Secure Information System for Visitor Access Recognition using Machine Learning

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Abstract. Typical visitor access apps are usually passive/manual. The security guards in highly populated communities have to verify the identity of the visitors every single time, be it the residents or new people. This process is also time-consuming. Availability of the resident is also essential to approve the entry. VISITOR ACCESS is a better substitute for the regular visitor access systems. The process starts with choosing the house number and the name initially. When there is a known person, the visitor is verified, recognized, and approved to enter. If the visitor is unknown, he or she is asked to enter a few more details, which are sent to the resident's mobile. A message is sent to the visitor's mobile regarding the approval status to deal with the case of multiple visitors. Open CV is used to verify the identity of the visitors using face recognition, and the app acts as an interface between the users and the system.

1. Introduction

When a community or society is large, the security is not so robust as the guards have to verify the identity of the visitors every single time. Moreover, most of the visitor access apps are manual. The security guard is responsible for verifying the visitor. This way is more prone to risk as the guard could get lazy at times or even use his power in a bad way. There are passive apps that provide mobile-based security management. But these apps have problems. The identity of people that are regular and known is verified every time, though they visit the community almost every day. It is more convenient considering all possible scenarios.

These apps do not provide a solution for the case when there are multiple visitors at the same time. Hence, the verification process takes a lot of time. The security guard may not be available sometimes and therefore, there is no way to confirm the identity of the visitor as only the security guard has the app, and in such cases, the security is compromised. The visitor access management system is designed to provide an added layer of security for the residents of the gated community by providing an automated approach. It ensures that the visitor access management is made easy and more convenient considering all possible scenarios.

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2. Literature Study

A literature study for an AI visitor access project for gated communities would involve researching existing research and literature on the topic of visitor access management, with a focus on gated communities. This can entail researching the most recent innovations in scientific theory and practice used for managing visitor access, as well as looking at case studies of similar projects that have been implemented in gated communities.
Face recognition technology is a biometric tool that identifies a person by their unique facial traits[1]. The facial pictures are gathered and then automatically processed using image recognition technology. The article provides an overview of many facial recognition-related studies. The facial recognition technologies discussed in the article are at various phases of development.
Haar cascade classifier is employed in this study[2]. In this work, the methods for object identification were covered. The experimental results indicate that the suggested method is sufficient for processing the object's features.
Face recognition is a technique that recognizes a person based on their facial traits or profile. [2,3]LBPH (Local Binary Patterns Histogram) is a technique for identifying and locating a person's face. In LBP, a section of a grayscale image is first selected as a 3x3 window size, and the neighboring and center pixel values are compared. Then, a binary value is assigned, which is then translated into a decimal value. This work uses the LBPH method to accomplish frontal face and side profile face recognition on the GPU. Afterwards, the effectiveness of the CPU and GPU are evaluated [4].
[5]Mobile Application Development relates to the creation of application software for portable devices like mobile phones and Personal Digital Assistants. The user is given access to a number of functions through the use of mobile applications, allowing him to meet all of his demands and many more. Users should be able to engage with apps. Applications may be downloaded from a variety of sources, including the iOS App Store and Google Play Store.

3. Methodology

Although society management systems are not new to the market, people have lately begun to take advantage of numerous untapped capabilities that society management systems provide. Security management has now become an essential part for many communities[6]. Hence, VISITOR ACCESS has a lot of scope as there are several gated communities almost everywhere. This idea could be standalone or could be used for making the existing security management systems like the MyGate, and NoBrokerHood apps much better.

4. Proposed Model

4.1. System Overview

The process starts with the visitor choosing the house number and the name on the screen provided near the gate. (according to the house number provided). The identity of the person is verified using the Opencv library. If the person is a known visitor, he/she is approved to enter the community as the model was already trained with about 300 images of that person, and hence, it recognizes the person. If the person is un-identified, it means he/she is a new visitor or not a regular visitor, and therefore the person will have to enter a few more details like the phone number[7]. The details of the person are sent to the resident, who then checks and verifies the identity if he/she wants to, through the mobile application.
The approval status is sent to the visitor's mobile as the phone number is available. This provides a solution for the case when there are multiple visitors at the same time. As the

approval is sent to the visitor's mobile, if there are multiple visitors, they can use the screen and need not wait for the approval status on the screen. The resident also has an option to add the person to known users[8]. If this option is chosen by the resident, the person gets to see the option to add himself to known users. About 300 images of the person are taken and then the model is trained on these[9][10]. (The images on the visitor's side would be more accurate for prediction.)

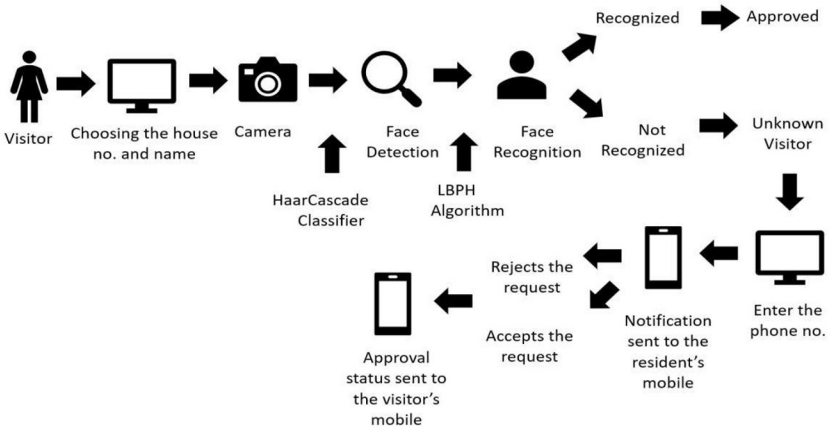

Figure 1 : Block Diagram

4.2 Equipment required

In this project, some hardware devices are used such as :

1. Screen – For the visitors to interactwith.

Webcam/Camera – This is to verify the identity of thevisitors.

Figure 2 : Screen

Figure 3 : Webcam/Camera

MIT App Inventor- An android operating system supports mobile apps created in the visual block-based programming environment. It allows users to create apps by arranging and connecting blocks, similar to Scratch, rather than writing code. It includes a variety of built-in blocks for common functions such as buttons, text input, and image display, as well as

blocks for more advanced features such as GPS, accelerometer, and camera. Users can also create their own custom blocks and import them into their projects.
Firebase Database: Google's Firebase platform offers a cloud-based, NoSQL database called Firebase Realtime Database. It enables realtime data synchronization and storage across several devices for developers. The data is stored in a JSON (JavaScript Object Notation) format, which allows for easy storage and retrieval of data, and the data is synced across all connected devices in realtime, which means any changes made to the data will be immediately reflected on all connected devices.
Python: Python is a powerful and versatile language; it has a large and active community and many libraries and frameworks that make it easy to get started on a wide variety of projects[11]. Python is also an accessible language for beginners and allows for quick prototyping, making it a great language for learning programming and developing projects.
Haar Cascade Classifier was used to detect the faces and LBPH was used for face recognition.

4.3 Implementation

The ProposedFramework

AproposedtheoryforAIvisitoraccesscould involve using machine learning algorithmstoanalyze patterns in visitor data and make predictions about future visitorbehavior.

Workflow

The flow chart of the proposed system is illustrated
Step1: Start.
Step 2: Enter house no & name and verify.
Step 3: If the visitor is known user, approve the entry and STOP.
(OR)
Take extra details.
Step 4: Send the visitor's details to the resident.
Step 5: If visitor accepted request, if yes approve entry.
(OR)
Disapprove entry and STOP.
Step6: Add user and display message.
Step7:STOP

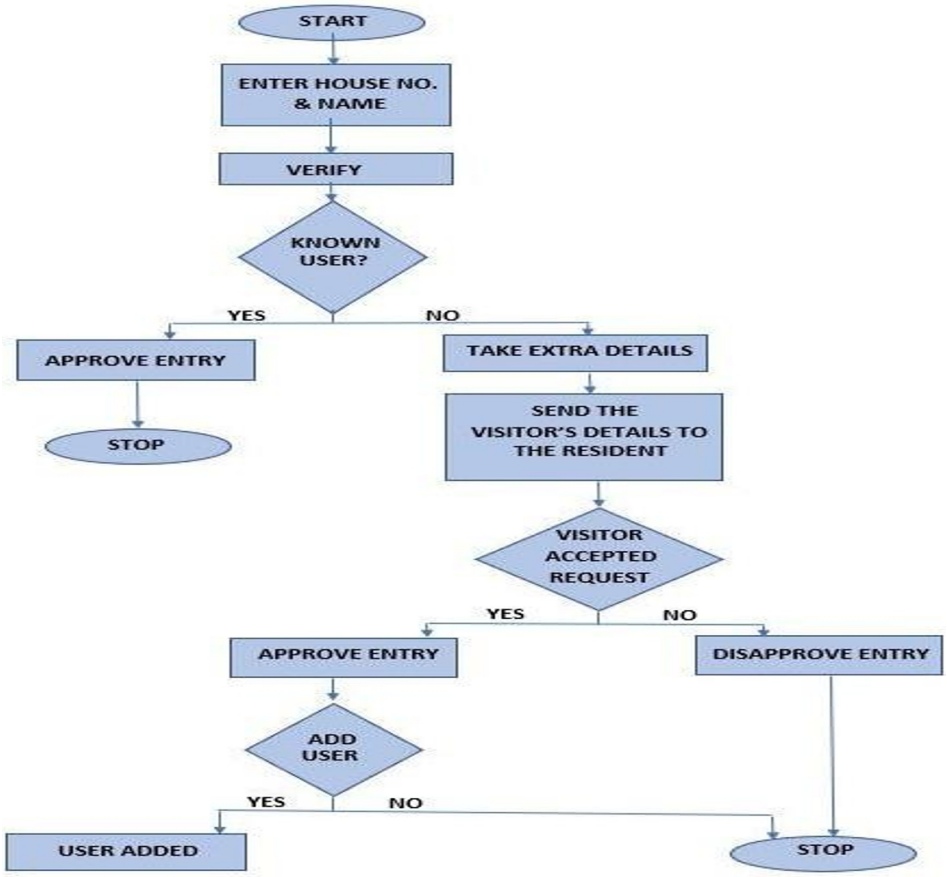

Figure 4:Flowchart of the proposed system

AI can be used to manage visitor access in a physical space by utilizing various technologies such as facial recognition and mobile access. The working of AI visitoraccesstypicallyinvolves the following:

1. Registration: The visitor is registered in the system, and their information, such as name, photo, and contact details, are stored in a database.
2. Authentication: When the visitor arrives at the building or office, they are prompted to authenticate themselves. AI can be used to analyze the information provided by the visitor and verify their identity.

5. Results

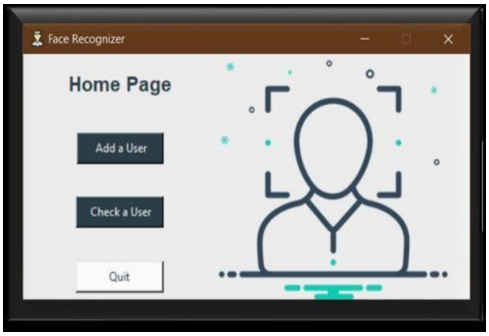

Figure 5: Home page

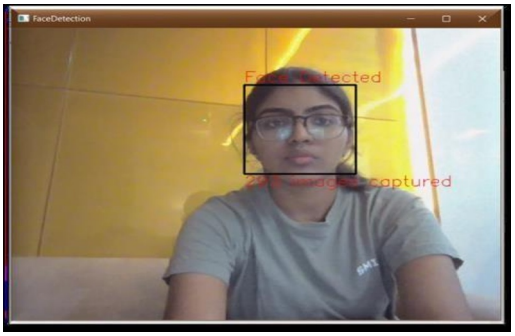

Figure 6: Capturing images

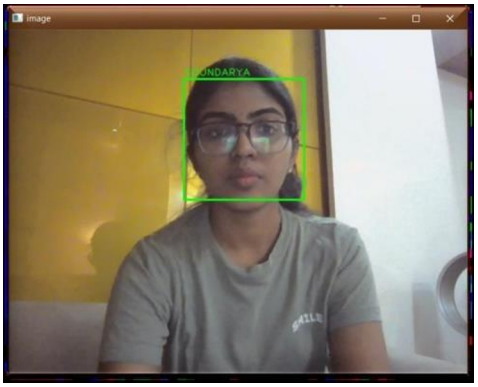

Figure 7: Output (Knownvisitor)

6. Conclusion

In conclusion, the AI visitor access project has successfully demonstrated the potential of using artificial intelligence to enhance security and improve the visitor experience. By implementing facial recognition technology and integrating it with existing systems, the project has streamlined the check-in process and improved the accuracy of visitor identification. Additionally, the system has been able to detect and flag potential security threats, providing an additional layer of security for the organization. The project has also highlighted the importance of proper system configuration and maintenance to ensure data privacy and security. Overall, the project has demonstrated the potential for AI-based visitor access systems to be a valuable asset for organizations.

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