

E-Vote System Design and Implementations

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Abstract: Voting process is an important process for any democratic country. Its proper execution is rigorous process in many countries. The process is manual that creates many issues such as; printing, Security, Threats to voter, privacy and many other issues. In this regards, the Electronic system are preferred and need of today's edge. The Electronic Voting Machine (EVM) is best choice to be developed for addressing all the issues. It provides many facilities such easy casting of votes, storage cost, privacy and etc. Electronic voting machine with finger print is implemented with Arduino technology. In this paper, the system is designed using a machine voter can poll his vote easily. All voter information is store in register system, this information will checked by database, If there anything wrong the will not allow the voter cast his/her vote. Finger print voting machine has simple architecture very quickly response, reduce the polling time, reduce staff members, has accurate counting without any problems.

Keywords: Arduino technology, Electronic voting machine (EVM), Register system, Vote Casting.

1. Introduction

In recent political systems, the democratic systems is widely accepted system all over the world. In addition to several benefits, there are some and challenges before democracy. These issues include, how democracy is superficial by individuals, who is ruling the system, and etc [1].

Pakistan is also a democratic country governments are elected by people by voting system. Our country follow Pakistan the federal government system, in which, the governance power is not handled by any one authority such as in king system or in Queen System. Instead of that it is handled by and carried out in different steps and in levels [2]. The political power in Pakistan is speeded in provinces and central authority that are ruled for five years. All of these process are carried out using voting system. This voting is carried out in different manner in different past times. For example in Early Roman Empire, it is done by raising hands in kindness or in contradiction of. However, in Pakistan the voting system is bit different.

In Pakistan, the election is carried out by voting. In that voter casts his/her vote for his desirable candidate to be elected provisional or by stamping on the ballot paper before putting inside the ballot box. This ballot paper has candidate name and his specific symbol assign by electron commission of Pakistan. This all process is too much lengthy and time consuming and also many issues such as; authentication and security of vote and many more [3].

Furthermore, all process required a detailed pre voting session in which, voter is advised to, how to caste vote. Vote casting is based on different aspects such as; how to put the stamp for specific candidate, how to avoid the nulling the vote, and the folding of ballot paper to be put inside the ballot box. This process also prints the Millions of ballot paper that is distributed across the specific region based on jurisdiction of cities, town, villages and more [4]. The loading and unloading of ballot paper and bot material to and from ballot office to polling station. Since many years the process is going same and government is paying cost for that [5].

The issues are getting worse day by day, as increase in huge volume printing ballot based on population of country, the ballot box material, and its transport issues. Overall a great amount of time, money and human resources are wasted

during the elections. All these issues need to be address in proper manner to save the cost, time, and manpower. In the next section, the main problems related to existing voting system are discussed [6-7].

1.1 Problem Statement

There are several issues have been reported in the present voting system. Such as; Large number of ballot paper required i.e. more paper stationary is used, whole voting process is time consuming, the result took much more time in announcement, more manpower is required [8]. There are also many issues have acknowledge for the post voting system [9]. For example, the stuff used in voting system need to be submitted back to offices, the authentication of results, and many more. Some of these issues are highlighted as follow;

- Time consuming.
- Take much time for result.
- More staff required.
- Hard to carry stuff of voting system.
- Voter must have NIC at the time of election.

When voting is over, after the time fixed for closure of the polling the Electronic Voting Machine by Using Finger Print is closed by the authorized personal or Presiding Officer [10]. There is no more voting process is continued after that no further recording of voters in the machine is possible. At the counting center, the balloting unit is not required only press the button of RESULT for announcing the result of polls. The result shows on the research workor in front of presiding officer & the agent of candidates. One of the significant advantage of this work is that rigging can be eliminated with Electronic Voting Machine by Using Finger Print System because the voter cannot cast his/her vote if the finger print sensor not scan or verified & buzzer will alert the official to arrest the mischief [11]. In traditional ballot box system, several marked ballot papers should be included in the box and also insertion of ballot papers in the box, this overall can't be proceed in few minutes it took time and also sometimes long queue blocking the overall electoral system as of in IoT Systems [12]. On the other hand the electronic voting system the record is already available and long queue can be avoided. Furthermore, at any stage, presiding officer finds any issue during polling by pressing the special center control button voting for any candidate or also whole system can be halted at any time. The officer can ensure that no longer votes could be recorded in the system. There is one more advantage of that electronic voting is that counterfeit votes can be halted immediately being polled. The vote that is inserted by Fingerprint via Electronic Voting System that vote cannot be singled out & devastated [13-14]. The developed system is quite useful in retentive the database of all votes that are inserted on the day of voting.

2. Background and Literature Review

There are several voting system have been developed by different developers. These system based on both paper voting and as well Electronic System. There are two electoral systems have been discussed so far that should be avoided based on pros and cons [1]. In Ballot paper, the Paper and boxes are used. In Electronic System, the embedded system with software language are used. The Visual output in Ballot paper is based on Stamp on paper and in Electronic system, the Single LCD, keypad & biometric finger print. There is no operating system/software is used in Ballot paper [2]. While different software's and programming tools can be used in Electronic system. The Records/Audits in the Ballot paper are carried out using Manual and inserted in the official record. This system is quite widen in time and secondly the chances of human errors are quite more that can produce inaccuracy in the voting system [3]. While in Electronic system, the Voting machine store the result for all candidate, at the end of election it send all result to database /matlab. In Control & Operation, the Ballot paper uses the Manual operation, while in Electronic system Automatic operation is used. In Ballot paper, the voter cast the vote issued by the electoral officer of Election commission. On contrary, the Electronic System of Election, the Crystal Display will show the ballot paper instead of paper [4].

In the existing system, votes that are counted on ballot paper, uses the ballot boxes made of plastic that are used to keep the paper on which the vote is casted [5]. This is not a secure way to save the data. In Electronic System, the al information is secure in data storage devices [6]. The cost of existing paper voting system is quite more due to paper printing. The process printing took a lot of time. All these issues are easily tackle by electronic system of getting vote cast [7].

2.1`Electronic voting machine (EVM)

The voting system by means of electronic nowadays is considered the cost effective and efficient way of vote casting for electoral system. It offers the smooth system of voting and can be extended at large scale that is not possible in existing paper based voting system [8]. Furthermore, this system also produces secure way of voting and their cased vote is kept secure. It also prohibited the invalid and malpracticed casted votes [9]. The electronic system is quite easy for the voter as he just has to press the key for that he want to cast the vote for his/her intended candidates. This electronic

system can be developed based on different functionalities via touch screen, switches in the form of push button, dial switches, panel made of papers [10]. The machines also respond based on the voting that vote has been cast. Traditionally, in the past and also in many countries like Pakistan, the increase in population, printing more paper ballots, and huge box with paper booths are prepared and a significant transportation and storage is required for all the material along with significant time is consumed in just vote casting and its arrangements [11]. This require plenty of money to ensure all above process in real-time. All these issues can be resolved by shifting all the electoral system of the paper via Electronic system. This system is already in used by several developed counties. However, in Pakistan, the traditional paper based voting system is used [12].

In this work, the electronic voting system is developed based on BIOMETRIC FINGER PRINTS. The system is well efficient and accurate and cost effective way of voting as it obsolete the need of paper based system. It is unfortunate that still this electronic system of voting is not adopted by our country. The purpose of this work is to introduce this new technology of EVM system in our country to conduct have the spotless Elections.

2.2 Way to cast vote in EVM?

In the existing paper based voting system, the name of the voter is included in voting list and he reached to station and asked to sign or put your thumb impression in paper based register. The staff of election system after propoer identification that voter is same that is listed is same an ink mark is put on your thumb to show that vote is casted by that person and he shouldn't be casted for the second time. In EVM voter give his thumb impression on finger print sensor if he/she is valid then go to next step. The voter name shows on research workor also with picture. Voter can see the candidate name with serial number and party name on the research workor screen. Voter cast his/her vote by pushing the keypad button. As soon as the voter push his desired candidate number through keypad, the message is displayed on the LCD that you have successfully cast the vote. It states that vote has been casted accurately. In case of invalid identification there is buzzer to take action against the invalid voter. It also states that vote is casted well and saved in the database and there is no point of any error to be incurred for all this voting issues. You can rest assured that your vote is not going to be invalid any case. The vote cast by the voter is directly send to the database on the security basis, so the unauthorized person cannot access the data. In the end presiding officer push the election done button and got the result of election. It is also the option of download or print the result sheet.

3. Research Methodology

This work describes the methods and each part of the designed system. It reviews the methodology for this work and is divided into two stages.

3.1 Development of System

The system of Electronic Voting Machine is developed as shown in Fig. 1. The system consist of Arduino, LCD display, Fingerprint Sensor, Laptop, Buzzer, and printer. The each block is discussed below.

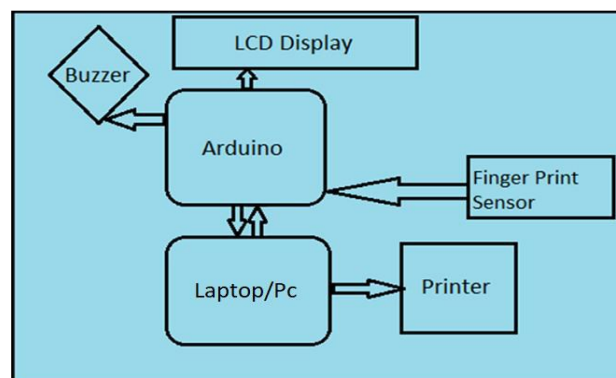


Fig. 1 -System Design of Electronic Voting Machine.

3.2 The Arduino

The Arduino is kind of microcontroller that has various inputs and outputs for connecting different input and output devices. The input are considered as in two forms either analog or digital one. The device is operated based on frequency of 16 oscillator. A serial bus connection is included in the system that offers the communication for transferring the data from board to laptop and also from laptop to board. The power jack is designed based on two ports. Either it could be taken as USB port or form CSP header. A master rest is valuable to fresh all the board steps. It is open source device to make electronic based system.



Fig. 2 -Arduino View used in system design

3.3 LCD Display

A display panel is used to show all the details of voting system. The Display is very wide as it has 20 columns and 4 rows. The display is also showing the 20 characters by each row and as it has 4 rows so total 80 characters can be display.



Fig. 3 -LCD Display of Designed System

3.4 Buzzer

Buzzer is used in this as an alarm or indication of any error in the system. In EVM it is used as an indication of illegal person which is not stored in the database of EVM. And if any person who want vote again so buzzer is on and the person is detect as he/she is illegal voter and can be arrest by the officer which is present in the polling area.



Fig. 4 -Buzzer used in Electronic Voting Machine

3.5 Finger print sensor/scanner

Finger print sensor/scanner is secure way to identify the authorized person. We know that everyone have different and unique finger print.no one have same finger prints even twins. By this difference we use finger print sensor/scanner for identify everyone easily. To add fingerprint verification in our research works we use that all in one optical fingerprint sensor/scanner R305. In our research work we use this finger print sensor/scanner for enrollment of our voters for the election, voters will enroll their finger prints in this finger print sensor/scanner before election so they can cast their vote at the time of election otherwise they will not cast the vote, our finger print sensor/scanner can store 127 finger prints. It has many advantages, Low power, Easy to operate, Small size and Good performance.



Fig. 5 -Fingerprint Sensor

3.6 Keypad

There should be a way to insert the data in database and also section of candidates by voter. For that purpose, Keypads are used. Instead of these keypads, could be mobile phones, also buttons as well for key in information. These keypads are used in several applications in electronic system. This include a home, houses, offices and other related applications. This keypad follows an encoding scheme that allow it to have much less output pins than there are keys. We use this keypad in our research work for casting the vote, this keypad is placed inside the booth area voter cast his vote by pressing the keypad button. This keypad is connected with the Arduino. The Keypad has different libraries that are accessible by microcontroller to access the matrix type keypad. There are different size and configuration that could be 3x4 and many more specification are there to follow. These include to insert the character, letters as input by the voter. The voter has the option to select and see the various candidates of election that are contesting right now.



Fig. 6 -Keypad used in EVM.

4. Experimental Result and Analysis

The process of Electronic Vote Machine is based on different aspects and process. In first, the process of vote casting is performed based on the presiding officer open the EVM on given time in front of all agents of election candidate. Voter come and give his thumb impression on finger print sensor FPS. The FPS scan the finger print and allow the voter to go on next step after the verification of thumb impression. At the time of scanning Presiding officer open the picture of voter on the multimedia research workor for verification. The verification is shown on LCD as shown in Fig. 7.



Fig. 7 -Verification of User

After scanning the finger print voter goes in polling booth for cast the Vote as shown in Fig. 8.

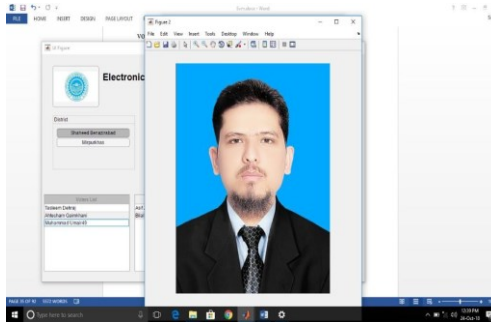


Fig. 8 -Matching of Fingerprint Scan with database

After seeing the serial number and name of election candidate in his/her district, voter cast his /her desired candidate, the serial number and the name is also shown on LCD screen which is placed in polling booth, the LCD screen is shown only to the voter. Voter cast his/her vote to the candidate with pressing the keypad button as shown in Fig. 9 and in Fig. 10.

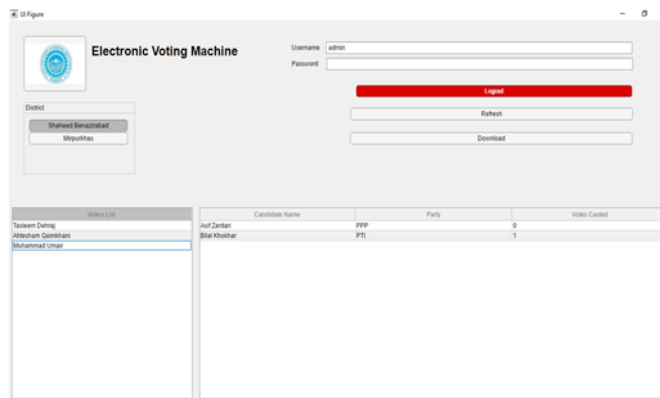


Fig. 9 -Selection of Candidate

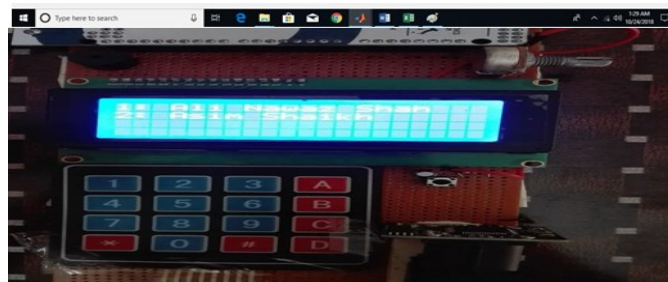


Fig. 10 -Candidate information on LCD

The vote goes into the desired candidate list. After that LCD shows “thank you”. For casting the vote successfully as shown in Fig. 10. No one know that voter cast his/her vote to which candidate before election will done. Because it is privacy. In the end only show the winner candidate vote and looser candidate vote. If the same voter can cast his vote again then LCD does not permit him/her to vote again and the buzzer alarm is on for indication that he/she is illegal person. The same process is running again and again until the voting time is over. In the end presiding officer push the election done button & close the voting as shown in Fig. 11.



Fig. 11 -Completion of Election

Then Presiding officer go to the see the result for this he click on result/download result button. The result is shown on the research worcor in front of all agents of candidate. The result card will print out and give its carbon copy to each agent and take signature on it by the presiding officer. The presiding officer submit his polling result to the authorized person/election office as shown in Fig. 12.

District Name	Candidates Name	Party	Voters Casted	Voters Defeat
Shahzad Benazirabad	Azul Zardari	PPP	9	Abdulkhaliq Jamshidi
Shahzad Benazirabad	Bilal Khokhar	PTI	5	Muhammad Umair
Mirpurkhas	All Nawaz Shah	PPP	9	Abdul Samad
Mirpurkhas	Asim Sheikh	PTI	9	Nawaz Adil Naemuddin

Fig. 12 -Result Compilation

5. Conclusion

Nowadays electronic voting machine is used in develop countries. This voting system by means of electronic is also terms as “e-voting”. Our EVM system consist of FPS, keypad buzzer alarm, LCD display and laptop/computer. The main hardware power supply for the EVM system by laptop/computer power unit. Once time a EVM system is ON, laptop shows the list of candidate from the memory. After verification voter are ready to cast the vote for the vote cast voter press on the keypad which placed in front of him/her, after pressing his/her favorite candidate, the vote goes in his/her candidate total list. EVM is capable of saving considerable reducing the time that is incurred for the election and also during the polling when the voter is casting the vote. This also produce a smooth and without any misconduct at the time of counting the votes. With the development of this work, there are several option enhance the capabilities of the voting system. This could be done by including the large panel of LCD and also instead of keypad, it can be linked with latest electronic devices including computer Tabs. Furthermore, the system can be developed in the local language to facilities the voter as many population of the Pakistan is unaware about English. In the future, the system can be developed in Urdu, Sindhi and other national language of Pakistan. The research work has several applications as By EVM the invalid voter cannot cast the vote. The main advantages is that EVM reduce the polling time. EVM is reliable to carry then ballot boxes which is used in paper voting system. Simple to operate. Re-usable by simply erasing the vote in previous polling. Preserves the voting secrecy. It has low cost then ballot paper voting system. Works on low power. It required less number of staff during polling. It can be used by Election Commission of Pakistan and Organization/Department elections. EVM can be connected to NADRA, the data of each citizen is already stored in NADRA, so connect EVM to NADRA and cast the vote.

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