Secure Voting System Through Face Recognition

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Abstract. Now-a-days in India there are two types of methods are used for voting. The first method is secret ballot paper, in which lots of paper are used and second method is EVM(Electronic Voting Machine) which is used since 2003 but both of those methods have some limitations. There is a necessity for a method for online voting that is more secure than the existing system. In our proposed system we introduce a secure way for online voting by using face recognition system which is used to authenticate a person. And also the tallying of the votes will be done automatically, thus saving a huge time and enabling administrator to announce the result to announce the result within a very short period.

Keywords: Smart Voting, ballot paper, Face Recognition, Authentication, EVM

1 Introduction

Every person in our nation has the fundamental right to vote. The "right to vote" belongs to everyone. But for a variety of reasons, not everyone is making use of their rights. Voting takes place at different levels, including municipal, state, and national elections. Therefore, we use technology to improve the technique of voting through face recognition in order to make it simple to vote and to boost the voting percentage.

So we are developing an effective solution to this as secure voting system through face recognition. It will enables voters to vote securely. In this we employ the LBPH method (Linear Binary Pattern Histograms). The face is photographed and trained for use in this algorithm. During training, at this phase, the faces are turned first into grayscale images, then the points or pixels.

Computers can be programmed to use prior knowledge to optimize Performance criteria using machine learning (ML). We have a model that has been developed up to a certain point, and learning is the application of a computer program to optimize the model's parameters using training data or prior knowledge. The model may be descriptive to learn from the data or predictive to make future predictions. By learning to represent the world as a layered hierarchy of concepts, with each concept defined in relation to simpler concepts and more abstract representations computed in terms of less abstract ones, deep learning is a specific type of machine learning that reaches considerable power and flexibility.

Face recognition is the process of identifying or verifying someone's identity based on their face. It examines patterns based on a person's facial features, compiles the data, and compares the findings. The face detection method is an essential first stage in the process of identifying and locating human faces in pictures and videos. The face capture process transforms analogue information (a face) into a collection of digital information (data or vectors) based on the

subject's facial characteristics. You can identify whether two faces belong to the same person or not by using a face match.

OpenCV is a free software library for machine learning that uses computer vision. To hasten the inclusion of artificial intelligence into goods, OpenCV was used to develop a common infrastructure for computer vision applications. The collection contains more than 2500 optimised algorithms, including several both established and cutting-edge computer vision and machine learning methods. These algorithms can be used to find comparable images in a database of images, recognise objects, categorise human actions in videos, track camera movements, track moving objects, extract 3D models of objects, create 3D point clouds from stereo cameras, join images to create high-resolution images of entire scenes, and eliminate red eyes from photographs.

The LBPH algorithm, which is used to improve the performance of face recognition results, combines the Local Binary Pattern (LBP) and Histogram Oriented Gradients (HOG) techniques. The performance and precision of LBPH, which can identify a person's face from both the front and the side, are well known.

In this algorithm, the face is captured and trained. At this stage during training, first the faces are converted into gray scale images and then the points or pixels obtained through the gray images are then converted into Histograms and these histograms contains some values and these values are converted into a single value i.e., from binary digits to a decimal number.

A secure Voting System is Proposed of having Objectives like Face recognition is implemented while voter is going to cast their vote, Email verification is implemented while new user is registering, and Fake votes can be reduced, and only one time an user can cast their vote.

2 PYTHON

It is a high-level, object-oriented programming language with integrated dynamic semantics that is mostly used for creating websites and mobile applications. Because it provides dynamic typing and dynamic binding possibilities, it is quite alluring in the field of rapid application development. Python requires a special syntax that emphasises on readability and is consequently straightforward, making it simple to learn. Python code is significantly easier for developers to read and translate than code in other languages. Because teams may collaborate without large language and experience barriers, this lowers the cost of programme maintenance and development. Additionally, Python permits the use of modules and packages, allowing for the modular architecture of programmes and code reuse across numerous projects.

2.1 FLASK framework

A web application developer can create apps using the Web Application Framework, often known as the Web Framework, without having to worry about low-level issues like protocols, thread management, etc. Python is used to create the Flask web application framework. It is created by Armin Ronacher, the founder of Pocco, a global community of Python fans. The Werkzeug WSGI toolkit and Jinja2 template engine serve as the foundation for Flask. They're both Pocco projects. Python web application development now adheres to the WSGI standard for Web Server Gateway Interface. A uniform interface between the web server and web applications is described by the WSGI protocol.

A WSGI toolkit called werkzeug implements requests, response objects, and other useful features. As a result, a web framework may be built on top of it. Werkzeug serves as one of the foundations for the Flask framework.

Jinja2 is a popular templating engine for Python. A web templating system combines a template with a certain data source to render dynamic web pages.

It's common to hear Flask referred to as a micro framework. It strives to keep an application's core straightforward but flexible. Both a form validation support and a built-in abstraction layer for database handling are absent from Flask. Instead, Flask permits the use of extensions to give the application such capability.

3 Literature Survey

Jehovah Jireh Arputhamoni and Gnana Saravanan[1], have proposed that different biometrics they are Iris Detection in Voting System, Voting System using Fingerprint Recognition, Smart Voting. Since the suggested concept is a totally web-based system, its fundamental features such as database construction and picture processing capabilities—determine the system's software requirements. The face and fingerprints of the voter will be taken with the use of a laptop, PC, or mobile camera. Using the CNN technique, fingerprints may be compared with images stored in a database and the captured image can be recognised using the Haar Cascade algorithm. The technology is distinctive and effective because of the CNN algorithm used. Prior to voting, it ensures that the voter is verified. Smart voting is a better way to vote since the planned technology makes the election process less time-consuming, less expensive, and hassle-free. We can use a single biometric authentication method rather than using two.

Aman Kumar and Vishwash Kumar[2], have clearly explained about three different-different working security levels in smart voting system. The level 1 Unique Id Number (UID) registration mechanism will ask the user for a single unique id at that time. So through the unique id verification from database the voter can enter to next security level. The voter must input their voter id number at level 2 Election Commission id card number, where it will be checked against the database. If the voter's face matches the image saved in the database at level 3 facial recognition with their unique voter ID number, they can cast their ballot. In India, every new user must first register to vote. At the moment of registration, the system takes a picture of the user's face and stores it in the server database. The benefits of these security levels include more convenience, lack of corruption, swiftness, and speed. We chose these security settings, however the method for face recognition is different.

Nilam Choudary, Shikar Agarwal and Geerija Lavania[3], have proposed an effective voting system using three different face recognition algorithms. Eigenfaces does facial recognition using eigenvectors, and Principal Component Analysis (PCA) is used to determine eigen values.By reducing common features, PCA reduces dimensionality and generates eigen space. The eigenface approach has been extended to include Fisher faces. Linear Discriminant Analysis (LDA), performed in conjunction with PCA, aids in identifying the classification-related directions. Rapid picture comparison and similarity-invariant representation are made possible by Speed Up Robust Features (SURF). The training data set in this study includes 2316 photos as well as 4 additional samples for each image, for a total of 9264 images. Future research will use extensive training data sets to apply crucial techniques like CNN.

XueMei Zhao, ChengBing Wei[4] An easy approach to the face recognition problem is the Local Binary Pattern Histogram (LBPH) algorithm, which can identify both the front and side faces. The pixel neighbourhood grey median-based modified LBPH algorithm (MLBPH) is suggested. After the feature value is extracted by the subblocks and the statistical histogram is established to form the MLBPH feature dictionary, which is used to recognise the human face identity in

comparison to the test image, the grey value of the pixel is replaced by the median value of its neighbourhood sampling value. The Eigenfaces, Fisherfaces, and Local Binary Pattern Histogram (LBPH) face recognition algorithms are all included in the free and open-source computer vision package known as OpenCV. The LBPH algorithm is more flexible than the other two algorithms in that it can distinguish between the front and side faces in addition to the front face. The information acquisition module, feature extraction module, classification module, and training classifier database module are the four key components of a face recognition system. In the classification module, test samples are classified using a classifier that has been database-trained in order to ascertain the samples' identities. A Haar cascade classifier is available in OpenCV and can be used to find faces. The LBP characteristic spectrum histogram serves as the feature vector for classification in the LBPH method.

Shubham Shinde, Manas Shende, Jeet Shah, Harshdeep Shelar[5] This project's software architecture is client-server. Our system requires a person to register with his fingerprint and face image first. The Google Firebase Real-time Database contains data about voters, candidates, constituencies, and votes. A GUI will collect the login information and the voter's face image at the client-side, where a fingerprint device will take the voter's fingerprint and a neighbour) classifier will take the login information. The following 4 steps make up the entire facial recognition process: 1. Face recognition in images 2. Isolation and face projection Third, Face Coding 4. Facial recognition. By applying the HOG (Histogram of Oriented Gradients) algorithm, faces in the image can be found. The faces, including the eyes, lips, and other features, are next flawlessly warped in the frame. Accurate face alignment improves performance during both training and testing. The final stage is to locate the person in our database whose measurements are most similar to those in the test photograph. Using a KNN (k-nearest neighbour) classifier, the image is classified.

4 Proposed Work

In this project we are working with two different- different security levels
Level1: - Username and Pin Number

At the time of voter registration user will create the Username and Pin Number. The entered Username and pin number is verified from the database provide.

Level2: - Face recognition with respective Voters pin number.

In this level, Through OpenCV and Local Binary Patterns Histograms algorithm is used to verify the voters with the images captured at the time of registration of a voter.

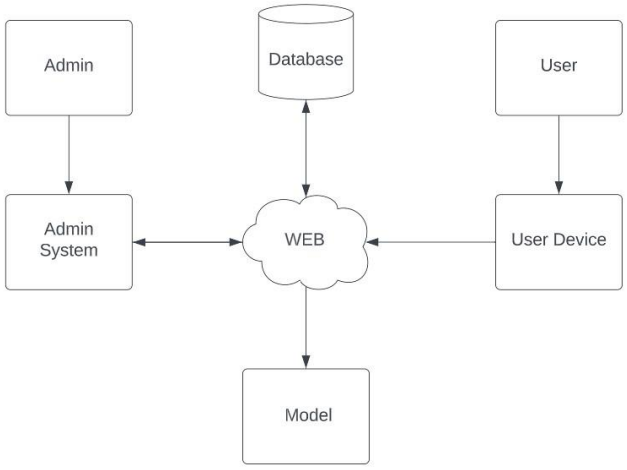

Fig. 4.1. System Architecture

4.1 System Model

The two modules that make up the proposed system are the admin login, user registration and login, and user application.

4.1.1 Admin Module

The first module is referred as admin login, where an admin can be authorized through credentials. Administrator has access to add nominee to particular post. At voting time and after completion of voting, administrator can view the results of the nominees.

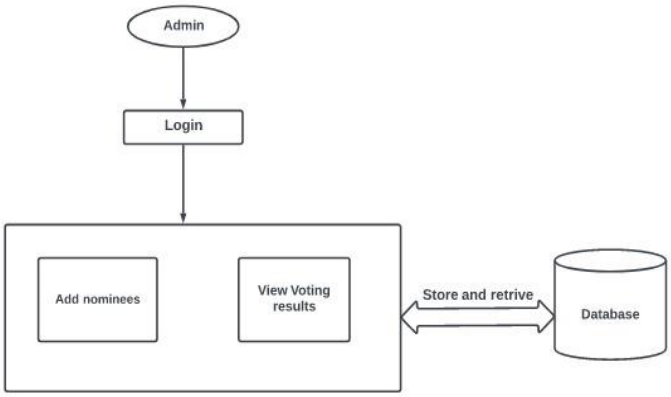

Fig. 4.2. Work flow of Admin

4.1.2 User Module

Second module is referred as user registration and login, where a new user has to register by filling details. Then after email authentication can be held to verify the user. After verification, system captures the voters face(200 images) through system camera. Then an existing voter can login through their credentials which has been created at the time of registration and after entering credentials, system camera is going to capture and compares with the existed images which was captured at the time of registration. If it matches, then only an user can cast their vote for once. Here for face recognition and capturing images, we are using OpenCV and Local Binary Patterns Histograms.

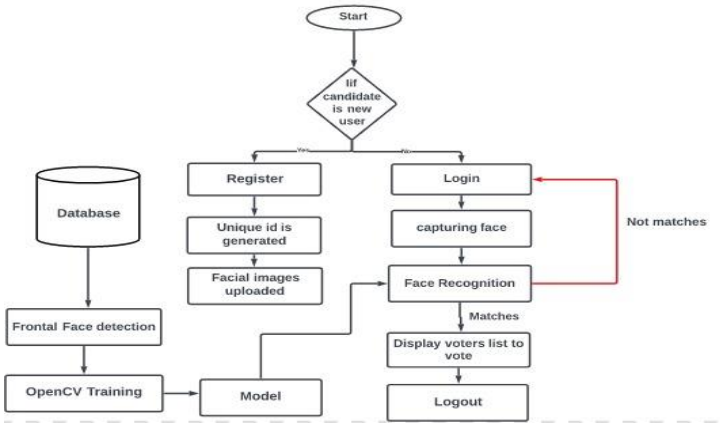

Fig. 4.3. Work flow of User

Additionally, one more feature is added to this project. If an existing voter

wants to update the details then voter can update by opening update page. But voter wants to update the details successfully then email verification has to be done successfully as same as registration process. So only authorized user can update their details in the database successfully.

4.1.3 Working flow of the system

i). Each new user must first register for voting by providing their information. Registration is therefore the first thing we do.

ii). Before capturing the voter images, email verification can be held to verify details. After authenticating successfully, system allow voter for captures the images by saving with pin number generated by the voter. Now registration of voter is successfully completed.

iii). At the time of election, we will use two levels of security first one is username and pin Number verification and second one is face recognition.

iv). System will check username and password entered by the voter is correct or not.

v). If username and password is correct then system allow to on web cam then the face capturing through web cam will compares with the respective image captured at the time registration.

vi). If the image matches then voter is allowed to cast a vote. If not voter is not allowed

vii). On the voting page, nominees images can be displayed and these nominees can be added by administrator. So voter can cast their vote by selecting any one of them.

viii). As soon as voter will give vote then voter is not allowed to vote more than once. so we can say that a voter can give only one vote.

4.2 Methodology

You can see that each image is represented using a matrix format, which consists of rows and columns. The fundamental unit of an image is the pixel. An image is made up of a set of pixels. Each of these is a little square. By placing them side by side, we can construct the full image. A single pixel is the lowest unit of information that may be found in an image. Pixels in every image have values ranging from 0 to 255.

Each pixel is composed of Three values are R, G, and B, which are the basic colours red, green, and blue. The combination of these three basic colours will create all these colours here in the image so we conclude that a single pixel has three channels, one channel for each one of the basic colours.

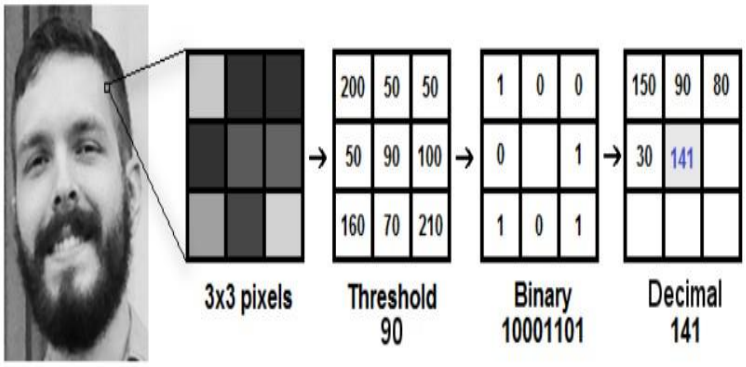

Fig.4.2.1. Calculation Of LBP Values

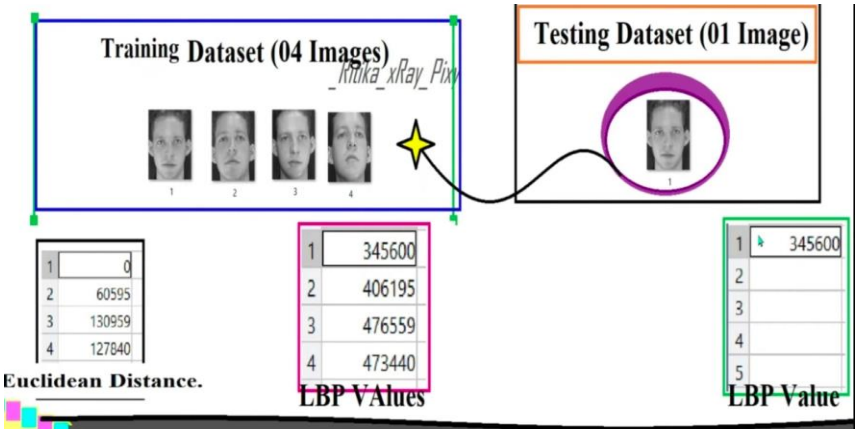

Fig.4.2.2. Workflow of LBPH Algorithm

Computer Vision is a field of deep learning that enables machines to see, identify and process images like humans. Images and text are both seen and processed by machines using numbers. The pixel intensity for each number corresponds to that specific position. The pixel values for a grayscale image, where each pixel only has one value—the intensity of the black colour at that location—are displayed in the image above. Every project using computer vision needs to be able to read and write images. Additionally, the OpenCV package greatly simplifies this function. Thresholding is a technique for segmenting images. It updates itself based on a comparison between pixel values and a threshold value. There are numerous thresholding variations supported by OpenCV.

5 Results

Fig. 5.1. Login page

The figure 5.1 shows the login page which is used by user to login into the application by entering required credentials (in case if user is already registered) or else by clicking enroll button the user can register by entering the required information asked by the application.

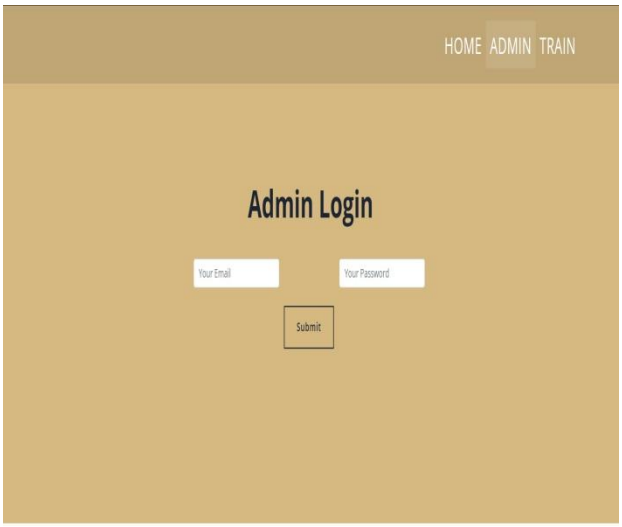

Fig 5.2 Admin Login information

The figure 5.2, shows the admin login details.

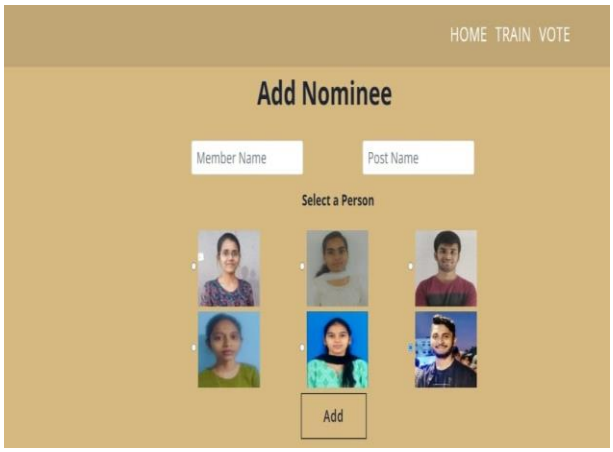

Fig. 5.3. Admin Dashboard

The figure 5.3, shows the Admin Dashboard to add nominee details.

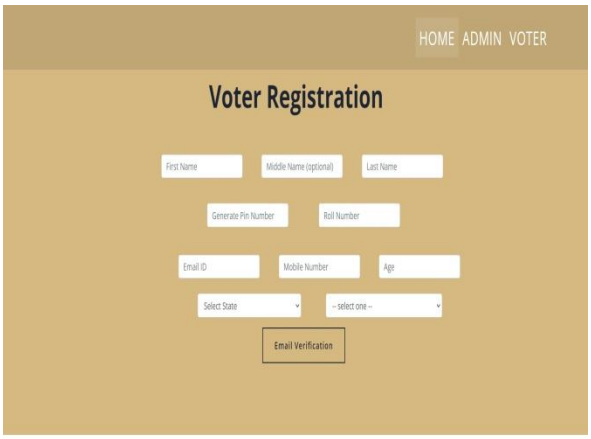

Fig 5.4 Voter registration form

The figure 5.4 shows the voter registration form with details.

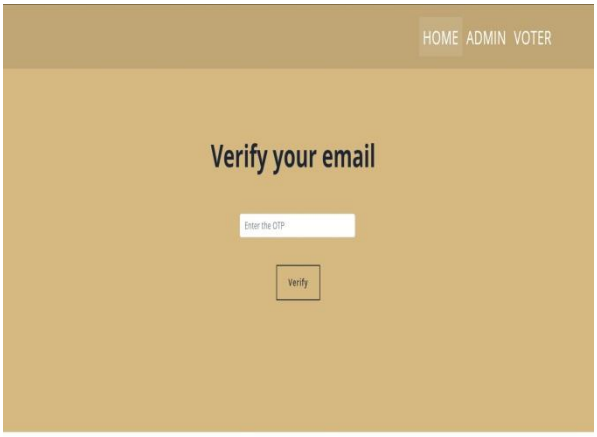

Fig. 5.5. Voter registration with verification Email.

The figure 5.5 shows that the Verification options for the voter.

6 Conclusion

As we can see, the current voting system has numerous flaws, including a long process that takes a lot of time, is not safe, allows for fake voting, and has no security level. The proposed method can address the issues and limitations of the current system, which will ultimately reduce bogus and false votes. This is because its difficult for the hackers to do marphing the face in live and offers a secure and comfortable voting environment. Using this method, voters can cast their ballots at the closest polling place or even from home if they are familiar with how the technology operates and understand its fundamentals. In our proposed system we are developing a user friendly web interface where users can easily interact with it to vote.

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