

A Comparative Study of Various Proposed Solutions for Online Voting System in India

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Abstract

With time, Elections in India has implemented various ways of voting. From using paper ballot voting and Electronic voting machines to proposals of Online voting system, India has shown

a remarkable increase in the technological developments and also the voter turnout. India is a democracy and conducting elections since 1952. Every citizen is given a fair right to choose his leader by voting. For implementing any voting system in real time elections, it should guarantee to provide correct results given that every eligible voter votes, that too only once and without any influence of some powerful people. When voting is implemented with no flaws, then we say that democracy continues. In this paper, we try to understand the systems we have implemented till now for voting and what is there yet to explore for the future systems. Also, we discuss some key features of different Online voting systems proposed till now. Though we are not able to realise the proposed systems because of security issues, but this system will definitely be the part of our future voting systems.

Keywords - Elections, Voting, Electronic Voting machines, Online Voting System, Network Security.

I. INTRODUCTION

The journey to the time when we are talking to give Online Voting system, the notion of truth and existence, is worth mentioning. Online Voting Systems is an interesting topic for research not only because it is new in terms of implementation in India but also because they present certain challenges with them to actually bring them out to public in real time elections. Elections are conducted after every 5 years for choosing the representatives by us and for us. Election Commission of India is the autonomous and statutory body which is responsible for conduct of free and fair elections [1]. Any online voting system would have been a success if it would have proposed a feasible and good solution to various security attacks that may come from anywhere on the globe. At present, the systems are not well-designed to identify an attack and also do something in order to prevent them. According to The Hindu newspaper Article, India is the third most prone countries to cyber attacks [12]. Thus, the main issue for correct conduct of the Online Voting Systems lie in the solution to prevent the network attacks. Along with the network attacks, the act of powerful people in the country by which they force people directly or indirectly to vote for them is a major concern that is the drawback of all voting systems till date.

When we will be successful in implementing the Online Voting System, Voter Turnout would increase.

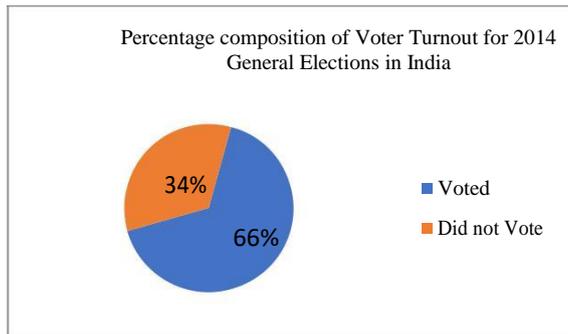


Figure 1-Voter Turnout of 2014 General Elections in India [14]

II. DIFFERENT VOTING SYSTEMS 1.

Ballot-Paper Voting System

In present scenario, we generally refer ballot-paper system to be a way by which people vote using a paper. They select one of the candidates listed on that paper, fold it and drop that in the ballot box. At the time of counting, these papers are unfolded by election commission officials and secrecy of votes is maintained. But, the ballot system is not very new. It has been in existence since ancient times. Ancient Greek people used these dating around 3rd century BC. In India, this was seen in around 920 AD, in Tamil Nadu. A lot of paper was wasted at times when ballot-Paper System was used for voting. Also, cases of illegal voting were in existence.

2. Electronic Voting System

Electronic Voting System is an up-gradation to the Ballot-Paper Voting System. Because it is electronic, and used micro-chips in the Electronic Voting Machine (EVM), it has been readily adopted in India and is a part of Elections since 1999. This concept of an EVM was the thought of Chief Election Commissioner in 1977. These were

designed by Election Commission of India in collaboration with Bharat Electronics Limited (BEL), Bangalore and Electronics Corporation of India Limited (ECIL), Hyderabad [1]. EVMs were used for the first time in 70-Parur Assembly Constituency of Kerala in the year 1982. EVMs do not require electricity. EVMs run on an ordinary battery. An EVM can record a maximum of 2,000 votes. The EVM has two units namely Control Unit and Ballot unit. Ballot Unit presents a list of candidates. On clicking the button corresponding to the chosen candidate, vote is registered. The control unit is connected to the ballot unit by a cable. If an EVM of some polling station goes out of order, it is replaced with a new one. The votes recorded until the stage when the EVM went out of order remains safe in the Control Unit's memory and it is fine to proceed with the polling after replacing the EVM with new EVM and there is no need to start the poll from the beginning. On counting day, votes recorded in both Control Units are counted to give the aggregate result of that polling station. [7] Though Electronic Voting System saved paper but it also had some drawbacks. Security problems and illegal voting or rigging still existed.

3. VVPAT

Voter Verifiable Paper Audit Trail (VVPAT) is an independent system attached with the Electronic Voting Machines which allows the voters to verify that their votes are cast as intended. When a vote is cast, a slip is printed containing the name, serial number and symbol of the candidate and remains exposed through a transparent window for 7 seconds. Thereafter, this printed slip automatically gets cut and falls in the sealed drop box of

Table 1-A Comparison of Ballot Paper and Electronic Voting System [13]

Parameters	Ballot-Paper System	Electronic Voting Machines
First Used	1951(After Independence), Has history back to 3 rd century BC.	1998
Pace of Voting	Slow	Fast
Working	It has a ballot box to collect the vote slips and voter can vote by marking on any of the candidates listed on the slip.	It has a ballot box that is electronic. Voter can vote by pressing the button in front of the favourable candidate. A beeping sound is made to verify that voting is done.
Capacity	Ballot Box can store more than 2000 votes	One EVM can store maximum 2000 votes
Extension	No extension	VVPAT is introduced in 2010. When a vote is cast, a slip is printed containing the serial number, name and symbol of the candidate and remains exposed through a transparent window for 7 seconds. Thereafter, this printed slip automatically gets cut and falls in the sealed drop box of the VVPAT.
Driving Force	No Driving Force	Both EVM and VVPAT are battery driven.
Disadvantages	<ul style="list-style-type: none"> • Cumbersome process • Malpractices like Ballot box stuffing, preventing people to vote. • Slow Process 	<ul style="list-style-type: none"> • Vulnerable to attacks • It is hard to tamper with EVMs but not impossible.

the VVPAT. VVPAT runs on a power pack Battery. VVPATs with EVMs were used for first time in a bye-election from 51-Noksen (ST) Assembly Constituency of Nagaland. [7]

4. Internet Voting System

[2] Mentions three types of Internet Voting Systems. First is Poll-Site Internet Voting System. This is convenient and efficient because voter can cast his vote from any booth where officials control the physical environment as well as voting platform.

Second is Kiosk Voting. In this, Voting machines not placed in traditional booths but in places like malls, libraries or schools. As under Kiosk Voting, platform for voting will still be under Election Commission Officials, therefore security and privacy concerns are less. Third is Remote Internet Voting in which voters cast vote from places that are convenient to them. With various benefits, its drawbacks include security and privacy concerns.

5. Online Voting System

This is the newest type of voting system that is under development since many years. It will be an application or a website which will be Internet dependent and the voter casts his/her vote by logging in at that interface. This has not been implemented successfully because of the issues of the network like the ones described in the next section.

III. SECURITY ATTACKS

Whenever we have to implement an online system, the first thing that we have to address is its Security, Security from attackers who try to exploit the network for their purpose. Some common attacks are [3]:

- IP Spoofing Attacks
- Trust Exploitation
- Password Attacks
- Confidentiality and Integrity Attacks
- Man-in Middle Attack
- Phishing
- Availability Attacks

IP Spoofing, in which attacker gets an unauthorized access to the computers. Attackers change their IP address to pretend themselves as if it is a different IP address. [8] Trust exploitation refers to an attack in which an individual takes advantage of a trust relationship within a network. [9] Attack by traffic monitoring is Man-in Middle Attack. The attacker is usually positioned between a minimum of two persons. The attacker actively eavesdrops and connects independently to victim. [10] Phishing is an Identity theft in order to obtain confidential and private information of individuals or companies for monetary or other gains [3]. It is

generally sending fraudulent e-mails that appear to be coming from a reputable source. If it is successful to fool the user, he/she is coaxed to give the confidential information on a false website. Different types of phishing attacks are Deceptive Phishing, Spear Phishing, Whaling and Pharming. [11] Denial of Service, in which services are denied even to the authorised users, is an availability attack.

IV. VARIOUS PROPOSED SYSTEMS FOR ONLINE VOTING

There have been many proposed systems for Online Voting System and for ensuring security on the networks. Some techniques that may give significant changes are:

- Based on Username and Password
- Based on AADHAR ID
- Based on Visual Cryptography
- Based on Biometrics

1. Based on Username and Password.

This system uses a unique Username and password for the voter to login to the voting system. During the voter Registration, the voter decides his username (unique in the domain) and a password is generated for him. This username and password have to be kept a secret confined just to the voter himself and he would be using the same username and password for logging in to the voting system at the time of actual elections. Though there are some flaws in this system, it poses generation of new ideas for the implementation of the dream online voting system In India. Such system is implemented by [4]. We may also make this system better by linking mobile phone number to the system. Whenever the voter would login to voting system, an OTP (One time Password) will be generated

that has to be mandatorily entered in the system in order to successfully login and vote.

2. Based on AADHAR ID

AADHAR ID is a unique identification number for the citizens of India. AADHAR ID includes the Address of voter, his date of Birth and his photograph. The Address would be telling about the constituency of the voter, his date of birth will ensure if the voter is above 18 years and photograph will ensure that the voter is authentic. Voter logs in using his unique AADHAR ID and password. The voting system interface would be redirected to the e-ballot where the list of candidates is mentioned. Voter will select one of them and system will verify that the candidate whom he wished to vote and who actually received a plus one in his vote account are same. Thus, if voter is satisfied with the candidate he wished to vote, he presses the confirm button and does the final submission of his vote. This system is better than the Simple Username and password System because it also ensures that the voter is an authentic person, citizen of India and also above 18 years. System proposed in [6] is based on this.

3. Based on Visual Cryptography.

Visual Cryptography is a cryptographic technique in which decryption is possible only through sight reading, thus it is generally used at websites to ensure that a robot is not accessing the website. Visual Cryptography can be more easily identified in real life when we see a

CAPTCHA (Completely Automated Public Turing test to tell Computers and Humans Apart).The image CAPTCHA is divided into two shares and one share is kept within the authentication system and

other is sent to their corresponding users. Once the users receive their shares, they can log into the system using their own share of CAPTCHA [3].Visual Cryptography can be used to find out whether user is in phishing site or not.

4. Based on Biometrics

Biometrics is the metrics (calculations and measurements) related to human characteristic. Biometrics can be used for authentication and identity of a person. Biometrics includes face, finger-prints, Iris and voice. These characteristic are unique for an individual and cannot be copied in any means. Thus if we implement an Online voting system using this technology, it would be better than the previous ones. Biometrics is also linked to AADHAR thus we can also implement a mix of both AADHAR and Biometrics based Voting system. In a finger-print based Voting system [4][15], a voter would be able to cast vote only if his finger print matches with the finger print details stored on AADHAR ID Database. In some case, if the finger-print does not match, then a secondary option would be to match the Iris. Thus people vote with higher security than the existing system. This system has one drawback, that it requires high technology finger-print sensors/Iris -scanners/Face-recognisors.

V. CONCLUSIONS

Getting a fair chance to vote is an important feature of any democracy. Since Independence, India has been a democracy and to continue in that notion, it is important that all the rights of the citizens be fairly implemented. One of them is the right to vote. Election Commission of India has implemented various technologies for conducting fair elections

hassle-free. With the new proposals of Online voting systems, we are moving towards a better way to vote from anywhere and conveniently. With advantages of Online Voting, we cannot neglect the drawbacks. It is important to note that we are still not so technologically ahead to avoid the security attacks and implement the dream proposal easily.

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