Secure and Reliable Election Process to Stop Vote Rigging and Tampering

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--**ABSTRACT**--
Voting is an utmost and legitimate process to reveal a caste's counsel chiefly for a democratic country. Numerous voting methods have been using from the introduction time. But people nowadays want a safe, secure, and reliable procedure to vote. The more people experience a method, the more reliability they want. There are diverse reasons why electoral voting has supplanted the ballot voting system. An E-voting system is more reliable, less time-consuming, environment-friendly, and reduces the probability of causing the human error. But no electoral voting is out of error and conflict. In this paper, we introduce a process that will help people find their propitiation and will not hamper the voter's confidentiality and privacy. We propose a system where each voter will have an account. The voters will log in to the system using their user id and password. The system will send a One-Time Password (OTP) to the voter's registered mobile number for more security. Voters will then select their desired candidate using their account before going to the voting booth. After choosing a candidate, voting power for that particular voter will be closed. But the candidate will not receive the vote until the voter appears in a voting booth and assert his authenticity by providing his biometric identity. The main objective of this method is to provide a neutral election where voters do not face any outer influences which may thwart their right to express their counsel. We are also concerned about the people who are not friendly to technologies and cannot select their candidates online. They can directly choose their desired candidate with the help of a polling agent after arriving at the voting booth.

Keywords - **Biometric, Confidentiality, Privacy, Security, Voting.**

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I. INTRODUCTION

Voting is a very ancient process of expressing one's opinion. People vote to take any collective decisions that we call Election. Elections are two kinds of - Political elections and Non-political elections. Generally, the election commission arranges the political elections. In some cases, the voters have to choose a single candidate for a unique position (Prime Minister or Vice-Chancellor). In others, they have to select multiple winners (Parliament members or Commissioners). Though the primary use of an election is political issues, it has other applications too. Voting may occur in different forms and processes, like-paper or ballot voting, electoral system, etc.

Voting was first introduced in the 6th Century BC by Athenian Democracy [1]. The first used voting method was secret ballot voting. From the same source, Rome introduced a ballot voting system between 139 and 107 BCE to avoid any intimidation and corruption. The Republic of Venice used multiple rounds of drawing lots and approval voting from around 1268 to 1797. With the flow of time, the voting process has changed tremendously worldwide, and finally, the most recent method is the Bio-metric system. The Design of an Electronic Voting System

is an E-voting system proposed for the Election Commission of Ghana based on their requirements in[2]. Article [3, 4] describes different requirements and mechanisms for an e-voting system. These include both technical and organizational requirements. [5,6,7] narrates some surveys and analyses of different electoral voting systems in practice that we discussed in section II.

In our proposed idea, we focus on a voter's confidentiality and fundamental rights. Technology has been part and parcel of our day-to-day life. A tech-friendly person can obtain maximum convenience from our system. The voter will bear a unique ID and password to log in to his portal and select the candidate he desires. He can choose candidates only once for a particular category of nomination. Since the selection process is secured for each user, voter secrecy is maintained. Once the voter completes the selection, he should arrive at the voting station to verify his bio-metric authentication via fingerprint to finally accomplish his vote. Since we propose a three-step confirmation (Password, OTP, Finger print) for one vote, there will be almost zero chance of intimidation, manipulation, and coercion. We also offer a separate procedure to the people who are not tech-friendly. These people can appear at the voting station and complete

their vote in the conventional E-voting system. Thus, our proposed idea will satisfy both the confidentiality and ease of use for any user.

II. RELATED WORK

Several kinds of research have been done in the last few decades about the voting process. These experiments proposed different out-standing solutions, and many of them are now in practice. Article [6] discussed the electronic voting system Diebold's Accu Vote-TS 4.3.1 and identified several issues regarding security, cryptography, network threats, and reliability. They then suggested a voter-verifiable audit trail to replace the faulty e-voting system. In [8], a three Ballot voting system allows users to vote on the ballot paper and provides a receipt as confirmation of their vote being counted. Ballot papers are scanned and published on a site where the voter can match his/her ballot with the receipt.

[9] Identifies two main requirements for a voting system. One is integrating the election result into the system so that voters are convinced that votes are counted correctly. The other is maintaining the confidentiality and privacy of a voter so that the voters arefree from coercion. They proposed a prototype named "Civitas" that is not supervised by polling agents, but a remote voting method. As per their assertation, the system is not yet secure enough to implement in national elections. The biggest drawback of the system is they focus on remote voting. Thus, no biometric validation of voters is checked.

[5] Discussed and analyzed some research and development (R&D) projects in their paper. In [7], they surveyed different E-voting systems and discussed the advantages and drawbacks. The ideas that were described here include Pool-site internet voting, Kiosk voting, and Remote internet voting.

In [10], they used the EVM system but in a bit secure way. It has the feature of two-steps authentication (password and fingerprint)for the user verification during the vote. The main focus of this idea was the power system failure solution for a load shedding prone area. They used battery backup and some control units to check the battery state in case of any power failure since this idea has been introduced for the voting scenario of Bangladesh where load shedding is a very mundane issue.

Journal [11] proposes another EVM process with a biometric system using fingerprints. They suggest the automatic vote enumeration for the election result being more reliable. The idea uses the control unit and ballot unit concept. In this paper, they used a four-layered network system to complete the whole process. They proposed to maintain two individual databases - one to store the NIDs and the other for voters. The reason for using two different databases was opaque. There is a feature to capture an image of the voter during the voting process that may seem redundant to others since the fingerprint is the key concern here.

The idea [12] has proposed a mobile voting method using the concept of a one-time password (OTP) and fingerprint verification. A user must de-register from the previous device if s/he wants to register to a new one. It also requires a machine that does have thefeatures of a fingerprint.

All the previous schemes have some hurdles. Some are fatally defective and could not reach the outcome that was presumed. Thus, the updated process has been introduced to overcome the problems. Many countries are already using the biometric voting method [13]. Nevertheless, election processes are intimidated and corrupted by some groups. Voters are being threatened by different political parties and manipulate their choices. According to some news portals [14], people don't have faith in elections now. That's why the number of voters is declining. According to some news portals, the General Election of Bangladesh 2018 was not fair even after using the Electoral voting process in some regions [15].

To solve these problems, to encourage voters to make their decisions, we present an idea. To that system, no influence and coercion of others can take part. Thus, people can enjoy a peaceful election.

III. MOTIVATION AND PROPOSED IDEA

Ballot paper voting is conventional in most places in the world. The electoral voting method has been introduced recently in several countries. According to Transparency International [16], Bangladesh owns a score of 26 out of 100 and has ranked 146 out of 198 countries on transparency. That means Bangladesh is a highly corrupt country. Out of many reasons for the corruption rate increasing day-by-day, one major factor is that people here cannot choose the right person for a powerful position. Booth capture, vote-rigging, and tampering are considered a commonplace activity in Bangladesh[17].Polling agents trace voters by using erasable ink on hand that seems irrational. There are too many controversies about using this election ink. No matter the election is national or local, everywhere political influence or power is used to dominate the people's choice. In a democratic country, the people have the right to cast their votes and choose their desired candidate, especially in Political Elections such as the National election, City Corporation election, etc. But, under the influence of dominating parties, they become threatened and have to cast their vote going away from their opinion. Thus, no election is fair. Voting should be a very confidential issue of our life where we express our decisions by choosing our desired representative for a position. But some unethical persons and teams are hampering the secrecy of vote day-by-day, and now the vote is not a secret anymore. In our proposed system, we have tried to ensure the privacy and safety of a voter so that election becomes fair and no influence can hamper anyone. Figure 1 shows the existing systems of voting and also depicts the devices and technologies that will be constituent for the proposed method. Figure 1(a) is one of the very initial voting processes which is already is in use in many origins. Mobile voting method is depicted in Figure 1(c) which is recently very common specially for a community election where number of voters is not vast. In Figure 1(b), we can perceive the EVM process that is an automated version of ballot voting method. The candidate's information appears in the display and the

voter has to click in the button or fingerprint sensor to confirm their choice. In Figure 1(d), we depict the technology required for our offered idea. Here, a fingerprint device is connected to the voter's database and all the user will need is just to scan his bio-metric identity to confirm his vote which he has chosen prior. A monitor screen will display the corresponding message about the confirmation or rejection of the vote once fingerprint is provided. TABLE 1 represents a benchmark comparison between the existing system and the proposed idea based on some properties.

We are now living in a tech world right now. So, we tried to extract some good uses of using technologies. The number of computer and smart phone users is increasing rapidly developed as well as developing countries. We collected the data of top countries in smart phone penetration [18] and depicted it in Figure 2. What we can analysis from this data is that, the number of smart phone users is more than 50% of the total population in most of the countries. These statistics lead us to offer an idea so that people can vote using the technology the use every day. I our proposed method, there will be a voting site and each user will have a unique identity to sign in. Voters can select the candidate using any browser from their computer or mobile phone. Once, the voter chooses the de-sired candidate, the voting access will be locked for him. Then the voter must go to the voting booth where he needs to provide his authentication via fingerprint to finally cast his vote. In such, no one can manipulate the voter's choice and the voter's confidentiality is maintained. But there also remains a portion of voters who might not be comfortable with signing up and selecting the candidate prior going to the voting station. For these voters, we have retained a general EVM process and they can arrive to the voting booth and cast their vote directly. Thus, the election can be fair in legion. We ensure that the two available options in our proposed method will urge all sort of voters to cast their vote. There was a time when election was like an occasion to the country people. Through our system, people can regain their enthusiasm to election since it can stop vote rigging and voter intimidation to a vast number.

IV. FIGURES AND TABLES

(a) Ballot Paper Based Voting
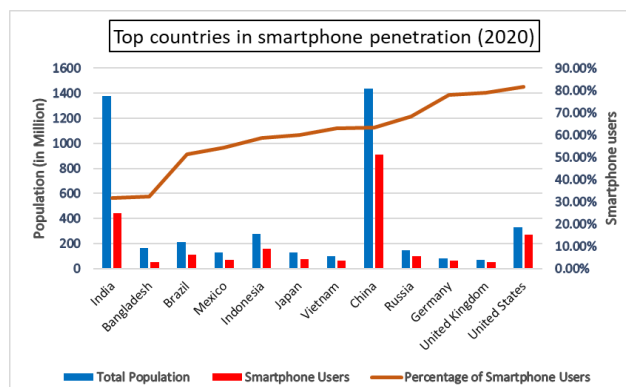

(b) Electronic Voting System
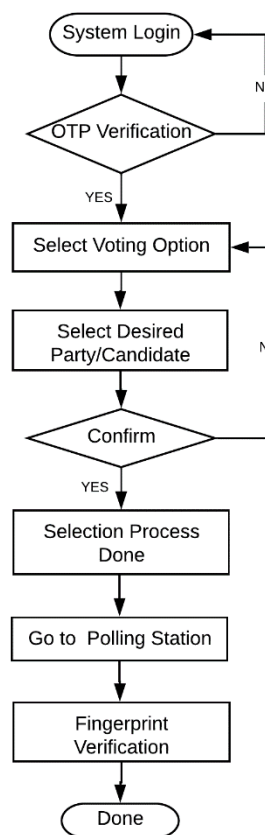

(c) Mobile Voting

(d) Proposed Voting Idea

Figure 1: Existing system vs proposed idea

Figure 2: Top smart phone penetrated countries and their population

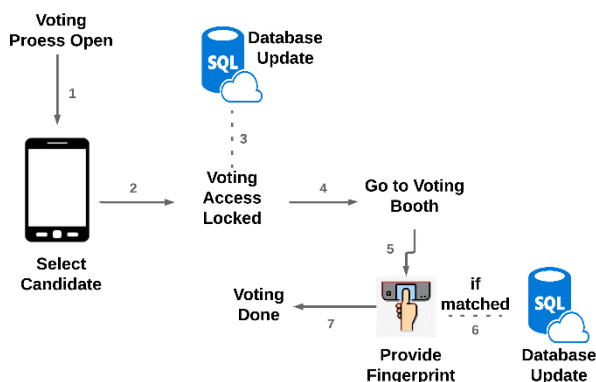**Figure 3: Flow chart for the voting process**

Figure 4: System diagram

Table 1: Comparison of Ballot Voting, Existing E-voting and proposed Smart Voting System

Properties → Method	Ballot Voting	E-Voting	Smart Voting
Paper based	Yes	No	No
Votermark identification	Yes	Yes	No
Privacy hamper	Yes	Yes	No
Time Consuming	Yes	Yes	No
Reliable	No	Partial	Yes
Smart	No	Partial	Yes

V. METHODOLOGY

In this system, every user will have a unique ID that is their NIDs, and a password to login to the system. When a user tries to log in,a one-time password (OTP) will be sent to his registered mobile number. After verifying the code, he can enter into the system. On the "Home" page, he will have several options related to the election and his profile. For now, I have considered the following features:

- Vote
- Show candidates
- View result
- Upcoming election
- Update profile

The voting process has two parts - Selection Round & Voting Round. Two different rounds have been introduced to integrate more security and avoid tampering. For the selection round, the user will first log in to the system providing an OTP sent to the voter's registered mobile number, and then select the voting option. Then, a page will be loaded containing the information of candidates or parties along with a radio button beside each choice. The user will then select his preferred one and lock his vote. At this stage, the voting option for that voter will be stopped but the vote will not be counted yet. The system will confirm the vote only after when the voter will go to the polling station to verify his authenticity by fingerprint. Thus, a voter can cast his vote without any influence from others. Fig. 3 represents the system flow of how a voter can select his desired candidate or party using the application securely and confirm his vote with biometric validation.

The voting round will include a fingerprint scanner and a display. After selecting a candidate, the voter will appear to a polling agent and provide his fingerprint. The system will check in the database whether the voter completes the selection round or not. If the first round is completed and fingerprint is matched, the display will show a confirmation message, and the vote will be counted. Otherwise, the display will show the corresponding warning. Fig. 4 expresses both the selection round and the voting round altogether. A voter can verify his identity with biometric verification until the voting poll is closed for that particular election.

If a voter fails to validate his identity with that time, his vote will not be counted. Since a three-level (Password, OTP, and Biometric) authentication is maintained in the proposed idea, the voters will experience a fair and neutral election environment.

The view result option will remain closed until the voting hour is open. Once the scheduled time for voting is up, the voters can see the result of the election through this option. Users can see the winner and all the participants with their achieved voting scores. When there is no election running today, this page will show up the result of the latest election that had been occurred last.

Users can also have some limited access to change the profile picture, change password, etc. using the system. In a word, this system will contain all the features that a user can cherish in.

VI. DEVICES AND CONTROL UNIT

Since the mid-20th century, the world is undergoing an Information Age. Thousands of new technologies have been introduced, and this system is a fingerprint scanner. ZKTeco ZK4500 or ZKTecoSLK20R can be a preferable option as a biometric reader to implement having a power voltage 5V, 200mA current. For the display unit, we can use a Tablet PC that has an inbuilt micro-controller unit.

VII. CONCLUSION

In this paper, we propose a Smart and Secured voting procedure that can ameliorate the existing unwanted chaos in the election. This idea can satisfy the voter with a pleasant experience of an election. The biggest challenge in implementing the idea will been suring that all the voters are familiar with the system login and Graphical User Interface (GUI) of the system. So that they can login to the portal on their own, provide OTP, and select their desired candidate without any external help. To ensure this, a training session can be arranged from the election commission before the main election. Thus, the maximum outcome from the idea can be achieved. The components required for this system are cheap and easily manageable. So, it will also reduce the overall cost to execute a successful election.

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Biographies and Photographs

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