FACE AND FINGERPRINT BASED SMART DIGITAL VOTING MECHANISM USING THE DATA FUSION AND ML ALGORITHM

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Abstract: Online voting has not been adopted in India. Additionally, the existing voting process is not secure or safe. Most people skip their chance to vote due to the inconvenience of having to travel to several locations, such as polling booths, and wait in a long line. Voters who are ineligible can also use fraudulent methods to cast their ballots, which could cause a lot of issues. The voter's face is recognised utilising a new authentication approach in this work's online voting system. There are now two different voting systems in use in India. Both the secret ballot paper and the electronic voting machines (EVM) have limitations or drawbacks. Therefore, in this project, we must suggest a voting system or procedure that is really useful or effective. In our method, the voting process has three levels of security. The verification of a unique identification number (UID), election identification number (EID), and facial recognition or face matching make up the first, second, and third levels, respectively. The new application process for each voter has significantly increased the security level of our system. By including facial recognition in an application that will determine if a specific user is authenticated or not, the system's user authentication process is improved. Utilizing powerful Matlab2020 software, the unique notion is implemented by machine learning tool.

Keywords: Face detection, Finger Print Recognition, Machine Learning

1. INTRODUCTION

There are two different voting methods utilised in India nowadays. Both the EVM, which has been in use since 2003, and a secret ballot paper are utilised in the first approach. This work must suggest an online voting mechanism that is more secure than the current one. The face detection and recognition concept is employed in this project proposal to pinpoint the precise person. We employed three different degrees of verification for the voters under the suggested system. A method of recognising or verifying a person's identification using their face is facial recognition. A subcategory of biometric security is facial recognition. The difficulty of creating false biometric data can vary depending on the biometric modality being attacked. While printing contact lenses to fool an iris identification system or making a fake finger to fool a fingerprint scanner may need some technical know-how, making a replica of someone's face is incredibly simple. All that is required is a picture of the person, which may be easily found online or taken from a distance by the user. The presumptions that synthetic biometric evidence can defeat biometric recognition technology are not just absurd: In their demonstration, the authors demonstrate how to successfully spoof a laptop's authentication system using just a printed photo [1, 5].

Since face spoofing caught the attention of the biometric community, a variety of publications that approach the issue in various ways have been published. Possible solutions include using other devices to determine whether a real person is in front of the camera or requesting that the user reply to a challenge by performing a specific gesture. Completely automatic systems, on the other hand, are more affordable and user-friendly because they don't require additional hardware and aren't invasive[3,7]. Information protection must start with user authentication, and face biometrics may be helpful in this situation. Face biometrics is less invasive to people and is natural, intuitive, and simple to use. Sadly, recent research has shown that facial biometrics are susceptible to spoofing assaults utilising low-tech, inexpensive tools. The highly regarded local binary pattern operator is extended

spatiotemporally (using dynamic texture) in this study to propose a fresh and appealing method to identify face faking. The main goal of the method is to recognise and understand the dynamics of the facial micro-textures that distinguish real faces from false ones. We tested the strategy using two freely accessible [2,4].

A. Problem Statement and Solution Strategy:

Online voting is not yet available in India. The existing voting process is not secure or safe either. The majority of individuals forgo their opportunity to vote because voters must travel to several locations, such as polling booths, and wait in a long line. A voter who is ineligible can also vote using fraudulent methods, which could cause a lot of issues[8,9].

A Voting System which is more secure, time saving and give two layers of authentication by electronic means based on individual Face pattern recognition of Voters. The new method uses the voter's facial pattern as authentication; during the election, if the voter's scanned face pattern data matches that of the data stored in the system, he is allowed to vote; if not, he is disallowed and given a report indicating that he is ineligible [11,12].

B. Aim:

This project work aims to build the novel Smart Digital Voting Mechanism using the Fusion of Face and Fingerprint by AI & MLTechniques.

C. Objective:

The following are the objectives of Smart Digital Voting Mechanism using the Fusion of Face and Fingerprint by AI & ML Techniques.

1. Disallow the use of absentee votes and allow voters to cast their ballots at any polling location nationwide.
2. Reduce the quantity of overvotes and eliminate vote manipulation to ensure that more valid votes are counted.
3. To recognize the person faces to authenticate the person.
4. To perform recognition of unconstrained face images robust to pose, expressions and illumination variation

2. SYSTEM ARCHIECTURE

The procedures for processing the image and subsequently storing it in the database are shown in the block diagram of Figure 1 and 2. Face alignment and face detection are performed after the image has been taken as input and pre-processed into pictures. Following these procedures, an image's features are extracted and compared to the original image; only the image is then kept in the database

A. Input image:

As input images, the Face and Fingerprint datasets are used. The input photographs are captured in.jpg or.png format.

B. Pre-processing: (Image Resize):

In computer graphics and digital imaging, image scaling refers to resizing a digital image. Upscaling or resolution improvement are phrases used in video technology to describe the enlargement of digital content.

Scaling a vector graphic image without sacrificing image quality is possible by utilising geometric transformations on the graphic primitives that make up the image. Raster graphics images must be scaled by creating a new image with more or less pixels. Scaling down often results in a noticeable quality loss when the number of pixels is decreased. The act of converting a discrete signal from one sampling

rate (in this case, the local sampling rate) to another is known as sample-rate conversion, and raster graphics scaling is an example of this process in two dimensions.

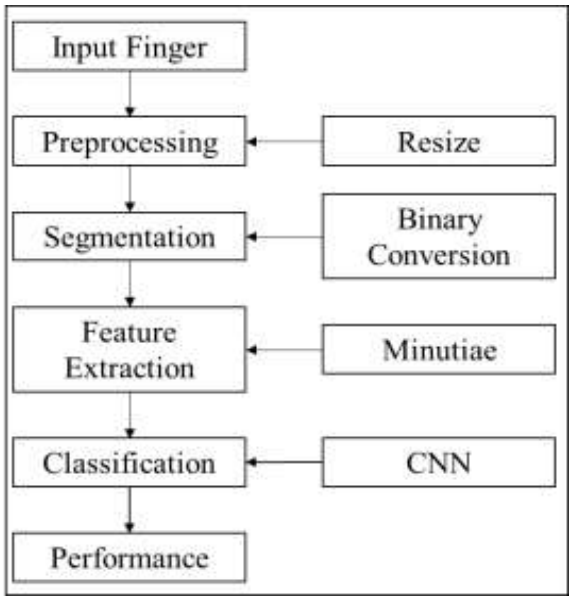

Figure 1. Block diagram of Face Detection for Smart Digital Voting Mechanism using the Data Fusion & ML Algorithm

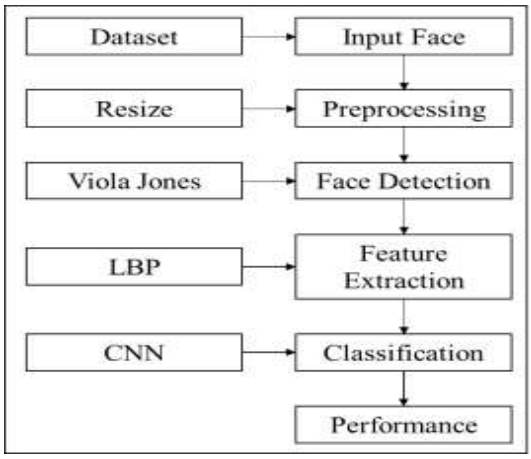

Figure 2. Block diagram of Finger print process for Smart Digital Voting Mechanism using the Data Fusion & ML Algorithm

C. Feature Extraction:

The Viola-Jones algorithm is the first to be proposed that offers competitive real-time object identification rates. It was primarily driven by the issue of face detection, despite the fact that it may be trained to recognise a range of object classes. We can effectively extract anti-spoofing features using the diffusion speed model based on the aforementioned investigation. To be more precise, we use the diffusion speed value at each pixel point as our baseline features, which is provided as shown in equation 1.

$$F\ base = \{s\ (x, y) \mid 0< x \leq W, 0< y \leq H \quad \text{---------- (1)}$$

Where W and H stand for the detected face region's width and height, respectively. To effectively capture even little changes between the diffusion speed maps of real and synthetic faces, we suggest specifying the local speed patterns. In computer vision, pattern recognition, and image processing, feature extraction uses an initial set of measured data to produce derived values (features) that are intended to be informative and non-redundant, easing the way for the subsequent learning and sweeping generalisation steps and, in some cases, enhancing human perspectives. Dimensionality reduction and background subtraction are connected.

An algorithm can be reduced to a more controllable group of attributes when the necessary information is regarded to be redundant or too vast to process (for instance, when the exact measurement is provided in feet or metres or when pixels are used to describe images).

D.Classification:

The k-nearest neighbours algorithm (k-NN), a non-parametric technique for classification and regression, is used in pattern recognition. The k closest training examples in the feature space make up the input in both scenarios. The outcomes depend on whether k-NN is used for classification or regression: A class membership is the result of the k-NN classification process. Before an object may be assigned to one of its k closest classes, a majority of its neighbours must concur on its classification. The object is simply added to the class of its one nearest neighbour if k = 1. The object's property value is the result of the k-NN regression. This value is the average of the values of its k nearest neighbours.

K-NN is a sort of lazy learning, in which all computation is postponed until classification and the function is only locally approximated. Among all machine learning algorithms, the k-NN algorithm is one of the most straightforward. Both classification and regression may benefit from giving weight to neighbour contributions, which would allow the closer neighbours to contribute more to the average than the farther neighbours. To give an example, consider the standard weighting method, which gives each neighbour a weight of 1/d, where d is the distance between the neighbours.

The flow chart for a smart voting system that uses face and finger print detection methods is shown in Figure 3.

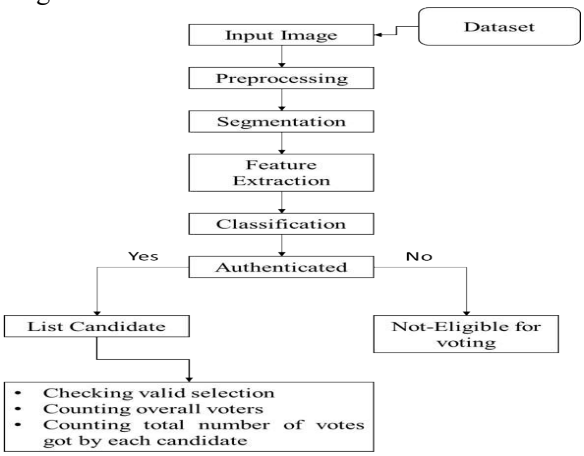

Figure 3.Flow chart of smart voting system

The system first accepts face and fingerprint data as input, after which it is permitted to perform image resizing on both the face and fingerprint images. Next, it is put through a segmentation process, during which it can implement ROI extraction from the pre-processed image. Finally, in feature extraction, the system uses patterns that are extracted from the regions of the face and minute features to extract feature values from the fingerprint image. The CNN can be used during the classification process to determine whether or not the person is authenticated.

The person is verified if their face and fingerprints match. then proceed to the following procedure, such as voting. The user can select the appropriate candidate from the list of election candidates if they are authorised to vote. Every candidate is noted and counted individually. Accuracy, sensitivity, and specificity are performance metrics that will be estimated.

3. RESULT & DISCUSSION

Following screenshots shows the working process of smart voting system using face and fingerprint detection techniques.

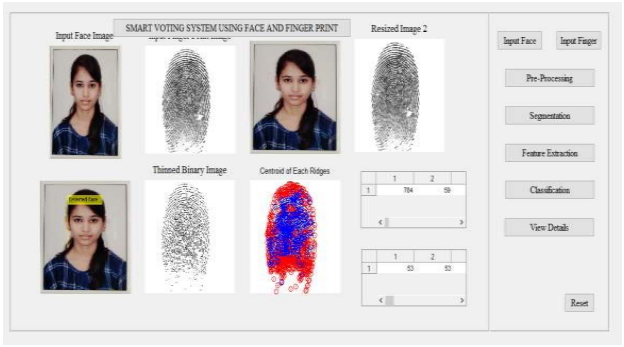

Figure 4. Illustrating the detection of face and fingerprint images used for processing

Figure 4 shows the detection of face and fingerprint images stored in the trained database and determines whether it is authenticated or not. After the classification Process it allows the authorized person for the process of voting then the list of election candidates is listed and he/she can vote whoever they wish to vote.

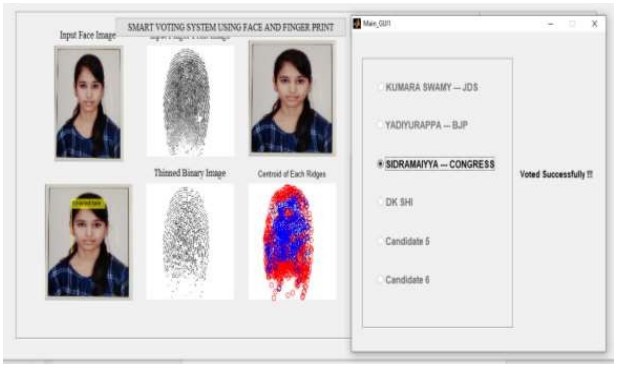

Figure 5. Voting process with various parties like

Figure 5 shows the voting process if both face and fingerprint data is matched then it allows the person to vote. Fig 6 shows the cancellation of voting procedure it will show the message you have cancelled the voting process. Fig 7 shows candidates vote counted list, after each person voted to election candidates each vote will be counted and listed.

Figure 6. Voting cancellation Message box

Figure 7. Candidates vote counting details

4. 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. However, we can now say that our technique is more advantageous and secure than the current system. The fraudulent voters can be easily discovered because this proposed method has three levels of security. We can prevent phoney votes during the election commission by using the facial authentication approach to identify fraudulent voters.

Voters can cast their ballots online using our suggested smart voting system from any location. Every operation requires internet access, thus the government just needs to make one investment. Voters' votes have greater weight than where they live. Data is kept in a centralized repository where it is accessible at all times and may be backed up. Results are updated every minute by a sophisticated voting system. Less labour and resources are also required. The database must be updated every year or just before an election in order to add new eligible citizens and

remove deceased people from the voter list.

5. FUTURE WORK

By including unique identity numbers such as Aadhar cards, palm prints, and eye scans, we might increase the security by adding more layers. If the Aadhar database is connected, which it is if your iris and fingerprints are associated with your Aadhar number, you can also add finger print verification in addition to face recognition. As an IOS or Android app, the entire system would be more effective and available. If a voting app is created, OTP creation may also be included in the verification process. The phone camera itself can then be used for facial recognition. The verification system may also include OTP generation. Algorithms are flexible, and performance varies greatly. The training of the algorithm can change the computation time.

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