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Optimizing Patient Identification and Appointment Management with Iris Recognition Technology

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ABSTRACT
This paper outlines the development of a web application that integrates iris recognition technology with a patient appointment management system. The application uses Convolutional Neural Networks for accurate iris detection, enhancing patient identification. It includes features for user registration, secure login, appointment scheduling, and doctor management. Patients who upload their iris images are matched with their previous medical records, allowing the system to present a list of relevant specialists based on their medical history. Patients can then select a specialist and book an appointment directly with that doctor. The backend is built using Flask, and data is stored in an SQLite database. This setup ensures that appointment details and doctors' prescriptions are carefully recorded and maintained. By combining iris recognition with traditional appointment management, the system streamlines the booking process, improves patient identification, and maintains comprehensive medical records, thus enhancing the efficiency of healthcare services.

KEYWORDS: Dataset of iris, deep learning algorithm convolutional neural network, patient details

1. INTRODUCTION

The incorporation of biometric technologies into healthcare systems has become increasingly ubiquitous, offering enhanced security and precision in patient identification. Among these technologies, iris recognition is distinguished by its exceptional accuracy and resistance to fraudulent activities. The genesis of iris recognition technology can be traced back to the late 1980s, with significant contributions from researchers like John Daugman, who pioneered algorithms for expeditious iris pattern matching.
This technology exploits the distinct and stable patterns present in the iris, which remain consistent throughout an individual's life, making it a dependable biometric identifier. In the domain of patient identification, existing methodologies frequently utilize traditional approaches such as RFID tags, barcode systems, and facial recognition. While these approaches provide certain advantages, they are limited by issues such as lower accuracy, potential for duplication, and susceptibility to security breaches. Furthermore, conventional appointment management systems in healthcare environments often depend on manual processes or basic digital frameworks that do not incorporate sophisticated biometric authentication, potentially resulting in inaccuracies in patient record management and inefficiencies in appointment scheduling.

Figure 1: Patientory Healthcare

The objective of the proposed methodology is to develop a comprehensive web application that seamlessly integrates iris recognition technology with an advanced patient appointment management system. This application is designed to enhance the accuracy of patient identification, streamline the appointment scheduling process, and maintain meticulous medical records.

By employing Convolutional Neural Network for precise iris detection, the system can accurately correlate patients with their historical medical data, ensuring that they are provided with appropriate specialist options based on their medical history. Additionally, the proposed system seeks to automate and optimize the management of medical appointments and prescriptions, thereby enhancing operational efficiency and patient experience within healthcare facilities. integration of iris recognition technology with appointment management systems addresses the limitations of existing approaches, offering a secure, efficient and user-friendly solution for both healthcare providers and patients. This project aims to capitalize on the strengths of biometric identification to ensure accurate patient recognition and effective management of healthcare services.

III. LITERATURE SURVEY

1. C. Barry, N. Ritter. Database of 120 Greyscale Eye Images. Lions Eye Institute, Perth Western Australia(2005).

A biometric framework employs an individual's unique characteristics or characteristics to automatically confirm their true identity. Owing to the increasing requirement for secure identification and the distinctive pattern generated by the human iris, iris recognition might become a standard in security frameworks through the use of economical equipment. It is considered that mechanism already within circulation. It can be accomplished to create a test situation based on the open source code that examines the performance of iris recognition technologies alongside image quality and acceptance rate. The investigation analyzes the overall general recognition performance, identifies the most important problem areas, and assesses retrieved from a database employing a typical camera. The primary objective of this project is to examine the eye's iris, which displays a distinctive design.

Unfavorable circumstances for iris surveillance may introduce artifacts into the image that compromise with the normal operation of the iris recognition process. Illustrations of these artifacts encompass numerous kinds of noise and light source reflections.

2. Richard, Yew Fatt Ng, Yong, Haur Tay and Kai Ming Mok, (2007). An effective segmentation method for iris recognition system.

Iris recognition research has received greater interest in recent years mainly because of its near-flawless recognition rates and consistency. template matching, and image preprocessing.For the following phases of feature extraction and template matching to be effective successful, iris segmentation throughout preprocessing is crucial.

Whenever the iris regions have not been separated appropriately, the pupil, reflection, eyelashes, and eyelids will be incorporated in the normalized iris region. In the presence of noise, iris recognition accuracy continues to deteriorate.

The suggested approach presents an opportunity for overcoming every one of the four distinct kinds of noise with the goal to increase accuracy rate. There are actually four components to it: (a) This pupil is positioned implementing the Circular Hough Transform and thresholding procedures. (b) To identify the outer iris, two search categories are defined, including the one which encompasses the circumference of the outer iris. (c) To identify the most prominent and lower eyelids, two search categories are determined based on pupil position. (d) For the elimination of pupil appears, observations, and eyelashes, thresholding is performed. Iris scans from the CASIA iris image database version 1.0 have been employed for the method's evaluations . In accordance with experimental results, the suggested approach has a high accuracy of 98.62%.

3.Milena B. P., Carneiro, A. C., Veiga, P., Edna, L. F. and Gilberto A. C., (2011). Solutions for Iris Segmentation, Biometric Systems, Design and Applications, Zahid Riaz (Ed.), ISBN: 978 - 953-307-542-6,http://www.intechopen.com/books/biometric-systems-design-andapplications/solutions-for-iris-segmentation.

In recent years, their has been considerable amount of intensive research on iris recognition. A brief summary of the most significant contemporary important iris recognition research has been provided in this paper. The initially element that was recognized was the advantages of Iris recognition techniques have been preferred ahead of other forms of biometric data in security applications. An overview to iris recognition and the applications it serves was subsequently given. A brief review of the most recently published studies on iris recognition techniques is provided as well. A description of the public iris databases and restrictions which are used for assessing extent to which these systems to recognize iris function

4. Archana V. M. and Bharti, L. D., (2010). Iris Recognition System with Accurate Eyelash Segmentation andImproved FAR, FRR using Textural and Topological Features. *International Journal of Computer Applications,* 7(9): 1-5.

Iris recognition approach that utilizes topological and textural properties. It acquires rotation invariant when the circular iris pattern transforms into a rectangular pattern. In present investigation, we desire to emphasize improved iris segmentation methods. The overwhelming majority of iris recognition research emphasizes the encoding and recognition of iris themes, but segmenting reliable sequences in and of itself is a challenging execution.

In other systems, a threshold always affects the manner in which a system executes. FAR and FRR are perpetually at conflicts with their counterparts while augmenting one inevitably deteriorates the other. In this study, an alternative strategy to iris-based authentication of rejection is presented. While a histogram is used for storing textural amenities, an Euler vector can be used to represent topological characteristics. The Du measure, whose beginnings originate with hyperspectral image analysis, is implemented to

match the shape of the histogram and Vector Difference Matching technique is devised to match euler vector.

5. Ruggero, D. L., Vincenzo P. and Fabio S., (2009). Agent-based Image Iris Segmentation and Multiple Views Boundary Refining.

In recent years, iris recognition is considered to be within authentication techniques. However, in non-ideal circumstances, which include unencumbered handheld devices, or non-collaborative setups, the overall .The efficient functioning of these mechanisms could diminish. More specifically, most important phase. iris image is the recognition technique. Since there are involuntary eye movements, hydrated area that is continuously transforming, and it is the subject of this process. Furthermore, impediments of the iris pattern that include eyelids, eyelashes, and reflections could possibly generate inconsistencies throughout the segmentation technique. Consequently, inaccurate segmentation may contribute to erroneous biometric recognitions and substantially decrease the overall precision of the system.

This chapter explores one of the most advanced iris segmentation algorithms obtainable nowadays in several different circumstances. We can explore boundary methods for estimation as well as how to take off occlusions and reflections form features including eyelids and lashes. The last component presents an assessment and analysis on the results of each of the principal approaches which have been applied to publicly accessible image datasets.

6. Mohammed, A. M., Abdullah, F. H. A., Al-Dulaimi, Waleed, A. and Ali, A., (2013). Efficient Small Template Iris Recognition System Using Wavelet Transform. *International Journal of Biometric and Bioinformatics (IJBB)*. 5(1): 15- 27.

The first commonly used and essentially accurate biometric technique for recognizing users is iris recognition. Iris recognition relies substantially on feature extraction, and at present the standard procedure is to extract features with smaller dimensions. In order to attain rapid verification algorithms and minimum template measurements, additional endeavors have been conducted. The intention of these efforts is to generate small embedded electronic devices, like integrated circuit smart card readers, compatible of human authentication. The current study presents the practical implications of an effective iris-masked eyelid ablation technique. Furthermore, a successful method for Encoding enabling iris recognition has been implemented. The most appropriate wavelet coefficients and quantization levels can be determined by exploring with different combinations of wavelet coefficients, everyone of which possesses a distinctive quantization level.

The CASIA Organization iris database images were rigorously investigated for developing the system.

IV. ARCHITECTURE

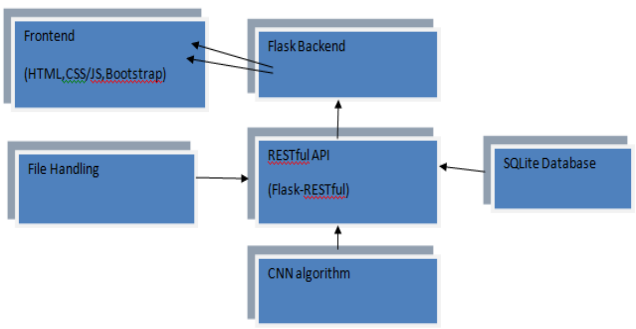

Figure 2: System Architecture Diagram

The web application is designed for efficiency, scalability, and security, integrating several key components for managing patient data, appointments, and iris detection. The client-side uses HTML, CSS, and JavaScript for structure, styling, and interactivity, with Bootstrap ensuring a responsive design. The server-side utilizes the Flask framework for handling HTTP requests, user authentication, session management, and routing. Data is stored in an SQLite database, including user details, doctor information, appointment records, and iris data. For iris detection, the application employs deep learning algorithm Convolution Neural Network for image processing, extracting unique iris patterns, and a biometric matching algorithm to authenticate patients. Flask-RESTful is used to create RESTful APIs for data exchange, including user registrations, logins, and appointments. File handling capabilities allow users to upload images, which are processed and securely stored. Security measures include secure password hashing, session management, and data encryption to protect sensitive information from unauthorized access and data breaches.

V. DATA FLOW DIAGRAM

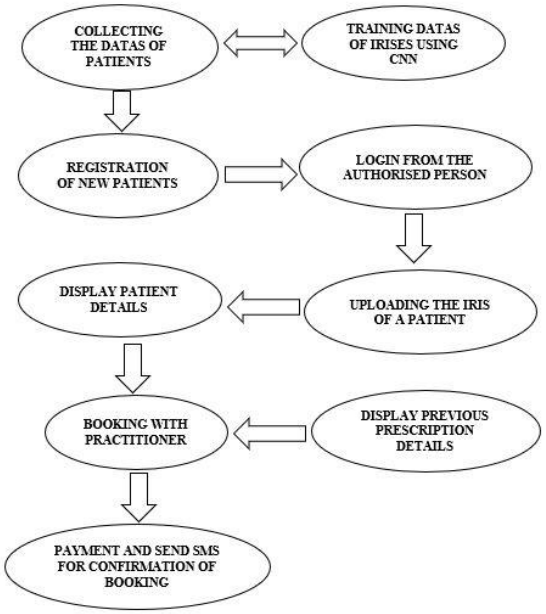

Figure 3: Workflow of Iris Recognition and Patient Appointment Management System

Collecting Data**:** This step involves gathering patient information, including demographic details, medical history, and iris images. The data collected here forms the foundation for both the identification system and the healthcare records.

Training Data**:** The collected iris images are used to train the Convolutional Neural Network (CNN) model. This training process is crucial for the accurate recognition of iris patterns and distinguishing between different patients.

Register**:** New patients register in the system by providing personal information and uploading their iris images. This step establishes a unique identity for each patient based on their iris pattern.

Login**:** Registered patients can log into the system using their credentials. Upon login, they can access their profile, view previous appointments, and book new ones.

Upload Iris**:** Patients upload their iris images for authentication. The system uses these images to verify the patient's identity by matching them against the stored data.

Previous Data**:** Once the iris is verified, the system retrieves the patient's previous medical records, including past appointments and doctors' prescriptions. This information is used to provide personalized medical services.

Output**:** After verifying the patient's identity and retrieving their medical records, the system generates a list of relevant specialists, such as gynecologists or maternity doctors, based on the patient's medical history and current needs.

Booking**:** The patient selects a suitable specialist from the provided list and books an appointment. The system ensures that the appointment is scheduled with the chosen doctor only. Additionally, the doctor's prescription and any updates during the consultation are saved in the patient's medical records for future reference.

Maintaining Previous Data: The system stores comprehensive records of each patient's visits, treatments, and prescriptions. This ensures that healthcare providers have access to the patient's medical history, enabling informed decision-making.

Specialist Recommendation and Appointment: Upon successful iris verification, the system suggests relevant specialists based on the patient's medical history and current health needs. The patient can select the appropriate specialist and book an appointment. This ensures that patients are directed to the right healthcare professional for their specific conditions. Saving Doctor Prescriptions: After consultations, the system saves the doctor's prescriptions and notes in the patient's digital medical records. This functionality is essential for maintaining a complete and accurate history of the patient's treatments, facilitating ongoing medical care and future consultations.

VI. Results

Figure 4: Homepage

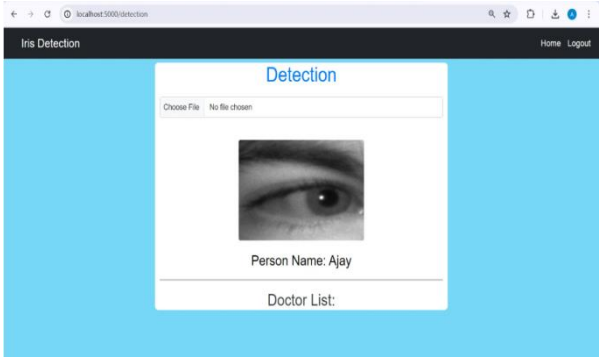

Figure 5: upload iris image

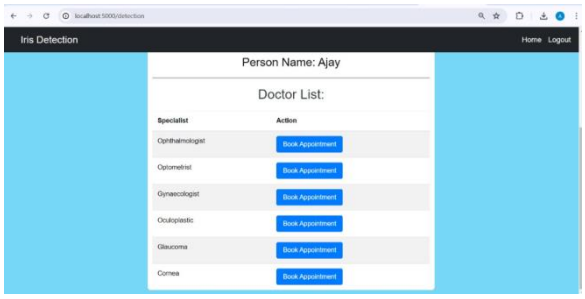

Figure 6: Display Doctorlist

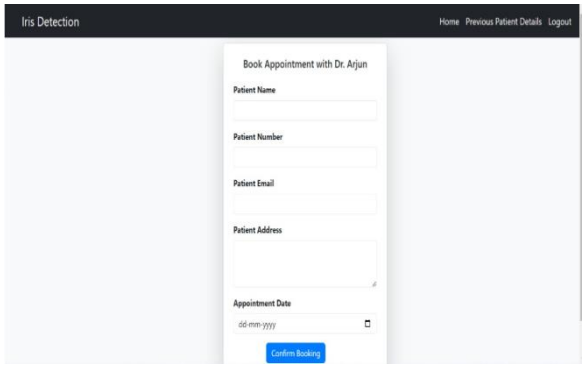

Figure 7: Booking Appointment

VII. CONCLUSION

The proposed iris recognition-based patient management system enhances the accuracy, security, and efficiency of healthcare operations. By streamlining patient identification and appointment scheduling and by maintaining detailed medical records, the system not only improves patient care but also contributes to a more organized and effective healthcare delivery process. Future developments in iris recognition technology and its integration with emerging health IT solutions promise to further elevate the capabilities and impact of this system.

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