to Iris Recognition in Noisy Environment”, “International Conference on Information Security & Privacy, ICISP2015, December 2015”