Secure Voting Using Bio-metric Authentication

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Abstract— In this era of technology and advancement, everything is getting online. Today people want to be part of everything but didn't want to spare time for it. So when it comes to voting or polling, giving it time feels a very painful task, so why it should not be online? Online voting system as the name suggests is the concept of getting voting and polling done online, simply termed as 'Internet Voting'. And to ensure security and authenticity of the vote, biometric authentication is done. This method is smart, quick, reliable, and secure. The earlier voting system was very time consuming and also were not so reliable. In the present day, the commonly used voting machine is EVM (Electronic Voting Machine), which have no mechanisms to verify the voter while casting vote and thus fake votes can be cast. But in the online voting system, Biometric authentication using fingerprint and unique voter identification number (here registration number provided during registration of voter) make it the most secure way of voting. This model covers all the limitation of present time in the voting system and is the most advanced of its time.

Keywords— EVM, BA, TGS, UIDAI

I. INTRODUCTION

In this modern era, people do not want to waste their time in any social activities but they want to be part of such social activities. So in order to provide such facilities to people online voting machine is a better way, which will be a secure, time-saving, and fast method. Online voting machine can be implemented anywhere like in colleges, universities to hold student elections, for any type of survey in the society. The online voting machine will allow a large number of people to give their views on any issue. This can be used anywhere like in the UN and IMF where different countries participate in making a decision on any issue related to the environment, security of any country, and money etc. Here online voting machine can be helpful for the different countries who are not able to reach there can give their vote online. The country representatives can give their votes without going anywhere. This online voting system can also be used to know the views of the people directly for the working of the government in the country directly not through their representatives. As we know in a large democracy like India it is not possible to hold the meeting of all peoples for any propaganda, so their representatives to whom peoples elect give his views but through an online voting machine, it is possible to involve all people in any agenda without much difficulty.

The online voting machine will be secured because it will have all records related to any individual. So, peoples will not be able to do any mischievous activities like giving vote many times. It will have all the records that how many times any individual accessed the particular page and up to where. The online voting machine will be much better than that of pen and paper-based surveys. There will also be different levels of authorization levels for different members, an administrator will have access to a poll of a particular area but before accessing the data he should have to verify with his credential details. The voters will also be verified on the basis of their details then only they will be allowed to give their responses.

The online voting machine will be very helpful in managing the elections on any level like at central level, state level, district level, municipality etc. As we know the democratic government is the best form of government because in democratic government, the representative is elected by the people and the representative who comes in power with the majority is responsible for the needs of the people. But in the democratic the way of choosing their candidates is not so fair; the people use money and mass power to win elections. And sometimes, violence takes place at the polling booths and this leads to the damage of property and life of peoples. Many peoples also do not go to give their votes due to the large distances of polling booths from their houses and many busy peoples love to do their work instead of going to give their votes at polling booths. As we know, for making the best form of democratic government all the peoples should have to participate actively.

To overcome these problems, we will design the online voting machine which will help the people to participate actively in elections to choose their own representative. The online voting system will help all the peoples that they can give their votes without going at polling booths. In this way, the people will also not be misguided by many people and they will be able to choose their leader according to their own will. In a democratic country like India, it is very important to implement an online voting system, because in this country, to handle such a large population at the time of voting is a very big task. Sometimes, as I have experienced the violence may take place between the majority and minority communities. Many of the peoples also do not get much preference for the elections in the rural areas. So if the online voting machine will come into existence at least the peoples may show interest in elections due to a better facility. The online voting machine will also be much better than that of the pen and paper-based method.

The online voting machine will also reduce the burden of counting of as in case of ballot paper-based voting system [1-3]. This will lead to the declaration of result in a short period of time. This online voting system will contain the information about every candidate who will contest in the election and about all the people of a particular area.

The online voting machine will also decrease the violence on the bases of communalism because there will be no need of going anywhere to the people. The people can use their own electronic gadgets to respond to their representative. And the states like Uttar Pradesh and Bihar where the population density is more but the percentage of the people who participates in the elections is less, the online voting machine will be the best option to motivate peoples to participate and also it will be helpful to government officials to have control over peoples.

There will be no fear in the mind of the people of majority or minority and the elections will be held in a free and fair way with the help of an online voting machine. The people will participate in large numbers the will no problem to manage the facility to peoples at the time of the elections.

Though it is not restricted to the election only, it is applicable to all kinds of polling to collect data to form an opinion. For a diverse country like India with so many languages and agendas, the online voting system is a solution to all at a single platform. It will reduce disputes, will bring better results and will be user-friendly.

II. LITERATURE REVIEW

Voting is a method by which a collective decision is made or taken.
Types of voting

A. **Paper-based methods**: The most commonly practiced voting technique is paper-based this was started in the early 1800s and was first practiced in America. This method involves using paper ballots on which voters mark their preferences. The paper contains the list of choices available the voter has to mark against their desired choice than these papers are then collected in a box. The votes on the box are counted and the choice of having the highest preference is chosen.
This method has drawbacks like:
- It is most appropriate only for small scale voting as if the voting is conducted on a large scale than it may take a lot of time in the counting of votes.
- In some cases, there may be some error while marking like the vote has been marked in such a way that it partly lies in one choice and partly in other so in that case, the vote is invalid.
- This method is not environment-friendly as a lot of paper is used.

B. **Machine voting:** The concept of voting machine was introduced by Chartists in 1838 [1]. In this method, each voter was given a brass ball which voter has to drop in the appropriate hole in the top of the machine which has the candidate's name written. The ball advanced a clockwork counter for the corresponding candidate as it passes through the machine, and then fell out the front where it could be given to the next voter.
In the present time, the advanced version of this machine is used known as EVM (Electronic Voting Machine) which has a button in front of the candidate's name. The voter has to press the button to which he wants to give the vote. Electronic machines are mostly used by the developed countries to cast and count votes during general elections.
The drawbacks of the electronic voting machine are not many but few are listed here:
- Electronic voting machines can tamper during its manufacturing
- Electronic voting machines do not have any mechanism through which voter can be verified thus fake votes can be cast.

C. **Postal Voting:** Postal voting is voting in an election whereby ballot papers are distributed to voters which are returned by them with their choice. In this process, the postal is sent to the voters and they are given a time frame by which they have to submit their postal.
The approach of this method is best as the voters are not compelled to vote on a particular day they are given freedom that they can vote and send their post any day according to their choice within the given time frame.
This method also has drawbacks:
- It is possible that a postal is sent to a voter but he doesn't receive it.

- The voter has sent the postal after casting his votes but that post doesn't reach its destination.
- This method doesn't have any voter identifying mechanism so there is a possibility of fake votes.

D. **E-Voting:** Online voting also known as e-voting makes use of the Internet to cast vote. The main aim of online voting is to increase political participation. So more and more people can actively take part in the voting process. Online voting is allowed in some countries. Estonia was the first country to use online voting. It was used for local elections in 2005 [5].

III.   ONLINE VOTING SYSTEM

Taking an opinion of all to make a decision is what makes the system fair, and efficient. But this thing does not limit to the election only. Every opinion counts for the decision. All the above-mentioned methods have the same function to perform i.e. to collect the opinion. With the passage of time and advancement of technology, we have developed these methods, and now we look forward to a more reliable, more suitable and more efficient method, that can collect our opinion on each and every aspect that affects our life. The online voting system comes out as the most reliable for this out of all methods that are being practiced till date. In the present date, the online voting system is limited to election use only. Here our model comes into play. Our online voting system provides voting service for any aspect you wish for. In our online voting system, we provide a proper authentication system, which will be biometric based. This model covers almost all the limitation of rest of all methods. It will be quick, smart, authenticate, and reliable.

DESIGN

A. Database
Firstly we'll need a database which will hold a record of all the candidates participating in the polling. It will be similar to the database that the election commission holds, but this one will be used for all forms of polling.
For the formation of the database, the details from the candidates will be asked at the time of registration at our portal. It will include details like:-
Name, age, gender, Father's name, Occupation, Contact and all other relevant details with documentation for proof and also biometric record will be maintained. Once the verification is done, the candidate is registered at the portal and with successive addition of different-different candidates the database will get developed. It will be revised at a regular time interval.
A quick way to do this thing is to collaborate with UIDAI (Unique Identification Authority of India) [6], this will give access to whole government database which will be a lot more useful and beneficial.

B. Authentication server and Ticket granting server
Each time a candidate logs into the server of our model, he will be verified first from our database through his registration number and biometrics. After verification, he will be directed to the list of choices in the polling going live. The candidate will have to choose the particular choice in which he wishes to vote. Once authenticated with the biometric his casted vote will be accepted and saved.
This two-level authentication gives additional benefit to our model and makes it more secure and reliable than other systems. First, he had to get verified from the database to log in and then he had to get his vote verified for the particular poll he wishes to cast it for.
For this process, an authentication server (Here biometric authenticator) developed using Kerberos prototype [7] will come in action. The second verification will be done by Ticket granting system.

C. Administration login
This feature will be accessible by the administrator of the particular poll of which he is an administrator. It will allow him to access only that particular poll, and for this will get verified in the same way as the candidate is being verified. Once verified the administrator will be able to access all the votes to prepare the result. He will prepare the result from the collected votes and will display it at the poll after the exit of the poll.

Both the candidate and administrator will be provided a platform to have a direct interaction through our model. This model will be installed in polling kiosk, available all over the place. This will increase the number of people participating in the poll.
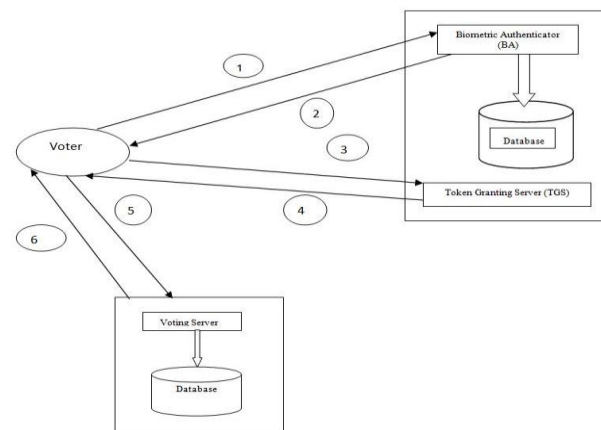
Voting System Implementation

Figure 1 Voting System Implementation

1. The voter will go to the kiosk and entered registration number in the voting machine which will send the details to biometric authenticator then biometric authenticator will ask for the fingerprint scan then it will authenticate the voter and will generate a ticket
2. This ticket will be sent to the voting machine.
3. The voting machine will send this ticket to the token granting server than token granting server will raise a token with details of the voter which are the area that can be accessed by the voter.
4. Then this token will be sent to a voting machine which will be sent to the voting server.
5. The voting server will verify the details in the token and will redirect the voter to a page containing choices with details of each choice. Each choice will have a vote button in front of it the voter will opt the choice he wants to opt by clicking on the vote and pressing the submit button.
6. After the vote is cast successfully the voting server will send the confirmation message on the screen of the voting machine.

Figure 2 Flow Chart of Voting Process

Illustration

Let's suppose a situation, where a car manufacturing company wants to do a poll to know 'What features a car should have made on a minimum affordable budget'. Here the motto of the poll is to know the common feature to keep in the car so that it can satisfy majority of people, as its being manufactured at minimum budget possible to make it affordable to everyone. Now the company will register itself on our polling system and we will allow them to conduct the poll. They will frame the list of items and other things and will decide a time span like at least a week or a month for people to give their opinion. The candidates interested will go to their nearest polling kiosk. They will enter their registration number if already registered and if not then will first register themselves. Then biometric will scan fingerprint to verify. Once verified they will be provided with the list of polling going live. Candidate will select from the list the car manufacturer poll and then be verified for this poll through OTP. After being verified he will cast his opinion. Now after the poll time completes the administrator will log in. They will be verified through the database and then they will prepare the result on the basis of the votes. This example gives an idea of how fast, reliable, secure, smart polling system can be made.

IV.   ADVANTAGES OF OUR SYSTEM

- No paper is wasted as in the ballot voting system
- There will be no fake votes as the voter will be identified using his fingerprint
- More and more people can take part in the decision-making process as the kiosk having systems with our software will be provided in every locality like the ATMs.
- The time taken for the counting of votes will be very less.
- People will be free to give vote whenever they want within a given time frame they will just have to visit the kiosk in their locality and cast the vote.
- There will be less human involvement as all things will be automat.

V.   CONCLUSION

Considering all the methods available for polling, online voting system can be considered as the most secure, efficient and reliable method. It increases the number of participants in polling. It provides a platform for free and fair polling.

The voter needs to go to its nearest polling kiosk. Authentication of the voter will be done through the unique registration number and fingerprint. The biometric scan will confirm the voter. A token key will be generated automatically which will direct the voter to the poll. The voter will cast the vote. The administrator also needs to verify through the same process to access the votes to form the result. This model is secure, fast, efficient and reliable. Biometric adds one more layer to its security and authenticity. This model can be established as the future of the polling system.
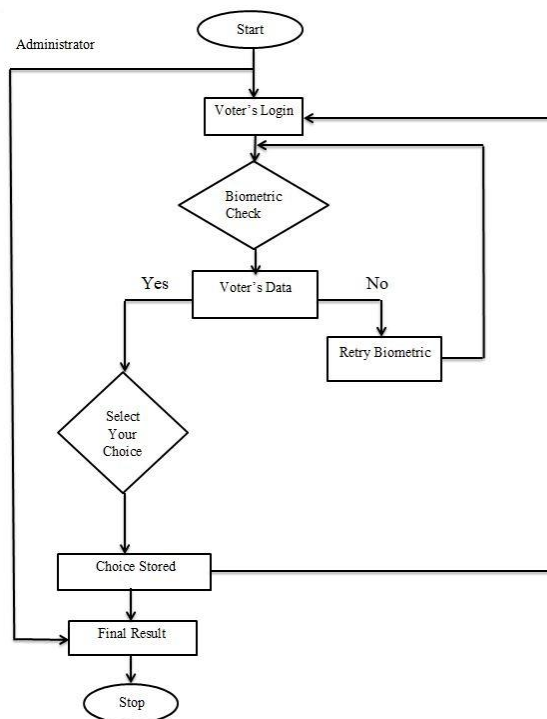
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