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VISISCAN – AI-Driven Smart Visitor Management

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Abstract- Visitor management is an important tool in the context of providing security and transparency in running of institutions. The conventional methods such as manual registers tend to be ineffective and subject to mistakes. VisiScan is an AI- based Smart Visitor Management System that offers the solution of using facial recognition and AI-based automation to secure and contactless check-in. The efficiency is also increased by incorporating real-time tracking, voice-enabled feedback, and encrypted cloud storage into the system as well as role-based access and automated notifications provided to administrators. VisiScan fosters institutional openness and is in line with SDG 9 and SDG 16 which enhances innovation and strong institutions. Controlling visitor access in an efficient and secure manner is one of the necessary requirements in present-day institutions and organizations. The conventional visitor management software, e.g. manual registers and physical passes, frequently results in the inaccuracy of the data, time delays and security issue. All these approaches lack real-time updates, adequate verification, and maintenance of records on a long-term basis and hence are unsuitable to the modern safety and operational requirements. The Digital transformation has enabled the visitor management process to be automated and enhanced with the rapid development of the Artificial Intelligence (AI) and facial recognition. The use of AI-based systems can guarantee high speed and accuracy of authentication, less human activity, and less administrative overhead. Cloud-based databases also enhance the availability of data and security of storage, which allows organizations to have the right and open records of visitors.

Keywords: Internet of Things(IoT), Circular microstrip patch antenna, hairpin band-pass filter, microstrip filtenna.

I. INTRODUCTION

The project is intended to be an AI-driven visitor management system (based on a browser) that incorporates facial recognition, real-time monitoring, and automated notifications. Its design provides a smooth communication between the frontend, backend, and supporting libraries, which allow time-secure and contactless visitor check-in and check-out. The system records the data of the facial data with the help of the webcam, compares the data with the stored records and blacklist databases, profiles the feedback with the help of speech-to-text functions, and provides an administrator with a centralized dashboard to track the data in real-time, provide logs, and alerts, making it efficient, scalable, and being privacy-conscious.

The proposed system architecture starts with face capture and visitor recognition whereby a camera is used to capture the image of the visitor and then the image is processed by the facial recognition technology. The system initially carries out a blacklist check in order to confirm the restriction of the visitor. In case the visitor is blacklisted, it is denied and an alert is placed to the concerned authority.

To maintain high security levels and efficiency in operations, the system will also have the logout time monitor which will notify the administrators in case a visitor has reached the time limit assigned to him or her.

II. LITERATURE SURVEY

Abd Hafiff and Shamsul (2023) [4] suggested Dynac Visitor Management System (VMS), which is published by UTHM Publisher. They implemented a visitor management system that is kiosk-based and connected with facial recognition to register visitors and control their access. The system will substitute manual logging with automated verification of faces and real-time image processing to improve the flow of visitors and the safety of institutions. Nevertheless, web-based document scanning

systems such as VisiScan are more flexible than the dedicated hardware option.

The system suggested by K. Madhavi et al. (2023) [7] was a visitor access recognition system based on machine learning running on the OpenCV and classical ML classification algorithms. The system employs face embeddings, as well as distance metrics on access validation in constrained settings. Even though it is secure, it does not rely on cloud or browser-based integration but instead on locally deployed ML models.

Mohammed Aqib Zeeshan (2024) [10] discussed the use of face- api.js to implement face recognition with the browser. This work has been shown to authenticate in real-time, recognize sentiment, and compare the measure of accuracy with respect to CNN-based models.This research is direct support to the VisiScan browser native face recognition model.

In Join UIN SGD, Juliandy, Wong and Darwin (2023) [5] proposed an online attendance tracking system based on CNN and face-api.js. Their study established the feasibility of webcams based on client-side facial recognition on the web, an attendance management technology.

Alipour Talemi et al. [1] have suggested AAFACE: Attribute- Aware Attentional Network of Face Recognition, which can be found on arXiv. The model improves recognition accuracy with attribute-sensitive attention and soft-biometric features, which increase embedding discrimination in adverse conditions.

Mi et al. (2023) [8] suggested a face recognition privacy- preserving method that uses randomized frequency components and is revealed on arXiv. Their approach secures biometric information without sacrificing the recognition rate, which promotes the ethical implementation of AI and safe storage of embedding.

A hybrid Visitor Management System was released by IRJWeb (2025) [11] with a QR Code-Based Check-In Built-In Face Recognition Technology. The model incorporates the use of QR- based validation with facial recognition to perform the multi- factor authentication procedure. In contrast to this solution, VisiScan erases the need of QR dependency to have a complete contactless experience.

Oye, Frank, and Owen (2024) suggested the extension of Azure Face API by their own facial recognition models to enhance scalability and the work of the model in clouds. Their mixed model throws light on the benefits and drawbacks of cloud-reliant recognition systems with reference to browser-based models.

Bhavani et al. (2025) [2] came up with the Visitor Face Authentication Using Deep Learning published by AIP publishing. The system involves CNN based face encoding and cloud database surveillance to ensure secure access to the institutions but it involves specific AI infrastructure.

At GNITS Department, D. Naga Jyothi and B. Srujana (2023) [6] suggest a smart attendance and visitor monitoring system based on AI. Their system combines CNN-based face recognition with automated attendance and visitor management web interface, but does not provide sophisticated security features on the administrator side.

III. ARCHITECTURE OF THE SYSTEM

The suggested system begins with the process of capturing the face of a visitor with the aid of a camera and identifying him through the use of facial recognition technology. The system will first see whether the visitor is on a blacklist. In case the visitor is constrained, they are not allowed in and a notification is forwarded to the relevant authority. The system also compares the face with the database in case the visitor is not blacklisted. Repeat customers will be identified automatically whereas new customers will be registered by gathering and storing their basic information safely to be accessed during future visits.

Once registered or logged in, the system records the check-in and check-out time based on face detection and thus the manual entries are eliminated, therefore, precise tracking is done. Upon the

completion of the visit, the visitors are allowed to provide feedback, and the system analyses it to get an idea of how satisfied they are. It also keeps track of the time that is allowed to visit and alerts the administrators in case time is running out. The activities are easily monitored and controlled via an admin dashboard.

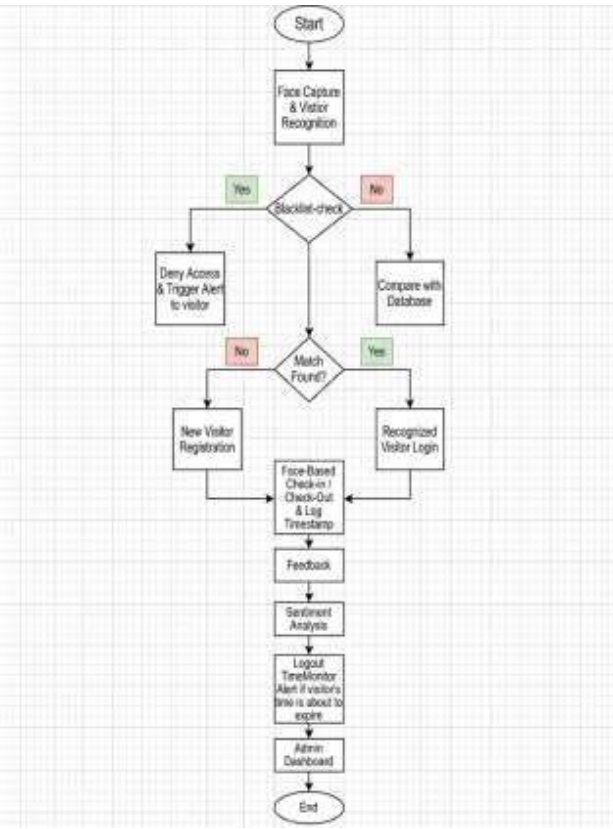

Figure: VisiScan Architecture

A. Face capture and Visitor Recognition

The system begins by taking an image of the visitor with high resolution camera. Facial recognition algorithms are advanced and these algorithms extract unique features and form a digital template, which is matched against existing records to identify whether the visitor is a new one or a returning visitor.

B. Blacklist Verification

The identified faces are compared with a blacklist database. In case a visitor is marked as restricted, the visitor is denied access and an automated message sent to the security personnel to boost the overall security.

C. Database Comparison

Other visitors not blacklisted are compared to the main database against which registration is verified. This avoids duplication of records and keeps the records up to date.

D. Match Found / Returning Visitor

If a match is found, previous details including name, contact information, and visit history are retrieved. Returning visitors can check in without manual forms, saving time and improving user experience.

E. New Visitor Registration

Individuals who do not have comparable records are registered. The simple information like name, contact number and purpose of visit are saved and kept safely to identify the visitor in future.

F. Face-Based Check-in / Check-out and Timestamp Logging

The system is automatic recording entry and exit time by facial recognition. The security audits and operational tracking have accurate timestamps that are recorded without manual sign-Ins.

G. Feedback Collection and Sentiment Analysis

Visitors also give feedback after the visit, which is processed with the help of natural language processing. Sentiment analysis categorizes feedback as a positive, neutral and negative one, which allows the organization to provide better services.

H. Logout Time Monitoring

Visitors also give feedback after the visit, which is processed with the help of natural language processing. Sentiment analysis categorizes feedback as a positive, neutral and negative one, which allows the organization to provide better services.

I. Admin Dashboard

All modules are integrated in the admin dashboard, which lets the administrators track the activity of visitors, logs, alerts, blacklist notifications, and the reports on the sentiment within one interface. It allows to effectively manage and control the system in real time.

IV. IMPLEMENTATION

The system is a hardware and software combination that initiates a secure and automated visitor management system. The picture of the visitor is captured by a camera and facial recognition technology is used to process the picture by comparing it with a previously stored database of visitor facts and blacklist list entries. In case the visitor is identified as a frequent visitor, then the system will enable easy and fast check-in. In case the visitor is a first time visitor, the system automatically registers him and safely stores his or her details to be used in the future. Check-in and check-out times are automatically captured in the system; this acts as a perfect way of tracking the time without the manual input required. By the conclusion of the visit, the visitors will be able to give feedback that will be analyzed with the help of sentiment analysis to get insight into their level of satisfaction and improve it in the future. Everything is controlled by an admin dashboard that enables the administrators to track visitor logs, check alerts, control logs, and feedback reports in real time and makes a system work efficiently and safely.

A. React.js

The frontend framework is React.js that will allow creating a dynamic, responsive, and user-friendly interface of the system. It enables the development of re-useable modules and would facilitate the administration dashboard, visitor registration forms, check-in/check-out modules and feedback easily. The virtual DOM of React guarantees quick render that improves the performance of the system and makes the user experience of the system smooth. Also, React.js is easy to connect to the backend services, such as Firebase, or external APIs.The component-based architecture enables developers to update single elements of the interface without loading the entire page, which is important with real time monitoring of the activities of the visitors and alerts.

B. Database: Firebase

The system utilizes firebase as a database and the backend service, which offers a real-time database service, authentication service, and hosting service. The database keeps visitor records, black list entries, check-in/check-out records and feedback in a safe place. The real-time functions of Firebase enable real-time updates such that the activity of visitors to a website can be updated instantly, unlike manual refreshes which will make the visitor activity show on the administration dashboard. Firebase also manages the backend easily using the authentication, storage, and cloud capabilities provided. The features are made so that complex server-side programming is not necessary and it can be easily integrated with the frontend interface written in React.js. It is scalable and therefore can accommodate a number of visitors at the same time without reducing its performance.

C. Tools & Libraries: face-api.js

Facial recognition and face detection in the system is done by a library which is known as face-api.js, a JavaScript library. It enables the system to scan a face of a visitor, isolate facial features and match the features with stored templates in real time. The library favors a variety of face recognition, precise recognition, and age/gender estimate in case of necessity, which is why it fits secure visitor management. Face-api.js can be used directly in the browser thereby cutting down the heavy backend processing and guaranteeing a faster rate and reduced latency. It is also compatible with React.js, which means it can be used to capture faces in real-time, recognize and check-in/check-out without the need to use extra server resources.

D. Web Speech API

The Web Speech API is used in order to allow voice-assisted interaction in the system. A voice command can be applied to actions such as starting a check-in, giving feedback, or moving around the dashboard by visitors and administrators. This increases accessibility and offers a hands-free interface that is more modern to have a smoother user experience. The Web Speech API can also be used to recognize speech in real-time and convert text to speech, which means that the system will be able to read out instructions to users or verify their actions as well as inform administrators about any alerts orally. This enhances the efficiency of operations particularly in

busy places or to users who need some form of accessibility.

E. EmailJS

The system has EmailJS which supports automated email notifications and alerts. As an illustration, the system may send notifications to administrators when a blacklisted visitor tries to enter the facility, when a visitor spends more time than he or she should, or to give feedback summaries to the management. Through EmailJS, the system does not require elaborate email settings at the back end. It enables one-on-one emailed messages via pre-established templates (frontend) and emailing, making the sending and receiving of messages simple, efficient, and user friendly. This guarantees that important alerts and updates are provided in time and without human intervention.

F. Results

This part shows the results of the VisiScan system development and testing. It identifies the way the system works in a real world case by testing its major features which include facial recognition accuracy, visitor check in/check-out effectiveness, blacklist imposition, and feedback gathering. The findings reveal the capability of the system to offer secure, contactless, and user- friendly visitor management experience as well as dependable real-time monitoring and notifications to administrators.

Figure 5.1 User Access Portal

The VisiScan system has a User Access Portal as shown in fig 5.1, which is where the users can see a straight forward interface enabling them to choose their roles. The Visitor Module allows visitors to check in and out safely, contactlessly with facial recognition by AI-based tools which can be accessed at any device with a webcam without any additional installations. Administrators are provided with the Admin Module which has a centralized dashboard with real-time visitor tracking, blacklist management, alerts, and reviewing feedbacks.

Figure 5.2 Resume Match Analysis

Fig 5.2 interface will enable new visitors to be registered easily into the VisiScan system. The users are required to fill in their personal information, including name, email address and the reason they are visiting the site and then take a snapshot of themselves using a linked web camera. The Capture Face feature captures facial data to be used to recognize the individual in subsequent visits. All the information is sent to the database with the help of the Register button and makes the onboarding efficient.

Figure 5.3 VISITOR CHECK-IN INTERFACE

Visitor Check-In Interface in fig 5.3 allows returning visitors to check in without any difficulty by means of facial recognition. The system identifies the visitor by clicking the Capture Face button which provides a quick and contactless entry by using stored facial embeddings to verify the identity of the person. This

makes the procedure of authentication manual nonexistent, thus saving time and human efforts. The interface offers minimalist yet targeted design to the user. It provides secure and real time check- in and the experience is smooth and user-friendly.

Figure 5.4 ADMIN LOGIN INTERFACE

Fig 5.4 Admin Login Interface offers the administrative dashboard of the VisiScan system in a secure way. To enter the website, administrators need to log in with their registered email and password. The interface is user-friendly and reacts quickly, as well as it is devoted to authentication and system security. After being logined, admins will be able to control visitor data, track activities, and deal with alerts in real time. The simple layout and color use of the design ensures simplicity, ease of use and professional look.

Figure 5.5 Admin Dashboard Overview

In fig 5.5, the Admin Dashboard is used to monitor and manage visitor data in real time having a centralized interface. It shows the overviews of major metrics, including the total visitors, the number of people present at the premises, the number of people that were checked out, and the blacklisted users. The real time analytics charts are used to visualize trends such as the number of visitors per day and history of blacklisted visitors to assist the administrators in making prompt decisions. The dashboard is crafted in a clean and easy interface to be used as an efficient data tracker.

Figure 5.6 Visitor Information Panel

The fig 5.6 illustrates visitor information panel that has the list of visitors and their details. The table will contain the columns with the name of the visitor, his/her email, the position (client or intern), the time when the person entered the house and the time when he/she left the place as well as the feedback that this person has given about visiting the house. There is also an option to Add or delete a visitor in the blacklist in each row, thus making the management of access control implemented by the administration effective. It is an interface that facilitates easy tracking and control of visitor movement.

Figure 5.7 Detailed Visitor Activity Report

The part of fig 5.7 represents the full trace of the visitor movements into and out of the premises as well as his time tracking. It has the necessary visitor information like email and reason, after which a

transparent record of all the places visited with the check in and out time is recorded. Visit time is automatically counted to track the time spent on the visits effectively. This comprehensive log enables transparency, security and good visitor management.

Figure 5.8 Visitor Check-out Interface

In picture 5.8, one can find a Visitor Check-Out interface of a visitor management system. On the page, there is a live camera image in the center where one can scan the face of the visitor and be verified as one. Under the camera feed, a text box enables the visitor to type on their feedback with another option of speech-to- text being convenient. There are buttons used to scan the face as well as to submit the feedback and the checkout request. The bottom offers the visitor a congratulatory note upon his/her name, which means that he/she has been recognized and communicated with.

Figure 5.9 Blacklist Visitor Check-in

The fig 5.9 displays the interface of Visitor Check-In, according to which the system performs face recognition to verify identities. The camera takes a picture of the face of a visitor and the software instantly determines whether one can get in or not. In the case, a message is displayed in the system saying, Access denied, You are blacklisted, which means that the visitor is not allowed to access the premises. This aspect improves security since unauthorized people or those with flags do not have access and there is increased security within the premises.

V. CONCLUSION

VisiScan Visitor Management System illustrates how AI facial recognition can be successfully combined with a visitor management platform to provide a safe, touchless, and efficient visitor management system. Its web-based platform means it does not need any specialized hardware and can be deployed easily in locations like the corporate office, university and at events. The system automates the key processes such as visitor check-in and check-out, blacklist identification, real-time tracking and voice-based feedback retrieval. These characteristics save the manual labor, decrease the human error, and enhance the total security and efficiency of the operations. The real-time alerts and the admin dashboard enable the administrators to keep track of visitors and make decisions in a timely manner.

To continue the future enhancements, an increase in accuracy with respect to facial recognition in diverse lighting conditions and quality of the camera will further reinforce the system reliability. The speech-to-text module can be enhanced with noise-cancellation and more sophisticated language models to make it more accurate in noisy places. Furthermore, the application of multi-factor authentication solutions, like QR code or NFC, advanced analytics to the admin panel, and mobile applications that will be used by the visitors and administration of the facility will enhance ease of access, security, and user experience.

VI. FUTURE ENHANCEMENTS

Additional improvement of VisiScan system can be done in the future and aim at improving the performance and usability. The accuracy of facial recognition could be improved so that it could operate effectively in low light, other angles and high

density. The speech-to-text option can be enhanced to have noise cancellation capability in order to record feedback of the visitors in a busy environment.

To increase security, multi-factor authentication, e.g. in the form of QR codes, NFC, or other biometric options, can be added. Creation of mobile applications among both visitors and administrators will allow visitors and administrators to check-out/check-in remotely, receive instant notifications, and manage it easier via their phones or tablets. Along with it, the incorporation of more sophisticated analytics and reporting features into the dashboard of the administration panel and allowing the establishment of an API connection with the current facility and security systems will contribute to improved decision- making and the smooth functioning of the operations.

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