

Next Generation A Secure E-Voting System Based On Biometric Fingerprint Method

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Abstract. In this paper we propose a secure e-voting system for Pakistan based on fingerprint biometric method, a public voting system that would be deployed in Pakistan to make the election process system transparent and efficient, and to make voters satisfied. Our system is client/server architecture and it can be implemented using virtual private network like automated teller machines or any local area network. Our system reduces the cost and time solves many problems that happen are happening in current system like less participation rate, vacant ballot and cheating. Our system's process composed of three components that are Registration phase, Administration Phase and Vote casting phase. Our System is mobile means Voter can be cast in his own halqa from anywhere in the Pakistan. Our system is fast, 30 seconds per vote. The security of the system is assured by the use of biometric fingerprint device incorporated with software application that notifies if voter have already cast the vote. Our system support simultaneous voting due to the distributed nature of the database. Voters are allowed to cast vote for both National & Provincial Assemblies at the same time also it allows referendum. The voters could shortly view the results of the Election immediately after the election time expires on Client Machines.

Index Terms: Secure election, Referendum, Fingerprint, Cost reduction, Fast, Mobile.

1. Introduction

In every country Election is a basic ornament of democracy that allows people to show their opinions by electing their leaders. Traditionally in a manual, paper based election system, voters have to reach at polling stations to cast their votes by standing in a long queue, therefore it is very much difficult for voters to vote their votes in this way there is a low rate of vote casting. This traditional process tends to less transparency because there could be chances of cheating at voting time and at manually vote counting time. In this tradition process mostly there are chances of counting errors and most of time voters look for the ways to cast their votes more than once. In this way this system creates lots of troubles and wars among people. This naturally calls for a fully automated online computerized election process. In addition to overcoming commonly encountered election pitfalls, electoral vote counts are done in real time that by the end of elections day, the results are automatically out [1, 2]. It is a fundamental demand of countries to enhance their election system. Now due to rapid emergence of technologies in computer and telecommunication world e-Voting based systems are to be introduced that lessens all the traditional manual election systems' problems. With the introduction of e-Voting systems our elections processes and social lives are going to be easy, efficient and low-cost. Now in this system voters can cast their votes from anywhere in world. E-voting system must meet security requirements such as confidentiality, integrity, fairness, forgery attack, verifiability and so on. This is because E-voting system is more vulnerable than traditional voting due to the nature of digital processing of election data which can be easily manipulated, hence may result in widespread fraud and corruption [1, 2]. E-

Voting is getting to be seen a next generation approach of election in almost all countries. The ultimate aim of e-Voting is to provide voters a good environment so that voters can cast their votes with minimum cost and efforts on the internet. Up to now there are so many properties have been proposed to make the e-Voting secure process, among them some are the below given must be satisfied [3, 4].

(1) Eligibility: Only eligible voters are permitted to cast their ballots.

(2) Privacy: There is no association between voter's identification and a marked ballot.

(3) Uniqueness: No voter can cast his ballot more than once.

(4) Completeness: No one can forge a valid ballot and a voter's ballot cannot be altered, the valid ballots are counted correctly.

(5) Fairness: No one can falsify the result of voting.

(6) Verifiability: Voters can verify that their ballots are counted correctly.

(7) Uncoercibility: No voter can prove what he voted to others to prevent bribery.

(8) Efficiency: The computations can be performed within a reasonable amount of time.

(9) Mobility: The voter can vote anytime and anywhere through internet.

Instead of these features, a good e-Voting system must be robust, fast and convenient. With the passage of time new demands and requirements are getting to be proposed by research continually. The ultimate objective of an E-voting scheme is to enable voting over the Internet convenient and to satisfy maximum properties and minimum limits at the same time [5].

2. Related Works

Most of the countries in the world e-Voting system have been used. Due to rapid growth of technology security problems are getting increased. So instead of developing e-voting systems, also there is a lot research work is being done to make these systems more secure. Nowadays in some e-Voting systems, there is a password is issued to individuals to make the system more. Nowadays a lot of research work is going on developing more secure methods and one of them secure methods is usage of biometrics. Biometric based systems are those in which human physical characteristics like face shape, finger prints, etc. are being used for identification and authentication.

Fingerprint recognition method and ID system in biometric methods are frequently preferred because applications of them are easy and low-cost [6]. Every human in the world has a unique Fingerprint so it is impossible to steal or lose so there is no need to remember fingerprints like if individual passwords or personal identification numbers (PINs) in card technology to keep systems secure. Besides, every finger has distinctive characteristics because fingerprints of every finger of a person are different [7]

That is why majority of secure systems are using fingerprint method alone or in combination with other biometric feature to make systems more secure in this rapidly advancing technology era. That is why in this e-Voting systems are identification of voter is based on fingerprints.

3. The Proposed e-Voting System

All the systems that are based on biometric mechanisms are client-server architectures, in which system administrator has privileges to manage the system. In this paper we designed a biometric based secure e-Voting system for Pakistan election commission. The architecture of our system is shown in

Figure. 1 Microsoft biometric fingerprint device having built in libraries is used to integrate fingerprint control to the system. The server side is the Election Commission Pakistan (ECP) where a database is maintained about all the voters and candidates' information having got being confirmed from National Database and Registration Authority (NADRA). On every client machine a local database server is maintained which stores the data of voters in order to decrease the traffic load on the network and in order to election process faster. We developed system using Visual Basic .NET and Microsoft Fingerprint scanner SDK is interfaced with system, which takes fingerprint scan as input and recognizes the legal voter by performing authentication process. Once having taken prints it opens the voters concern record from the database to validate the voter's information like voter is registered or not, voter has already casted vote or not. We developed database in oracle 11g.

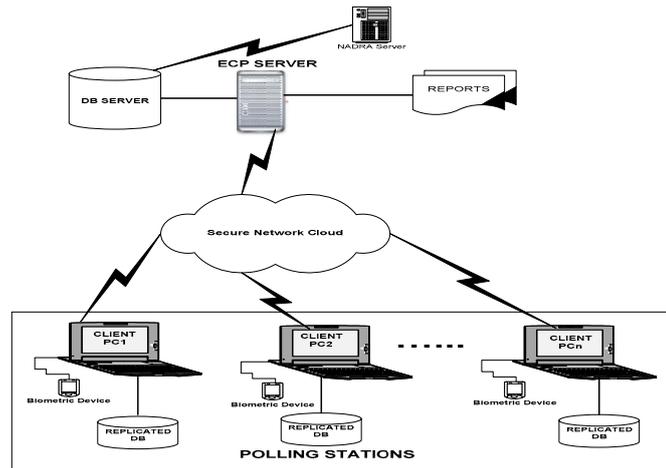


Figure 1. System Architecture

4. Administration Application

In this system the server is Election Commission Pakistan (ECP) that has task to enrol all the voters and the information it needs from the voter for registration is his National Identity Card (NIC) , his bio data and his fingerprints. Here a database is developed using oracle 11g and all the voters information is stored here in this database after getting confirmed from NADRA. So whenever the voter goes to cast vote at the time of election then at that time just his fingerprints are needed that would be match with the stored fingerprints, if matched then voter will be allowed to cast vote otherwise it would be prompted that you are not a registered user. Sever also assigns a voter's a Halqa corresponding to his city and stores in the database. Sever also stores all information of all the candidates of the different parties that are elective for the seats against National Assembly and Provincial Assembly. By the end of election server displays results of election of referendum on every client machine and on the website of ECP just by generating reports. Start-up screen of the admiration is show in Figure 2. Every option of administration is displayed here administrator has all the rights. In this Fig. a TEST option is given in which before starting session first ECP has to clear all the voters' status. In TYPE option there are two options are given first is Election and second is Referendum whichever ECP wants. After selection of TYPE option there is a TIME option where administrator has to give time in hours of the election session or referendum session. Now whenever administrator clicks on SART button then session start on every CLIENT's machine and clients has no any right to start, stop or suspend only administrator has. When START button once clicked then it would be replaced with STOP button, to stop the session whenever time of election expires. Once session has been started on every CLIENT's machine and whenever any mishap occurs on any client machine then administrator can suspend that machine's process and also can see the details of any machine. At the end there is a result button display results on every client machine and on website. Referendum Form administration application is displayed in Figure 3. Party Form-Registration Application is displayed in Figure 4.

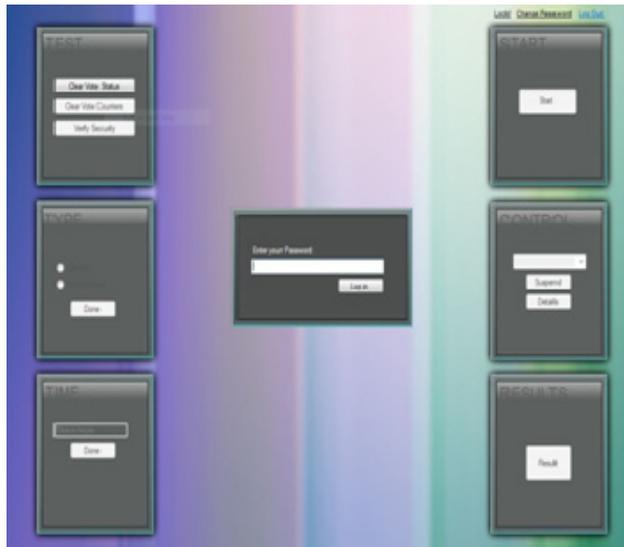


Figure 2. Start-up Screen of Admin

5. Client Machine Application

The client machine main application is shown in Figure 5. Here a space is given that is displaying text to tell voter that you have to press your right thumb on Fingerprint scanner and our Microsoft scanner has ability to recognize thumbs no matter in which angle has been pressed on scanner. If fingerprints are not matching with those that are already stored in the server database then it would prompt that you are not a registered user but when voter comes to scan second time then after scanning it would prompt that you have already casted vote. Now if voter is registered then after his scanning fingerprints a welcome screen displays as

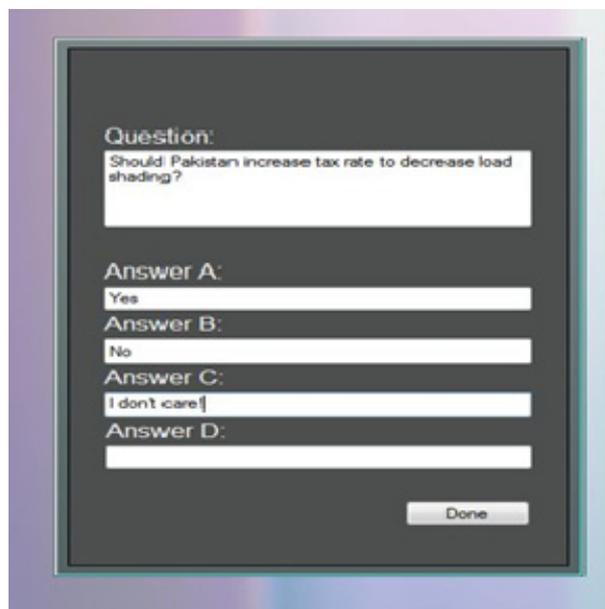


Figure 3. Referendum form- Admin application



Figure 4. Party Form-Registration application



Figure 5. Main Screen-Client Application

show in Figure 6., then his corresponding halqa with the symbols of MAN and MPA will be opened as shown in Figure 7. for casting his vote by just clicking now at the end of vote casting the Figure 8. appears.

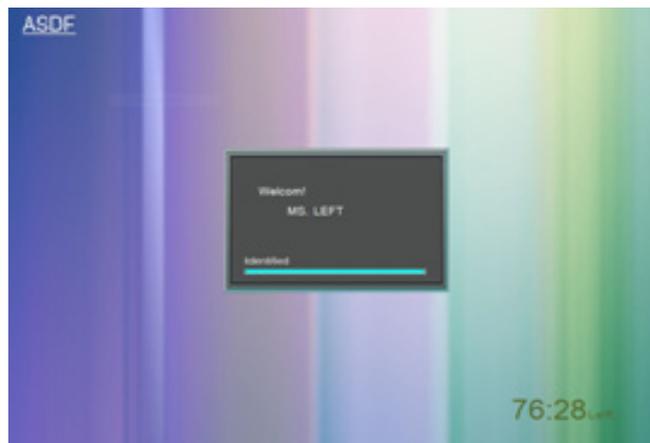


Figure 6. Welcome Screen-Client Application

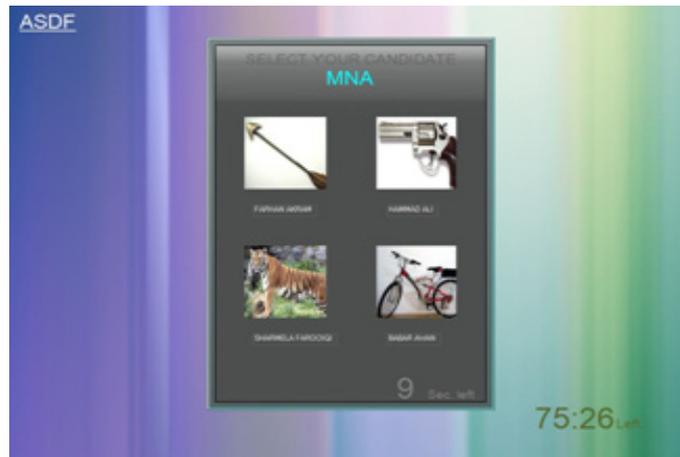


Figure 7. Candidate form-Client Application



Figure 8. Ending form-Client Application

6. Conclusion

In this paper we have developed a secure e-Voting system based on biometric fingerprint method. With the implementation of this system we can get rid of all the traditional voting systems' problems and we will have an ideal election process containing all properties of a system like Accuracy, loving democracy, verifiability, convenience, flexibility, mobility and fastness. This is a system in which power is in system's hand rather than human being. Fast- 30 seconds per vote. Mobile system in which voter can cast his vote in his own Halqa from anywhere in Pakistan. A system giving immediate results right after session time expires. Transparent in which there is a same result at the same time on server as well as clients. System providing facility to start referendum that is public can make suggestion in 12 hours which is free of cast to government. Only requires onetime cost of implementation, once system is implemented, Same machines and software is used every time, then Cost free election means there will be no paper and printing cost and there will be no need to hire Presiding officers hence time and cost will be saved for forever.

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an option to get his/her money back simply by pressing a Cancel button. The same procedure is adopted in Figure 6.

8. References

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