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An Android Application for E-Voting using Biometrics

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Abstract- ***An electronic voting (e-voting) system is a voting system in which the election data is stored, recorded and processed primarily as digital information. E-voting may become the quickest, cheapest, and the most efficient way to administer election and count vote since it only consists of simple process or procedure and require a few worker within the process. Authentication of Voters, Security of voting process, Securing voted data are the main challenge of e-voting. The idea behind Android app is designing a secure e-voting system which is very important. This app would ensures that vote casting cannot be altered by unauthorized person. The voter authentication in e-voting process can be done by face recognition and by entering one time password. Finally the election server, administrator will sort out valid voter, schedule date of election and display final result by decipher the received encrypted information using public key cryptography.***

Keywords—Electronic voting, ***election data, Android app, authentication, face recognition, one time password, cryptography.***

INTRODUCTION

Voting for any social issue is essential for modern democratic societies now a day. So it is becoming very important to make the voting process more easy and efficient. In other hand the rapid development I operating system of the mobile phones gives rise to the application development on the large scale. The main reason behind the tremendous development in android application is that the android is an open source operating system. It means that the software developers can have customization rights. As well as the software development kit provides tools to build and run Android applications. With the appearance of cell phones with programmable platform, it is possible the development of application for worldwide popular participation, by the digital vote using mobiles. There is a raising interest for voting on SMS cell phones, and through social networking tools like Facebook or Twitter. It's believed that the voting process by cell phones gives some decision power to the citizens, which can actuate directly on decisions of their concerns. The voting process also can give ways for numerical information surveillance about social phenomena. For this reason, the following research is being developed with the intension to survey future scenarios which can occur during the international voting process by mobile devices. Our system gives facility to voter to vote from any location through their cell phone. Also security is maintained for any external attacks on the system.

Now a day's mobile phones are widely used, it is possible the development of applications for worldwide popular participation by digital vote using mobiles. E-Voting system is the application for Android Mobile Operating System Platform. It is application for voting (polling) purpose. Application is based on Client-Server Architecture. At server site, we are storing a database globally. System is divided into three main parts one is Server, second is Java client (Registration Centre) and third is Android client (Voter). In Java client application, Voters can register their name, documents and face image for further authentication. The system can have numbers of Android clients. Each Android client can view candidate information, information about different parties and can submit the vote and also can see newly updated status of election.

Mobile Voting has been used in lots of countries with the development of the E-government technologies in the past years. Generally in these countries the electronic voting is supervised by the presence of the independent electoral authorities. The specific electronic voting machines are used at polling stations for the voting operation. Manual voting system has been deployed for many years in our country. However in many parts of our country people cannot attend the voting because of several reasons, sometimes people may not be in their own region and due to this fact they cannot do voting. In order to solve these problems there is a need of electronic voting system in addition to manual voting system. After registering to system, the voters will vote from any region by using proposed system from their android device if they are valid voters.

In the past years many governments have started to adopt Internet-based applications for their administrative processes; applications range from simple download of forms to Internet-based submission of applications or tax declarations to full scale electronic procurement systems. The first mover in this area was U.S. Federal Government with the Federal Acquisition Network, in the meantime similar systems are being deployed in several EU countries.

Such systems use commercially available technology and basically automate administrative processes. The question arises whether Internet services could also be used for voting processes, and, if so, to derive the design principles of such systems. An Electronic voting (E-voting) system is a voting system in which the election data is recorded, stored and processed primarily as digital information. If a secure and convenient E-voting system is provided, it will be used more frequently to collect peoples opinion through cyberspace. Traditional paper-based voting can be time consuming and inconvenient. E-voting not only accelerates the whole process, but makes it less expensive and more comfortable for the voters and the authorities as well. It also, reduces the chances of the errors. E-voting system will provide all basic features that

conventional voting does, further will furnish more services in order to make the process more trusted and secure.
Unlike traditional voting systems in which voter choices and intentions are represented in form of a paper ballot or other means like a punch card, Internet Voting (E-Voting) uses electronic ballots that are used to transmit voters choices to electoral officials over the internet. Our project focuses on introducing E-voting systems, requirements that E-voting system must meet, E-voting threats, challenges that can compromise the electoral process and some proposed E-voting solution.

1. Related Work:

Electronic voting systems have been used since the 1960s, with the introduction in the market of punch card systems, followed much later by optical scanning systems, the direct-recording electronic (DRE) voting machine and the Internet. Nowadays different Electronic Voting Systems have been proposed, for example, in 2005 came up with the design and implementation of a secure electronic voting system developed in Java (SELES), which uses the Client-Server model. However, some disadvantages were detected. If the Java version installed in the mobile device is not the one required by SELES, it makes the downloading of applets impossible, hence the voter cannot cast his ballot because such applets cannot be seen on the mobile device. In 2009, Ahmad et al. proved how encryption time consumed in a mobile environment using ECDH-256 and AES-128 was not accepted as it took so long. In other words, achieving high security level at a high computational cost is not the solution. The computational cost of a mobile device should be as small as possible since we have to consider its resource limitation just as Yin Qiu mentioned in, where it is said that a voting system should afford more expensive computation cost with computers due that they have more power, in comparison to mobile devices, to carry out large processes without affecting the system performance in large scale, which should be as fast as possible.

3. Security Requirements for Voting Schemes

Now we will describe a set of voting security criteria. However, depending on different democratic Requirements in different countries, and the different scales of electronic voting systems, security goals can vary. General security requirements include democracy, privacy, accuracy, fairness, verifiability and recoverability.

A. Democracy:

All and only the authorized voters can vote, and each eligible voter can vote no more than once. Voters can also choose not to vote. To achieve democracy, voters need to be properly registered and authenticated, and then there should be a convenient way for them to cast their votes, for example, availability of different language choices, special aid for disabled voters, and proper ways for absentee voting and early voting

B. Privacy:

All votes remain secret while voting takes place and each individual vote cannot be linked by any individual to the voter who casts it. The privacy issue is paramount.

C. Accuracy:

The voting result accurately reflects voters' choices. In this case, no vote can be altered, duplicated or eliminated without being detected

D. Fairness:

No partial result is available before the final result comes out.

4. Algorithm Used:

A. Eigenface generation:

A set of eigenfaces can be generated by performing a mathematical process called principal component analysis (PCA) on a large set of images depicting different human faces. Informally, eigenfaces can be considered a set of "standardized face ingredients", derived from statistical analysis of many pictures of faces. Any human face can be considered to be a combination of these standard faces. For example, one's face might be composed of the average face plus 10% from eigenface 1. 55% from eigenface 2, and even -3% from eigenface 3. Remarkably, it does not take many eigenfaces combined together to achieve a fair approximation of most faces. Also, because a person's face is not recorded by a digital photograph, but instead as just a list of values (one value for each eigenface in the database used), much less space is taken for each person's face.

The eigenfaces that are created will appear as light and dark areas that are arranged in a specific pattern. This pattern is how different features of a face are singled out to be evaluated and scored. There will be a pattern to evaluate symmetry, if there is any style of facial hair, where the hairline is, or evaluate the size of the nose or mouth. Other eigenfaces have patterns that are less simple to identify, and the image of the eigenface may look very little like a face.

The technique used in creating eigenfaces and using them for recognition is also used outside of facial recognition. This technique is also used for handwriting analysis, lip reading, voice recognition, sign language/hand gestures interpretation and medical imaging analysis. Therefore, some do not use the term eigenface, but prefer to use 'eigenimage'.

B. Practical implementation

To create a set of eigenfaces, one must:

1. Prepare a training set of face images. The pictures constituting the training set should have been taken under the same lighting conditions, and must be normalized to have the eyes and mouths aligned across all images. They must also be all resampled to a

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common pixel resolution (r × c). Each image is treated as one vector, simply by concatenating the rows of pixels in the original image, resulting in a single row with r × c elements. For this implementation, it is assumed that all images of the

training set are stored in a single matrix T, where each column of the matrix is an image.

2. Subtract the mean. The average image has to be calculated and then subtracted from each original image in T.

3. Calculate the eigenvectors and eigenvalues of the covariance matrix S. Each eigenvector has the same dimensionality (number of components) as the original images, and thus can itself be seen as an image. The eigenvectors of this covariance matrix are therefore called eigenfaces. They are the directions in which the images differ from the mean image. Usually this will be a computationally expensive step (if at all possible), but the practical applicability of eigenfaces stems from the possibility to compute the eigenvectors of S efficiently, without ever computing S explicitly, as detailed below.

4. Choose the principal components. Sort the eigenvalues in descending order and arrange eigenvectors accordingly. The number of principle components k is determined arbitrarily by setting a threshold ε on the total variance. Total variance v = n*(λ1+ λ2+…+ λn),

n= number of data images

5. k is the smallest number satisfies :

$$\frac{n(\lambda_1 + \lambda_2 + \ldots + \lambda_k)}{v} > \epsilon$$

These eigenfaces can now be used to represent both existing and new faces: we can project a new (mean-subtracted) image on the eigenfaces and thereby record how that new face differs from the mean face. The eigenvalues associated with each eigenface represent how much the images in the training set vary from the mean image in that direction. We lose information by projecting the image on a subset of the eigenvectors, but we minimize this loss by keeping those eigenfaces with the largest eigenvalues. For instance, if we are working with a 100 x 100 image, then we will obtain 10,000 eigenvectors. In practical applications, most faces can typically be identified using a projection on between 100 and 150 eigenfaces, so that most of the 10,000 eigenvectors can be discarded.

C. Review on Eigenface

Eigenface provides an easy and cheap way to realize face recognition in that:

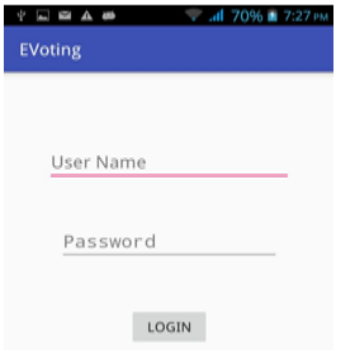
- Its training process is completely automatic and easy to code.
- Eigenface adequately reduces statistical complexity in face image representation.
- Once eigenfaces of a database is calculated, face recognition can be achieved with real time.
- Eigenface can handle large databases.

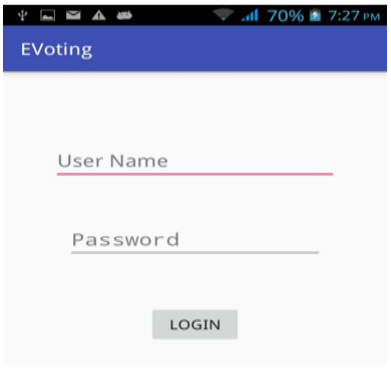
However, the deficiencies of eigenface method are also obvious.

- Very sensitive to lighting, scale and translation, requires a highly controlled environment.
- Eigenface has difficulty to capture expression changes.
- The most significant eigenfaces are mainly about illumination encoding, doesn't provide useful information regarding the actual face.

To cope with illumination distraction, in practice, eigenface method usually discards the first three eigenfaces from the dataset. Since illumination is usually the cause behind the largest variations in face images, the first three eigenfaces will mainly capture the information of 3-dimensional lighting changes, which has little contribute to face recognition. By discarding those three eigenfaces, there will be a decent amount of boost in accuracy of face recognition but other methods such as Fisherface and Linear space still have the advantage.

5.Screenshots





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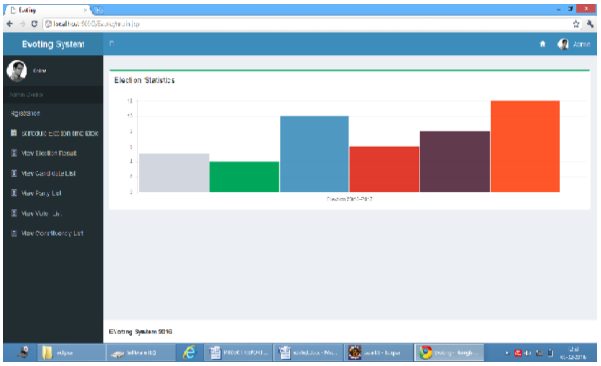

6. Conclusion

The entire project has been developed and deployed as per the requirements Stated by the user, it is found to be bug free as per the testing standards that is implemented. Any specification-untraced errors will be concentrated in the coming versions, which are planned to be developed in near future. The system at present does not take care off the money payment methods, as the consolidated constructs need SSL standards and are critically to be initiated in the first face; the application of the credit card transactions is applied as a developmental phase in the coming days. The system needs more elaborative technicality for its inception and evolution.

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