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Smart Voting System using Face Recognition

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Abstract: *All democratic governments are defined by elections, in which the people are able to express their preferences and ideas by casting their ballots. The voting process has developed from basic handwritten ballots to internet voting platforms in leaps and bounds throughout the years. The goal of this project is to develop a facial recognition voting system that would enable every Indian voter to vote from "ANYWHERE IN INDIA" at the closest polling station. High-level biometric security is maintained via the implementation of this project. A database on a server has all of the voter information. There must be an individual standing in front of a computer with a camera reading their picture before they can begin voting. Once the data has been read, the serial port on the microcontroller is used to communicate it to the web application. The person database is managed by the web application software. The "smart voting system" confirms that a person's vote has been recorded after he or she casts it, and if he or she attempts to vote again using his or her face sample, the web page will show that he or she is unable to cast a ballot. Afterwards, the election commission may examine the results and reset the votes, and it can also update the candidate results annually.*

Keywords: Face Recognition, Webpage, Database, Bimetric

I. INTRODUCTION

In India, voting systems are split into two categories: direct voting and indirect voting. It has been in use since 2003, and the first method was secret ballot paper, which necessitated the use of a significant amount of paper. Our present method to internet voting is insufficiently safe, and we must develop a more secure approach. For the purpose of identifying the person, the concept of face detection and recognition is used in this proposed project. The voters are checked at three separate phases in our proposed strategy, according to us. When you reach the third stage of security, the system looks for your face in a database of photos given by the electoral commission and recognises it. The first two tiers of security are the verification of a unique identification number and the verification of an electoral commission identification number or voter card number. Upon confirming that your voter card number is accurate, you will be sent to level three, which is the highest degree of protection. Voters may only cast their votes in an election if the photo they took matches the image in the database that relates to the voter. Otherwise, they will be disqualified from voting. The current method restricts security to a voter card, which implies that anybody may use a voter card to cast a vote on behalf of another person. Our team has, on the other hand, devised a voting technique that is far more secure than the present approach.

II. OBJECTIVES

The project's primary goal is to find a way to increase voter participation in local, state, and national elections. As a result, we're working to create a voting system that allows people to cast their ballots from a distance, with their previously recorded picture face serving as proof of identity. The goal of this research is to optimise the embedded system's run time for facial recognition. Various methods and strategies for feature extraction, normalisation, selection, and classification are needed to address these concerns, as well as the computational complexity and time issues. This kind of embedded facial recognition technology may be utilised in everyday life.

2.1 Page Layout

This document covers the requirements for the release of the Voting System and Facial Recognition. The organizations will be able to store data in the form of images and videos of voters. Our motive is to provide remote voters with a time-efficient mode of voting and having a say in government formation. This will hopefully increase the turnout as the penetration of the internet is increasing on a day to day basis.

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III. MOTIVATION

Every few decades, the voting machine undergoes a little upgrade. There have been several flaws with conventional Electronic Voting Machines over the years, thus India's Election Commission has made a number of steps to improve the system. They still had to deal with issues including skewed results, illicit activity at polling places, and poor turnout. Now that technology has progressed so far, it seems reasonable to include it into the voting process. As Future Engineers, we must be able to tackle the challenge that our society is now facing. As a result, in an effort to benefit society as a whole, we chose the Smart Voting System. Using our smart voting system, we can prevent all of these instances of fraudulent voting. Using a biometric sensor and cloud technologies, this project offers and executes an easy and safe way for voting. Model flexibility, security, dependability, and scalability are all improved by the use of the improvisations. The government already had the citizen's fingerprints on file. As a result, this initiative offers the greatest way to prevent fraud and high participation via the use of electronic voting. The project's design is portable, versatile, and consumes little power.

IV. LITERATURE SURVEY

X. Liu, P. H. Tu, J. Rittscher, A. Perera and N. Krahnstoever, "Detecting and counting people in surveillance applications,"A new video-based people counting method has been proposed in this research that incorporates a number of new features. We can be certain that the items being tallied are solely individuals since we can see their faces. When the face scales drastically shift, a scale-invariant Kalman filter is presented. Face occlusions are also handled using a kernel-based object tracking algorithm combined with it. Finally, we've suggested a method for counting individuals based on the automated categorization of possible face trajectories's. The Earth Mover's Distance measures the degree of similarity between the spots in the histogram. By eliminating incorrect trajectories, not only can the system's counting accuracy be improved, but the automated categorization process can also eliminate the need for humans to develop counting rules based on empirical evidence. An accuracy of roughly 93 percent was achieved by evaluating our experimental data, which exhibited excellent performance on these many areas. It is our goal to adapt our technology to more complicated environments, such as outdoors, where light varies greatly. In addition, online learning and the adoption of a more robust classifier will enhance the categorization of face trajectory to better match varied settings. N. R. Borkar and S. Kuwelkar, "Real-time implementation of face recognition system,A Face Recognition System Based on PCA and LDA is presented in this study. Accuracy of 97% has been achieved by utilising the raspberry pi 3 module in conjunction with these two approaches. To be employed in identification systems, the Raspberry pi 3 module is a low-cost, lightweight, and tiny component. I've learned a lot about facial recognition algorithms with this project, and I'm glad I had the chance to do so. This study has also shown me that improving the accuracy of a Face recognition system by integrating many approaches. In the future, robots might be made more human-like by incorporating this face-recognition technology. A. Das, M. Wasif Ansari and R. Basak, "Covid-19 Face Mask Detection Using TensorFlow, Keras and OpenCV,"At the beginning of this article, we briefly discussed the purpose of our research. The model's learning and performance challenges were then shown. Sophisticated methodologies and ML tools have been used to reach a reasonable level of accuracy. It may be used to a wide range of uses. Considering the Covid-19 situation, wearing a mask may become a necessity in the near future.. Masks are required by several public service providers in order to use their services. The public health care system will greatly benefit from the model's implementation. In the future, it will be possible to tell whether someone is wearing the mask correctly if the technology is included. A more advanced version of the model might determine whether or not a mask is susceptible to viral infection, i.e. whether or not it is surgical, N95, or not.

V. PROJECT PLAN

The algorithm has three stages:

Stage 1: Person Detection: The total number of persons in the image is getting calculated at this stage. Python libraries CV2 and argparse are being used here. DNN from CV2 is being used which allows running pre-trained neural networks. readNetFromCaffe() function for reading a network model stored in Caffe framework with args for “prototxt ”and “model” file paths.which comes with a nice pre-trained face detection convolutional neural network (CNN). The new model enhances the face detection performance compared to the traditional models, such as Haar. The framework used to train the new model is Caffe.

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Stage 2: Face Mask Detection: Recognize and manipulate faces from Python or the command line with the world's simplest face recognition library. Built using dlib's state-of-the-art face recognition built with deep learning. The model has an accuracy of 99.38% on the Labeled Faces in the Wild benchmark. This also provides a simple face_recognition command-line tool that lets you do face recognition on a folder of images from the command line! Find and manipulate facial features in pictures. Get the locations and outlines of each person's eyes, nose, mouth, and chin.

Stage 3: Face Recognition: There is an amazingly simple Python library that encapsulates all of what we learned above creating feature vectors out of faces and knowing how to differentiate across faces. This Python library is called face_recognition and deep within, it employs dlib – a modern C++ toolkit that contains several machine learning algorithms that help in writing sophisticated C++-based applications. The pickle module is also used which implements binary protocols for serializing and de-serializing a Python object structure. "Pickling" is the process whereby a Python object hierarchy is converted into a byte stream,

5.1 Document Purpose

The purpose of this document is to guide developers in selecting a design that will be able to accommodate the full-scale application. This is intended to help the users visit areas of utmost importance such as military cantonments, airports, prestigious institutions, industries, and governmental institutions. While entering such premises the visitor must prove identity necessarily, with some documents like ID cards. Such a procedure might involve certain levels of security checks, followed by an entry in their visitor's record book. The whole procedure is time-consuming but has its importance and security cannot be overlooked. According to a Timex survey, Human beings spend approximately 6 months of their lives waiting in line for things, which means like 3 days a year of queueing up. Therefore, to overcome such an issue while visiting such places, we come up with a solution that is comparatively fast and paperless.

5.2 Product Scope

This document covers the requirements for the release of the Voting System and Facial Recognition. The organizations will be able to store data in the form of images and videos of voters. Our motive is to provide remote voters with a time-efficient mode of voting and having a say in government formation. This will hopefully increase the turnout as the penetration of the internet is increasing on a day-to-day basis.

5.3 Product Functionality

1. Sign up / Login
2. Person Detection
3. Mask Detection
4. Face Verification
5. Verification by OTP/Email.
6. Voting Procedure
7. Logout.

5.4 Design and Implementation Constraints

1. Login Mechanism
2. Unique ID, phone, email.
3. Can vote only once
4. User Characteristics: The user should be familiar with the related terminology like login, identity, verification, password.
5. General Constraints:
    a. It requires an Internet connection.
    b. Reliable devices like smartphones, computer systems.

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5.5 Assumptions and Dependencies

- All-time availability of internet
- Electricity availability at Checkpoints
- Robust and reliable device

5.6 Functional Requirements

1. Use Case 1: User Registration

Primary Actor: User Pre-Condition: Django, Main Scenario:

- Start the application.
- User prompted for registration.
- The user gives the required information for registration.
- The system does registration. The main screen is displayed.

Alternate Scenario:

Registration will be failed if the email and username are already registered.

2. Use Case 2: User Login

Primary Actor: User Pre-Condition: Django Main Scenario:

- Start the application.
- User prompted for email/username and password.
- The user gives the login id and password.
- The system does authentication. The main screen is displayed.

Alternate Scenario:

- Authentication fails due to the wrong password typed or invalid login id then prompts the user that he typed the wrong password. Allow him to re-enter the password.
- Users who haven't created an account then suggest the user first create an account and then log in to the application.

3. Use Case 4: Person Detection

Primary Actor: User

Pre-Condition: User logged in, internet connection

Main Scenario:

- User clicks on Person Detection
- The camera captures the photo and verifies it and if verifies the access is given.
- Code will be ready to share

Alternate Scenario:

- If the face is not verified, then access is denied.

4. Use Case 5: Mask Detection

Primary Actor: User

Pre-Condition: User logged in, internet connection

Main Scenario:

- User clicks on Mask Detection
- The camera captures the photo and verifies it and if verifies the access is given.
- Code will be ready to share

Alternate Scenario:

If the face is not verified, then access is denied.

5. Use Case 6: Facial Recognition

Primary Actor: User

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Pre-Condition: Camera, internet connection
Main Scenario:

- The camera captures the photo and verifies it and if verifies the access is given.
- Alternate Scenario:
- If the face is not verified, then access is denied.

6. Use Case 7: Vote
Primary Actor: User
Pre-Condition: User logged in, internet connection
Main Scenario:

- After successfully securing your confidential data, the user must vote on the desired candidate from the candidates listed.

5.7 Non-Functional Requirements

A. Software Requirements

1. Operating System (Windows, Linux, etc)
2. Postgres DB server
3. Django Framework
4. Postman

B. Hardware Requirements:

1. Processor – i3 & above
2. Hard Disk – 500 GB
3. Memory – 1GB RAM

C. Performance Requirements

1. Uninterrupted internet connections.
2. Availability of online database.

D. Software Quality Attributes

- Availability: The system should remain operational in any day and any place.
- Usability: The system should provide a User-friendly user interface and tooltips to enhance itself and be effectively responsive.
- Secure: The system must be able to provide security against any external injections by using a layered security system. Implementation of user login functionalities also ensures the system is secure from unauthorized persons.
- Performance of the system: Response time is very good for a given piece of work. The system will support a multi-user environment.
- Reliability of the system: The system will be highly reliable, and it generates all the updates information in correct order. Data validation and verification is done at every stage of activity. System recovery will also be speed.

VI. Conclusion

The proposed system will be helpful to the public on a large scale. It will enhance Voting turnout as well as make the security check process hassle-free and time-efficient. This would be hugely time-saving and comfortable for both the voters and organizations.

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