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Secured Mobile Voting

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Abstract:*Traditional voting process is fully manual and paper based which was very time consuming and prone to security. As technology developed, electronic based voting systems were still prone to electoral frauds and voters have to make tremendous efforts in order to cast their ballots. The proposed system is secure mobile voting which will overcome all these issues. So the proposed system uses fingerprint textures for voting process as the fingerprint shows most promising future in real world applications. Because of their uniqueness and consistency over time fingerprint have been used for identification and authentication purpose.The mobile equipment used will be in the form of Smart phone with Android OS. The system consists of three phases: Registration, Vote Collecting and Result Phase. In Registration phase voter will register himself at tollbooth using fingerprint. In second phase, voter will login and then voting process will be performed by voter. In this phase hausdorff algorithm is used for pattern matching. This algorithm considers both translation and rotation for fingerprint. In last phase, results are generated. So the proposed system allows the voting process in a simple and convenient way without the limitations of time and location, thereby increasing the voting percentage and also ensuring confidentiality.*
Keywords:*Mobile Voting, Fingerprint Texture, Confidentiality, Hausdorff Algorithm.*

1. INTRODUCTION

India is a democratic country. Democracy gives every citizen right to vote which is very important. Voting in India is a Constitutional right if one is a citizen over 18 years of age. It has been a tendency among voters, especially in the urban areas, to treat the voting day as a day of rest. The traditional voting systems in most institutional bodies is time consuming and hectic. It includes hand-counted paper ballots. These paper-based systems can result in a number of problems, including:

a) Unacceptable percentages of lost, stolen, or miscounted ballots
b) Votes lost through unclear or invalid ballot marks
c) Limited accommodations for people with disabilities

Therefore there is a need for improvement in the voting system as a means of attaining the democracy most people advocate for, through the relevant technologies.

Voting is the agent of change. If the people of India think that the ruling government is not performing its duties satisfactorily, they can show it the door by voting against it that’s why every citizen of India must cast his or her vote. Like all other aspects of democracy, voting requires transparency, participation, accountability and most important security. As the digital age and biometric area continues to grow, only time will tell until almost every human-handled process becomes computerized. Furthermore, governments are getting more involved in developing the ICT sector due to the pressure imposed by other governments and regulatory bodies for fear of lagging behind. Mobile communication of recent has taken the world by storm and its getting bigger and better. The advantages of Mobile communications provides advantages like reduced costs in printing and distributing ballots, Efficiency ,accuracy ,Flexibility and biometric area provides security .

The voting process in today's era is behind its time as it relates to the involvement of technology as seen by experience. The process begins with persons manually going to an electorate office show proof of address and then a national identification card will be issued. With this, a voters' list will be generated as per constituency. Each voter will then have to go to a polling station where they believe that their names may be at. After which they will cast their vote by placing a mark beside the political party of their choice. In some cases person's right thumb is then dipped in ink so as to mark that this person has already voted. After voting is complete officials will then go through the voting results manually and tally the counts. In some cases there may be needs for recounts. These processes are often tedious, inaccurate, and risky and in some cases the final count may be skewed this manual process leaves windows for errors, political dishonesty and political fraud.

2. LITERATURE SURVEY

Related Work done

Existing Electronic Voting in India:

Indian voting machines use a two-piece system with a balloting unit presenting the voter with a button (momentary switch) for each choice connected by a cable to an electronic ballot box.An EVM (Electronic Voting Machines) consists of two units:

- Control Unit
- Balloting Unit

The two units are joined by a five-meter cable. The Control Unit is with the Presiding Officer or a Polling Officer and the Balloting Unit is placed inside the voting compartment. Instead of issuing a ballot paper, the Polling Officer in-charge of the Control Unit will press the Ballot Button. This will enable the voter to cast his vote by pressing the blue button on the Balloting Unit against the candidate and symbol of his choice.

The controller used in EVMs has its operating program etched permanently in silicon at the time of manufacturing by the manufacturer. No one (including the manufacturer) can change the program once the controller is manufactured. In April 2011 Gujarat became the first Indian state to experiment with Internet voting by using secure remote voting technology.

3. MOBILE VOTING

Secure Mobile Voting System overcomes the disadvantages of the existing voting system. In traditional voting system inaccuracy in counting of votes may occur, political dishonesty and lot of paper work also there. So in order to overcome these disadvantages the proposed system consists of modules such as: user registration, user login, user voting, and admin login and admin user validation as shown in fig 1.

3.1 Modules

- Admin Login Phase: Admin will take the necessary information and fingerprint image from user. This information will be stored by admin in government database.
- User Registration Phase: The process begins with registration [1]. User will go to the tollbooth and gives the details about his proof of identity and fingerprint. The given details along with fingerprint image are stored in government database. According to details given by user, the unique user-id and password is generated and sent it to the user via SMS.
- User Login Phase: On the day of voting, user will login on application by using user-id and password on his Smartphone.
- User Voting Phase: User will select the candidate to whom he wants to vote. After that camera will get opened and user has to capture fingerprint image and click on the vote button.

Validation Phase**:** If user enters correct id and password then ward wise list of candidates will be shown to user. If the time span between selecting the candidate and uploading the fingerprint image is less than or equal to some threshold value then the voting status of user will be updated as “Voted Successfully” else the status will be updated as “Blocked”. The status of voting will be sent to user via SMS.

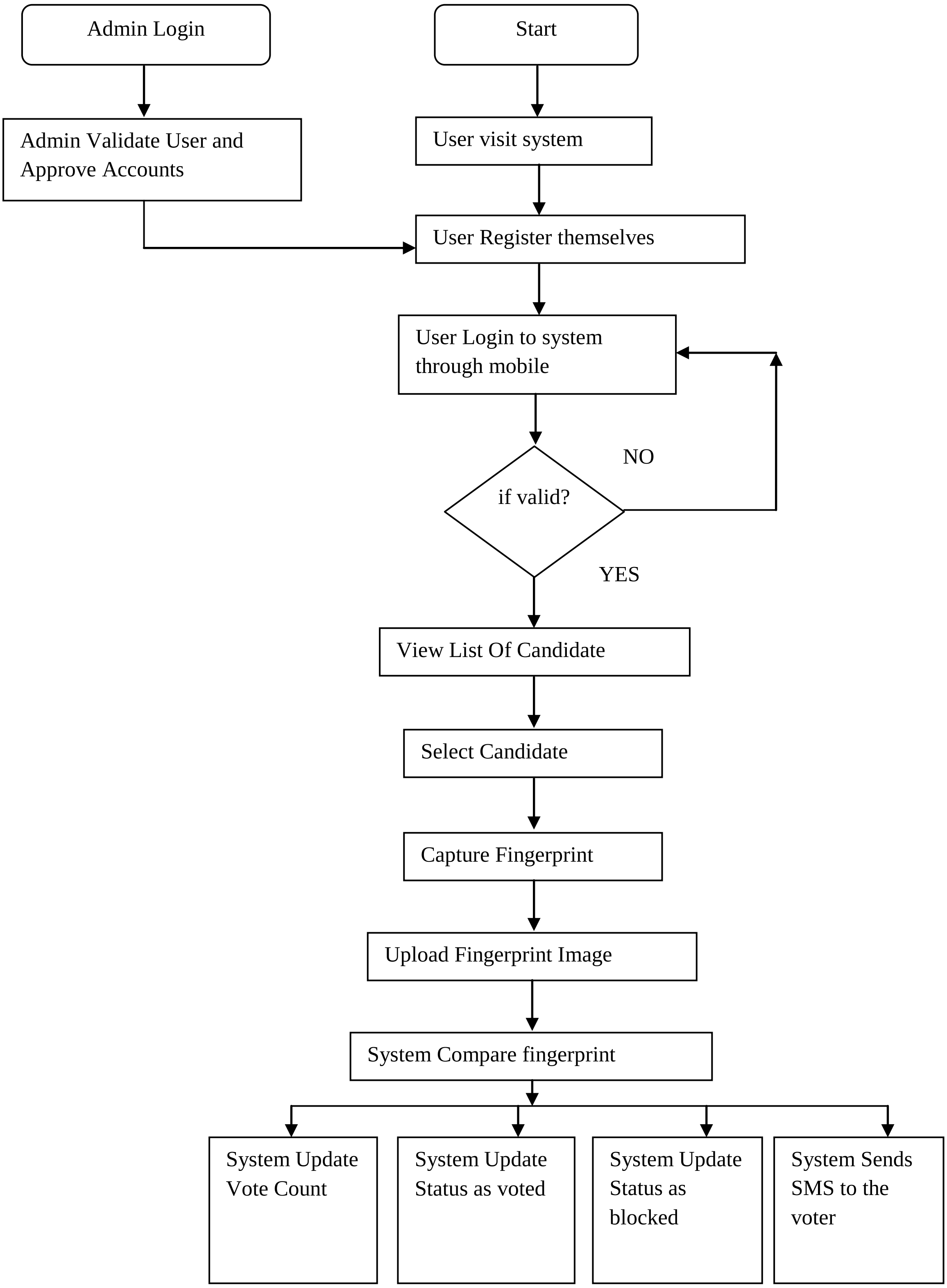
Admin Login
Start
Admin Validate User and Approve Accounts
User visit system
User Register themselves
User Login to system through mobile
NO
if valid?
YES
View List Of Candidate
Select Candidate
Capture Fingerprint
Upload Fingerprint Image
System Compare fingerprint
System Update Vote Count
System Update Status as voted
System Update Status as blocked
System Sends SMS to the voter

Fig 1: Flowchart of proposed system

3.2 Hausdorff Algorithm

A fingerprint is the pattern of ridges and valleys on the surface of a fingertip. Each individual has unique fingerprints. Most fingerprint matching systems are based on four types of fingerprint representation schemes :grayscale image , phase image , skeleton image , and minutiae . Due to its distinctiveness, compactness, and compatibility with features used by human fingerprint experts, minutiae-based representation has become the most widely adopted fingerprint representation scheme. The uniqueness of a fingerprint is exclusively determined by the local ridge characteristics and their relationships. The two most prominent local ridge characteristics are: 1) ridge ending and, 2) ridge bifurcation. A ridge ending is defined as the point where a ridge ends abruptly. A ridge bifurcation is defined as the point where a ridge forks or diverges into branch ridges. Collectively, these features are called minutiae[2].

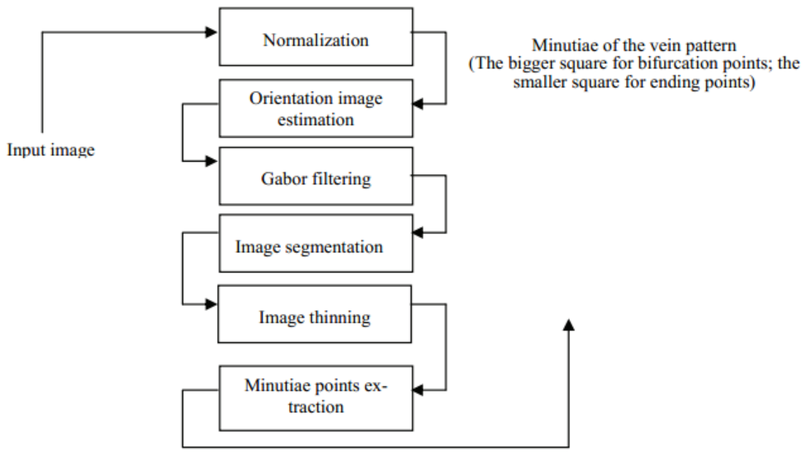

Fig 2- Flowchart of Hausdorff processing

3.2.1 The Lmage Normalization

The main fingerprint image which is stored in database is compared with the fingerprint image which is given by voter at the time of voting. For the difference of acquisition time, light intensity and the personal palm thickness, the image gray scale distribution is different highly. If the image difference is great, the difficulty of image processing and matching will be increased. So the image must be normalized. All of the images must be converted to the standard image of the same mean and variance. For dispelling the illumination effect, a method of gray scale normalization is adopted.

$$p(i,j) = \frac{p'(i,j) - G_1}{G_2 - G_1} \times 255 \qquad (1)$$

where p’(i,j) is the gray scale value of original image; p’(i,j) is the gray scale value after converted; G1 is the minimum gray scale of original image; G2 is the maximum gray scale of original image[3].

3.2.2 Orientation Image

The orientation image represents an intrinsic property of the finger-vein images and defines invariant coordinates for ridges and valleys in a local neighborhood. A number of methods have been proposed to estimate the orientation field of fingerprint images. Similarly, by viewing a finger-vein image as an oriented texture, we have improved orientation estimation algorithm. Given a normalized image f, the main steps of the algorithm are as follows:

1) Compute the gradients $\partial x(i,j)$ and $\partial y(i,j)$ at each pixel (i,j) .
2) Estimate the local orientation of each pixel (i,j).

a) Use the window W x W to slide in the original image, pixel gray value in the center of the window is f(i,j).
b) Orientation of window W x W is estimated and is regarded as orientation of the pixel (i,j)in the center of the neighborhood. The equations using to estimate the local orientation is as follows:

$$V_x(i,j)=\sum_{u=i-\frac{W}{2}}^{i+\frac{W}{2}}\sum_{v=j-\frac{W}{2}}^{j+\frac{W}{2}}\left(2\partial_x(u,v)\partial_y(u,v)\right) \qquad (2)$$

$$V_y(i,j)=\sum_{u=i-\frac{W}{2}}^{i+\frac{W}{2}}\sum_{v=j-\frac{W}{2}}^{j+\frac{W}{2}}\left(\partial_x^2(u,v)-\partial_y^2(u,v)\right) \qquad (3)$$

$$\theta(i,j)=\frac{1}{2}\arctan\left(\frac{V_x(i,j)}{V_y(i,j)}\right) \qquad (4)$$

where θ(i,j) is the least square estimate of the local ridge orientation at the block centered at pixel (i,j). Mathematically, it represents the direction which is orthogonal to the dominant direction of the Fourier spectrum of the W x Wwindow.

c) If every point in the image is passed, namely orientation of all pixels are estimated, that is end. Otherwise, repeating above Step.

3) Due to the presence of noise, corrupted ridge and valley structures, minutiae, etc. in the input image, the estimated local ridge orientation, θ (i,j), may not always be correct. Since local ridge orientation varies slowly in a local neighborhood where no singular points appear, a low-pass filter can be used to modify the in-correct local ridge orientation. In order to perform the low-pass filtering, the orientation image needs to be converted into a continuous vector field, which is de-fined as follows:

$$\phi_x(i,j)=\cos(2\theta(i,j)) \qquad (5)$$

$$\phi_y(i,j)=\cos(2\theta(i,j)) \qquad (6)$$

where$\emptyset x(i,j)$ and $\emptyset y(i,j)$ are the *x* and *y* components of the vector field respectively. In the resulting vector field, the low-pass filtering can be performed as follows:

$$\phi_x'(i,j)=\sum_{u=i-\frac{W_\phi}{2}}^{\frac{W_\phi}{2}}\sum_{v=j-\frac{W_\phi}{2}}^{j+\frac{W_\phi}{2}}\left(h(u,v)\phi_x(i-u,j-v)\right) \qquad (7)$$

$$\phi_y'(i,j)=\sum_{u=i-\frac{W_\phi}{2}}^{\frac{W_\phi}{2}}\sum_{v=j-\frac{W_\phi}{2}}^{j+\frac{W_\phi}{2}}\left(h(u,v)\phi_y(i-u,j-v)\right) \qquad (8)$$

where h is a two-dimensional low-pass filter with unit integral and $W_\emptyset$ x $W_\emptyset$ specifies the size of the filter.

4) Compute the local ridge orientation at (i,j) using[3]

$$O(i,j)=\frac{1}{2}\arctan\left(\frac{\phi_x'(i,j)}{\phi_y'(i,j)}\right) \qquad (9)$$

3.2.3 Gabor Filter

Orientation can efficiently remove the undesired noise and preserve the true ridge and valley structures. Gabor filters have both frequency-selective and orientation-selective properties and have optimal joint resolution in both spatial and frequency domains. Therefore, it is appropriate to use Gabor filters as band pass filters to remove the noise and preserve true ridge/valley structures.

The circular Gabor filter is an effective tool for texture analysis, and has the following general form:

$$G(x,y,\theta,u,\sigma)=\frac{1}{2x\sigma^2}\exp\left\{-\frac{x^2+y^2}{2\sigma^2}\right\}\exp\{2\pi i(ux\cos\theta+uy\sin\theta)\} \quad (10)$$

where $i=\sqrt{-1}$, *u* is the frequency of the sinusoidal wave, Θ controls the orientation of the function, and σ is the standard deviation of the Gaussian envelope. To make it more robust against brightness, a discrete Gabor filter $G(x,y,\theta,u,\sigma)$, is turned to zero DC (direct current) with the application of the following formula[3]:

$$\tilde{G}(s,y,\theta,u,\sigma)=G(x,y,\theta,u,\sigma)-\frac{\sum_{i=-n}^{n}\sum_{j=-n}^{n}G(x,y,\theta,u,\sigma)}{(2n+1)^2} \quad (11)$$

3. EXTRACTION OF MINUTIAE POINTS

The branching points and the ending points in the vein pattern skeleton image are the two types of critical points to be extracted. To obtain the junction points from the skeleton of vein patterns, we run the following pixel-wise operation commonly known as the cross number concept. For a 3*3 region , If *Po* is 1, and the number of transition *Nptrans*between 0 and 1 (and vice versa) from *P1* to *P8* is greater than or equal to 6, then *p*0 is a junction point. Mathematically, this can be expressed with the following equation:

$$N_{trans}=\sum_{i=1}^{8}|p_{i+1}-p_i|\text{, where } p_9=p_1 \quad (12)$$

A similar approach can be applied to find the ending points. The difference is that the number of transition *Ntrans*for an ending point is now exactly [2][3].

4. CONCLUSION

The manual voting process can be very tedious, prone toelectoral fraud and costly. The time that is been consumed andthe resources often times runs into expensive projects. The counting of ballots can also be rigged and very much time consuming and often times results are not tallied quickly enough, tallied results seems uncertain and the credibility of the calculation is often times questioned. Semi-technological systems had solved some of these issues but create access to more problems such as persons breaking through the system to vote multiple times. The proposed system addressed these challenges which brings the application of Biometric i.e. Fingerprint towards voting from the mobile device where people can vote to any party of their choice from anywhere.

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