A Review of techniques used in E-Voting

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***Abstract*—Voting plays important role in democracy of any country. It gives chance to the citizens to select their leader so it must be transparent. Over the years manual voting system replaced by the E-voting to ensure the security and transparency. Electronic voting process reduce human error in calculation of votes and identification of the authenticated user. E-voting involves less human interface which makes the system error free. Many techniques are come into scene over the years to ease the process of authentication of the user and to cast the vote in more transparent way. The advance E-voting techniques are surveyed in this paper.**

Keywords- sensors; fingerprint Recognition; Face Recognition; aspberry pi; ATM, GSM, VVPAT, ZKF-4500 sensor

I. INTRODUCTION

Voting is a process in which citizen choose their leader. Manual Voting system involves verification of the user by checking Name, CNIC etc of user manually on the record and count the vote by calculating the ballot papers at the end of process completion. Manual voting process increase the human error and not able to maintain the transparency of process.

The history of voting shows security of ballot privacy is an important factor of voting process to satisfy the user's that their votes are casted accurately and to reduce chance of vote buying and fraud. (Tabatabaei, Jamroga, & Ryan, n.d.)

Electronic voting term is used when electronic device like computers, sensors, biometric devices are used to cast the votes in election process. Electronic voting term mostly used when internet connectivity, web based or desktop applications are involved to carry out the voting process. The electronic systems can be used to register voters, validate user, tally votes, calculate the results and to update the results. (Bungale & Sridhar, 2000).

E- Voting theory process start from 18th century and over the years many techniques develop to identify the legitimate user and to maintain the transparency and security of voting process.

Different web based applications, hardware and sensors are design to identify the user and to enable them cast the vote to the candidate of their choice using internet connectivity and without using internet connection.

E-voting system must be easy to access and easy to use for the citizens no matter literate or illiterate because it's a chance for them to choose their leader.

E- voting process need to mature enough to facilitate the citizen of every area weather having facility of new technology or not. Work done on different E-voting techniques are surveyed in this paper.

II. SURVEY DETAILS

Due to the problems faced in manual system to conduct the voting process E-voting system is proposed that use Smart Electronic voting machine (EVM), Card reader, Ballot unit, Control unit. It enroll the voters and issue them PVC and allow them to cast the vote and then calculate the result. Control unit of the proposed system consist of power supply and information of the candidates when user get its thumb mark enter in the chamber with the ballot paper and vote for candidate busy red light will show on the paper and vote added to the register of the control unit. It requires less electricity and maintenance as well. (Amuzie, 2016)

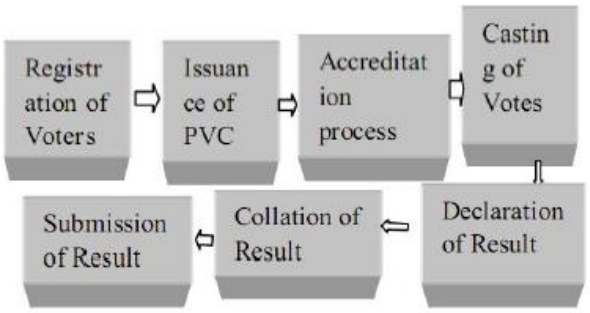

Fig 1. Block diagram of the system

To replace the existing manual system web based E-voting system is proposed. The proposed system work in the hierarchy and at each level administrator have different roles to ensure the transparency. It allows the polling station administrator to register the user by adding the details of the user. User registered by the administrator, and to cast the vote voter visit polling station of its area polling station master verify the authenticated user and caste its vote. ("Cost Effective Online Voting System for Pakistan," n.d.)

GSM model become common and accessible technique used in mobile phones. GSM based voting technique is used to send the voter data to the base stations and to track the user. It keeps the record of the user who cast their vote in the register. It also calculate the vote casted and vote rejected to ensure the accuracy of the system. GSM based electronic machine used infrared sensors to track the information of the voters and send the data to the main server after voting is done. (Bhatia & Gupta, n.d.)

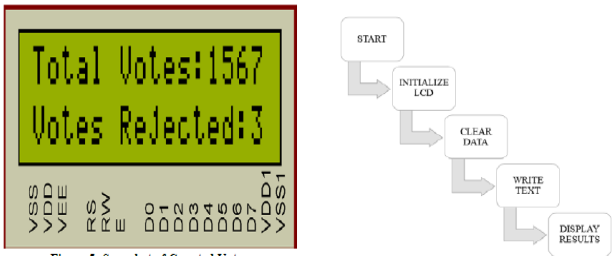

Fig 2- Diagram of system

To conduct the error free voting process the proposed model provides the facility to the voters per their area and the facilities they are having. Proposed model consists of online voting facility and standalone application for the area's not having internet facility. In those areas where internet facility is available voter cast their vote using Mobile internet facility, ATM facility and in remote areas where internet facility not available voter can cast their vote by using standalone application. Data saved into standalone application in the local database and compile at the base center. The whole process is being monitored at each level state allocation of data is monitored by state verification department and national level monitored by national level verification department and after verification final result publish. (Uzedhe & Okhaifoh, n.d.)

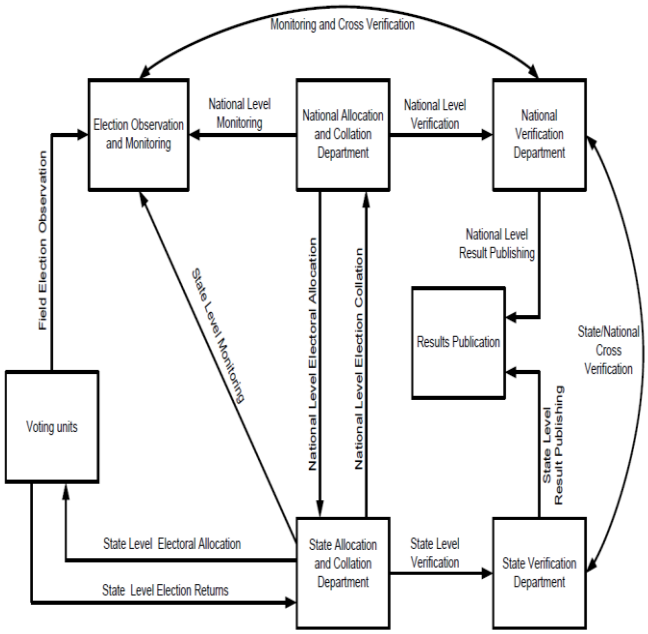

Fig 3- Election Administrative Framework

To cast the vote electronically desktop application is designed that first enroll the voter by collecting 13 digit CNIC and their finger prints using ZKF-4500 sensor and save on local database. User cast its vote when its finger print matched with already save finger print image. If finger print not matched alarm ring and not allow the voter to cast the vote same in case if user already cast its vote. Second part of this application is web based that update the result to show the number of votes casted by the user and to which party. It immediately update the record to ensure security and to reduce chance of fraud.(Ali, Amin, Shah, & Farid, n.d.)

Fig 4- Program Flow

It uses raspberry pi, biometric fingerprint sensor, and touch screen to cast the vote and then generate verified authenticated user it compares the fingerprints and NIC of the voter and allow the registered user to cast the vote. Voter paper audit trail (VVPAT) is generated to ensure the voter that it cast the vote. This biometric voting consists of user application and database and voter application and database. The proposed solution involves three steps 1- Users first enroll / register in the system and cast their vote by using fingerprint sensor and touch screen. 2- Casting of vote 3- updating of results. After completion of the process of voting process data that is stored on local server send to central server using GSM and results updated on the website (Gohar Awan et al., 2016)

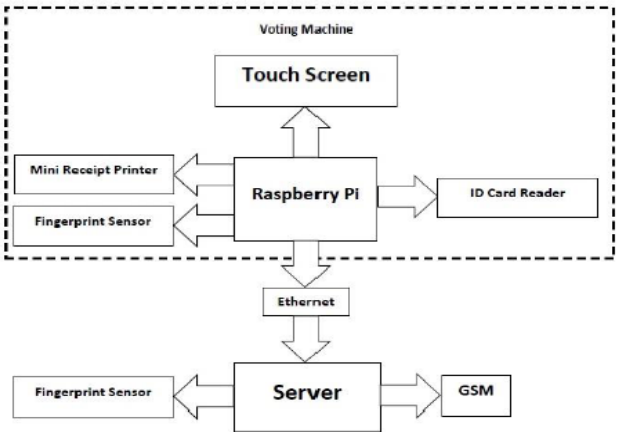

Fig 5- Hardware Block Diagram

Traditional voting process is organized centralize or distributed manner called voting booths this voting process is very complex, time taking and involve human efforts. Mobile voting provides secure way using RSA algorithm for security purpose to conduct voting process. The whole process consists of three main steps 1- online registration of the user, vote casting and display of result. This method involve internet only at registration time and remaining steps carried out through SMS messaging without using internet. Voter register themselves by sending SMS they get private encrypted key after authentication done at server side using their mobile number and CNIC. This private key is used to cast the vote. (More et al., 2250)

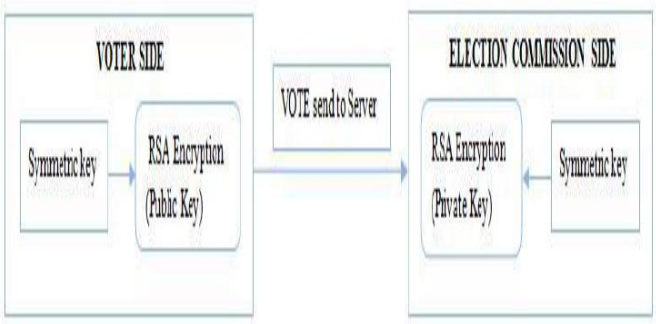

Fig 6- Structure of RSA algorithm

Gabor filter method is implemented in the MATLAB to authenticated user it compares the fingerprints and NIC of the voter and allow the registered user to cast the vote. Gabor finger recognition techniques perform better than other recognition techniques like correlation after finger scanned and validation of the user. User cast its vote by using LCD voting record immediately updated making the system efficient fast and error free. (Baig, Ishtiaq, Kanwal, Ishtiaq, & Hassan Javed, n.d.)

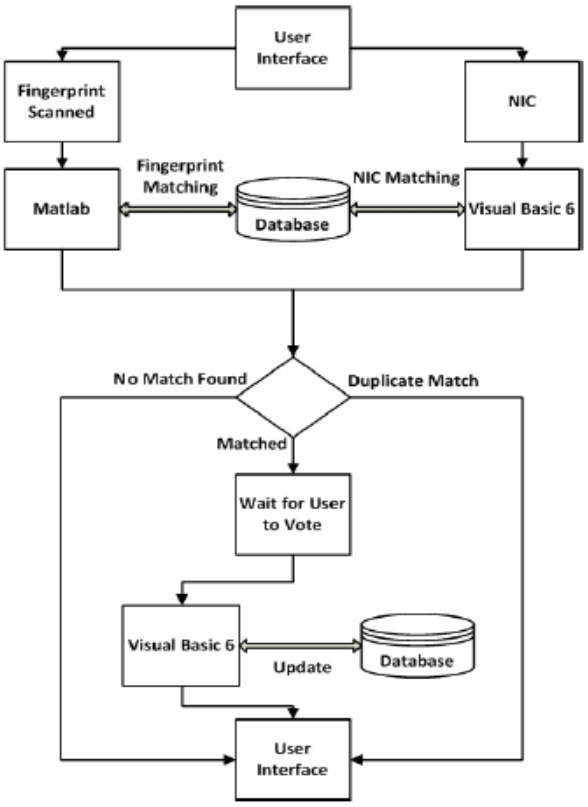

Fig 7- Flow chart of EVS

Existing system of voting involves human power, security, and discipline. Due to more involvement of human chances of error also increase. Face recognition is a technique used to authenticate the user. In this method face recognition technique is used to authenticate the user this technique enable the voter to cast the vote from anywhere in the world. User sign in through application installed on laptop, tables, or computer by using face recognition method, face matched with the central database if user face is matched then it selects desire candidate and cast its vote. This proposed solution first register / enroll the user and also save the face pattern in the database for comparison. (Trishapatel, 2013)

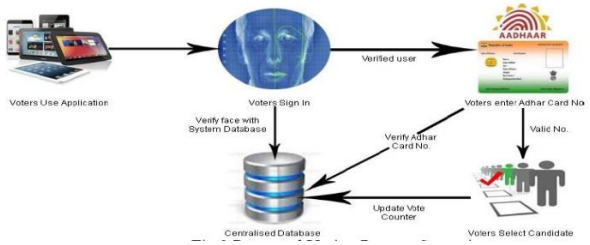

Fig 8- Voting Process Scenario

III. CONCLUSION

Evolution of voting process from manual system to e-voting shows importance of transparency of voting process and improvement of technology that enable every citizen to cast their vote from any location or area.

Evolution of E-voting starts from punch cards and now move towards advance techniques like finger print recognition and face recognition. These advance techniques facilitate the user to cast their vote from any location by using internet connection that share central database which is accessible from every corner.

Every proposed technology has some advantaged and disadvantages. Implementation of E-voting system depends on the E- system of country. Developed countries have facility of fast internet connection while developing countries are facing problem of internet and other advance facilities.

The proposed methods describe above have one point in common weather using web based application to cast the vote or using biometric sensor or face recognition process enrollment of users in the system. Enrollment of large number of users is not an easy task. It takes too much time and requires human power and memory of system. Tedious task of registration of voters can be eliminate If we use NADRA database with the above proposed methods either using finger print sensor or face recognition it simplifies and ease the task. It also helps to maintain the transference of the system and accuracy of the voting process.

IV. FUTURE WORK

E- voting process can be improve in terms of less involvement of humans in voting process by using already used technique of fingerprint recognition to validate the authenticated user in combination of NADRA databases. Enrollment / Registration of the user is not only important but also sensitive task. If voter only enter its finger print through sensor to the application install on polling station polling master gets all its details verified from NADRA database only in read mode, central database of E-voting system only save the choice of candidate against its CNIC and finger print. Application will get the CNIC form NADRA database. The proposed method not only save the time required to enroll / register the user but also save the execution time and memory of the central database. After completion of voting process result will calculated by the system and updated once result final it cannot be changed to ensure the accuracy of results.

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