

DESIGN AND IMPLEMENTATION OF ADVANCED VOTING SYSTEM USING MATLAB IMAGE PROCESSING WITH PICTURE PASSWORDS

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Abstract—Elections form the backbone of our democracy wherein the people elect their political representatives and decide the composition of the government. Holding free and fair elections in a country in a highly secured and smart way is really a challenging task to Election commission. In today's existing voting system polling takes place on one day and all the EVM's will be sealed and collected from the polling booths to a secured place. After few days each EVM's seal will be opened and number of votes casted for each party will be counted under the supervision of Chief Electoral Officer. This makes the vote counting process tedious. This paper comes up with an alternate solution for counting. Here each and every EVM's placed in the polling booth will be linked to a web page via LAN connection. All votes casted in every EVM will be updated in the web page database. But all these details should be kept secured. For this purpose multiple images are chosen as passwords. By this way of authentication only the authorized person knows the correct image password and its tolerance level fixed. Hence he/she alone can view the end results. If this system is implemented then it makes today's EVS efficient and secure.

Keywords—EVM-Electronic Voting Machine; EVS-Electronic Voting System; EPLD-Electrically Programmable Logic Devices; LAN-Local Area Network

1. INTRODUCTION

Our country India is a constitutional democracy with a parliamentary system of government, and at the heart of the system is a commitment to hold regular, free and fair elections. Such elections determine the ruling party of our country, the membership of the two houses of parliament, the state and union territories, legislative assemblies and the presidency and Vice-Presidency. These elections are conducted by the Election Commission of India. All members of the Lok Sabha, except two who are nominated by the president of India are directly elected through general elections which take place for every five years, in normal circumstances, by universal adult suffrage and a first-past-the-post system. The upper house of the Parliament (Rajya Sabha) members is elected by the elected members of the legislative assemblies of the states and the Electoral College of the Union Territories of India.

2. INDIAN ELECTORAL SYSTEM

The parliament of India comprises of the head of the state and two houses which are the legislature. The President of India is elected for every five years by the Electoral College consisting of members of federal legislature and state legislatures. This is how election takes place in India. The house of people (Lok Sabha) represents citizens of India. The 545 members are

elected under the plurality electoral system. The upper house of Indian Parliament called Rajya sabha has 245 members, 233 members elected for every six years, with one-third retiring every two years. The elected members are chosen by a method of single transferable vote. The nominated twelve members are usually artists (including actors), scientists, jurists, sportspersons, businessmen and journalists and common people.

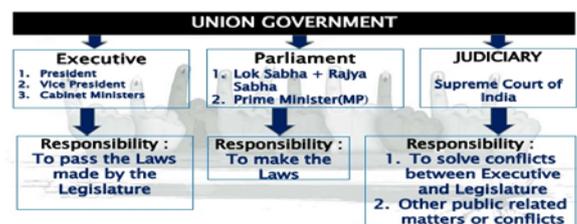


Fig.1. BASIC ELECTORAL SYSTEM

3. EVOLUTION

A. Paper-based Electronic Voting System:

This system is sometimes called as "Document ballot voting system", paper-based voting systems originated as a system where votes are cast and counted by hand, using paper ballots. With the advent of electronic innovations and developments came systems where paper cards or sheets are marked by hand, but counted electronically. Such systems include punched

card voting and later came the digital pen voting system. This also includes a ballot marking device or electronic ballot marker that allows voters to select their candidates using an electronic input device, usually a touch screen system similar to a DRE.



Fig.2.PAPER BASED VOTING SYSTEM

B. Direct-Recording Voting System

A direct-recording electronic (DRE) voting machine records votes via a ballot display provided with mechanical or electro-optical components which is activated by the voter (buttons or touch screen); that processes data with the computer software and that records voting data and ballot images in memory component. After polling it produces a tabulation of the results stored in a removable memory component and as printed copy. The system also provides a means for transmitting individual ballots or total votes to a central location for consolidating and reporting results. The ballots tabulated are casted and the results are printed after the close of poling.



Fig.3. DRE VOTING SYSTEM

C. Public Network DRE Voting System:

A public network DRE voting system is an electronic system that uses electronic ballots and transmits the vote data from the polling place to another location via a public network. Vote data can be transmitted as individual ballots as they are cast, or periodically as batches of ballots throughout the poling day or as one batch at the close of poling.

The central count method tabulates the ballots from multiple precincts at a central location. Internet voting uses remote locations (voting from any place with Internet capable computer) or uses traditional polling locations with voting booths consisting of Internet connected voting machines.

D. Electronic Voting System:

Electronic voting machines (EVM) are being used in Indian central and state elections for implementing electronic voting in parts during 1999 elections. As a continuation it extended to 2004 elections. The EVMs reduced the time in both casting the vote and declaring the results compared to the old paper based ballot system. After the rulings of Delhi and

Supreme Court and demands from various political parties, Election Commission of India decided to introduce EVMs with Voter-Verified Paper Audit Trail (VVPAT) system. EVM is the end product of sufficient experience and intensive trails were done at various elections in different parts of India under the guidance of the Election Commission of India.

These machines are used for the first time during the General Election to Kerala Legislative Assembly in May, 1982. To start with, EVMs were first introduced in 50 polling stations of Parur Assembly constituency in Kerala. After that, these machines were used in 1982-83 in ten other constituencies extended over length and breadth of India. This system was tried even in difficult and tribal areas of Northeast. The political parties, candidates and the general electorate found that the voting by means of these machines were far easier and simpler and consumed less time compared to the conventional system. More over the counting was absolutely trouble free and quicker.



Fig.4.ELECTRONIC VOTING SYSTEM

E. Voter Verifiable Paper Audit Trail System:

On August 14 2013, our Indian Government amended the election rules to permit the use of voter-verified paper audit trail (VVPAT) system. The first election to implement this new system was a by-election held in Nagaland. VVPAT system was first introduced in 8 of 543 parliamentary constituencies as a pilot project. Then VVPAT was implemented in Lucknow, Gandhinagar, Bangalore south, Chennai central, Jadavpur, Raipur, Patna and in Mizoram constituencies. The slips generated by the VVPAT system tells the voter to which party or candidate vote has been casted and also it includes name of the voter, constituency and the polling booth.



Fig.5.VVPAT SYSTEM

4. RELATED WORK

A. EVM Hardware Design:

EVM comprises of two units first the Ballot Unit and the Control Unit. It consists of a microcontroller driven by 8.8672 MHZ crystal oscillator. The main circuit board comprises of the switches for the buttons on the face of the device, buzzer and two EEPROM chips for non-volatile storage of vote data. The display board consists of a connector and another connector for the ballot unit. Control Unit display board consists of power and LEDs, and a six 7-segment LED digits. It connects to the main board via a 16-pin ribbon cable. It consists of a simple circuit in which the control unit board directly drives the 7-segment LEDs.



Fig.6. EVM HARDWARE DESIGN

B. Ballot Unit Board:

The ballot unit board is a very simple device. It has no CPU of its own instead it uses two electronically programmable logic devices (EPLDs) to interpret signals from the control unit CPU and also interfaces with the candidate buttons and LEDs on its face. It also comprises of 4 position switches used to select the ballot unit's position in a multi-unit.



Fig.7.BALLOT UNIT AND CONTROL UNIT

C. Ballot-Unit Communication:

The control unit and the ballot unit are connected via a 5 m cable with one end connected to the 15 pin ballot port of the control unit main board and the other end which is fixed permanently inside the ballot unit. It communicates with the control unit as follows:

- i. The control unit sends the number of the ballot unit it needs to check. The first EPLD in each ballot unit reads this number, and compares it to the position of the slider and activates the second EPLD if both numbers match.
- ii. The second EPLD on the active ballot unit will scan the buttons and if one is pressed, it communicates that information is back to the control unit. Then the control unit signals the first EPLD to activate the corresponding LED, indicating a successful vote casting message.

D. Software Design:

The software used in EVM is actually the coding written for the PIC microcontroller which is embedded or burned into the microcontroller. The software is actually present in the CPU. So the chip cannot be electronically reprogrammed. Despite the design features makes the election software difficult to extract from the control unit, the real criminal would have a variety of options for reading it out, including demounting the chip and examining it under a microscope. Since there is no permission to render EVM unusable, we do not attempt to extract the software by these methods, however once the software is extracted, it would be straight forward to reverse engineer it using standard demounting tools.

5. EXISTING SYSTEM

A voting system or an electoral system consists of the set of rules which should be followed for a vote to be considered valid. This sets how votes are cast, counted and aggregated to yield final result of election. Common voting systems are majority rule with a number of variations and methods like first-past-the-post and preferential voting. The study of voting systems is called social theory or voting theory, a subfield of Political Science, Economics or Mathematics. Depending on the votes casted the winner will be determined using majority rule.

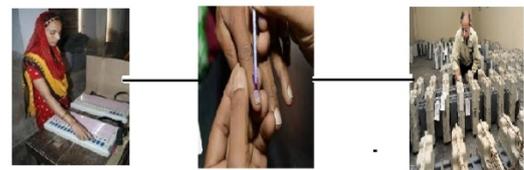


Fig.8. CURRENT POLLING PROCESS

6. PROPOSED MODEL

Most common security threat in any computer system oriented programming is a spyware and threat from usage by unauthorized people. To overcome such attacks and threats from such unauthenticated people, definitely certain different and secured methods must be followed. For this purpose this paper provides a new approach of security measures based on using different images as passwords using MATLAB. This protects and prevents the information from access by a third party. Spywares usage has increased rapidly for collection of passwords. Protection of passwords from spyware attacks continues to be a setback. The approach proposed here will definitely provide higher security compared to other methods. The robustness of this system is its strength to resist automatic adversarial attacks, and also it has several applications for realistic security, which includes online polling, free email services, worms and spam.

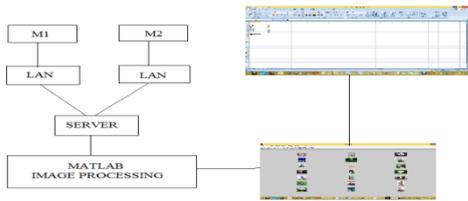


Fig.9. PROPOSED MODEL

A. EVM Construction using ARDUINO:

1) ARDUINO ATMEGA328P-PU:

ARDUINO is a single-chip microcontroller created by ATMEL. The microcontroller used in this paper is ATMEGA328P-PU. The ARDUINO UNO board is connected to a 16*2 LCD and then to five different pushes buttons. Each button corresponds to different political parties or any other parties. For example if this system is implemented in school, then it can be used for conducting School pupil leader elections. If it is used in colleges then it can be used for conducting elections or voting among different departments.

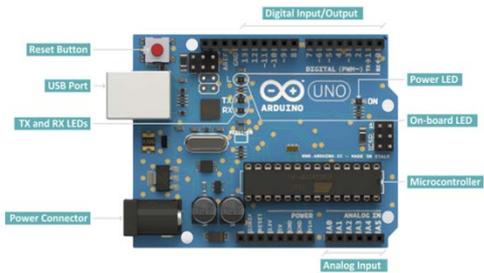


Fig.10. ARDUINO UNO BOARD

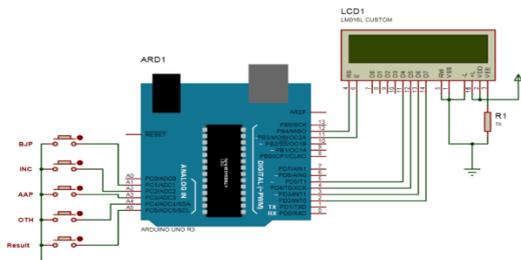


Fig.11. EVM CONNECTIONS

2) COMPONENTS:

- ARDUINO UNO BOARD With ATMEGA328P-PU Microcontroller
- 16*2 LCD
- Five push button switches.

B. Simulation Results

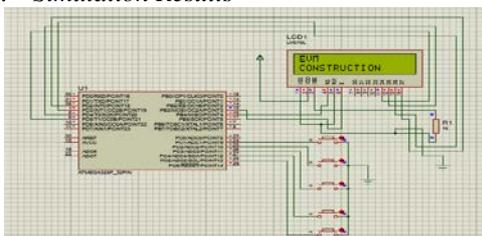


Fig.12. STEP 1

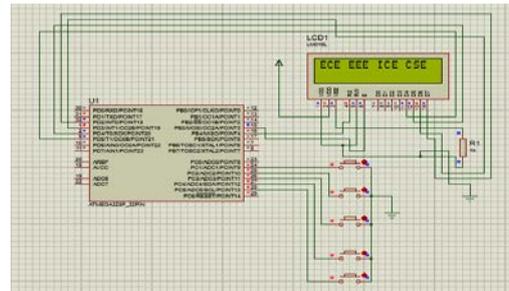


Fig.13. STEP 2

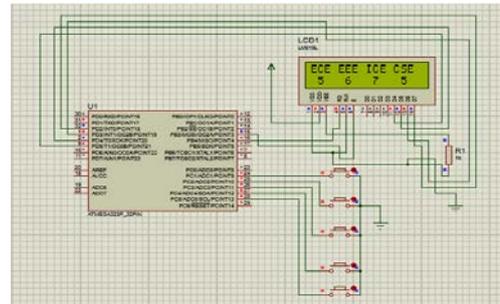


Fig.14. STEP 3

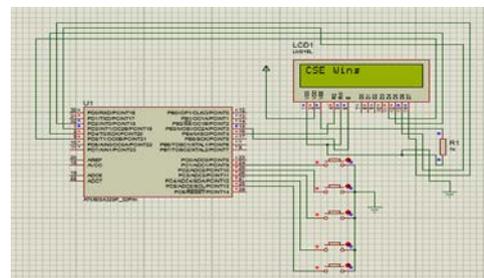


Fig.15. STEP 4

C. MATLAB Image Processing:

MATLAB (Matrix Laboratory) is a multi-paradigm numerical computing environment and fourth-generation programming language. It is a proprietary programming language developed by Mathworks. Here MATLAB is used to implement images as passwords incorporated with audio sounds tolerance level. MATLAB allows matrix manipulations, plotting functions, implementation of data algorithms, creation of user interfaces and interfacing with programs written in other languages, like c, c++, etc...An additional package, simulink adds graphical multi-domain simulation and model-based design for dynamic and embedded systems. The following are the different steps involved in using MATLAB in this system.

- A one-time password is generated to enter into the database in which all the votes casted for different parties are stored.
- Once step1 is completed a new page opens, which consists of different images among which one will be the desired password.
- Next the user should click on the correct image and also in the correct tolerance area which is fixed in the prior step.

- Again the previous page will appear. Then the user should select the next image. Like this consecutive four images should be selected by the user.
- Then the database in which the details are stored will appear, which can be viewed by the user.

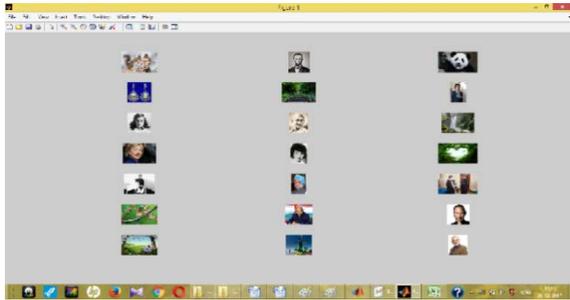


Fig.16. IMAGE PROCESSING

7. OUTPUT

Once the authorized person has chosen the correct pictures in the correct tolerance area fixed, then the user will be directed to the page containing the updated information. (i.e, the end results of poling). In this paper different parties votes are counted simultaneously and are updated in an excel sheet. As a next step of this project these details can be updated and made available in the web itself. For this purpose along with MATLAB image processing C shop technology should be merged. Otherwise for integration of MATLAB with internet Dot net technology can also be used.

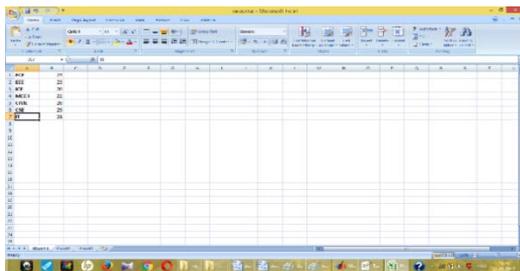


Fig.17. OUTPUT DISPLAY

8. CONCLUSION AND FUTURE WORK

This paper proposed an alternate solution for counting the votes casted. Here each and every EVM's placed in the polling booth will be linked to a web page. All votes casted in every EVM will be updated in the web page database. But all these details should be kept secured. For this purpose multiple images are chosen as passwords. By this way of authentication only the authorized person knows the correct image password and its tolerance level fixed. Hence he/she alone can view the end results. If this system is implemented then it makes today's EVS efficient and secure. With this paper as base in future not only two voting machines but also all the EVMs present in the polling booth can be interconnected via LAN connection. Next to this step all the voting machines present in every polling booth across India can be interconnected and results can be updated. Further as

mentioned earlier, for updating the details not only excel sheet format but also C shop and Dot net technologies can also be preferred. For such implementations in depth knowledge about such technologies is required.

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