

# Democratising Election Process

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**Abstract**—In democratic countries like India, voting is a fundamental right through which people choose their leaders. Traditionally, voting has taken place in centralized or distributed locations known as polling booths or stations. All citizens of India above the age of 18 years can cast their vote and choose their leaders. Voters go to polling booths and cast their votes under the supervision of an authorized person. Some of the main issues encountered with this traditional voting system include fewer voting percentages and false votes. To overcome these, an online voting web application is proposed in this paper. Any registered eligible voter can cast his/her vote through this application by logging in to the application. Before casting the vote, the application authenticates every voter on 2 levels. The 1<sup>st</sup> level of verification is carried through One Time Password (OTP) and 2<sup>nd</sup> level is through voter identification (ID) and any other government-issued ID cards such as Aadhaar, Permanent Account Number (PAN) card etc.,. The Aadhaar card is a government- issued unique identification card for every Indian citizen. Through this proposed online voting application, any eligible voter can cast their vote within minutes from any corner of the world by logging into the application using a gadget (mobile, laptop, tab, etc.,) connected to the internet. The main objectives of this document are to increase vote rate and reduce false votes. The conduction of elections through this application also reduces the workforce.

**Keywords**—Encryption, One Time Password (OTP), Online voting system (OVS), Security, Web application.

## I. INTRODUCTION

As per the International Institute for Democracy and Electoral Assistance (IDEA), Rwanda has reported 98.15%, the highest voter turnout or record during the recent national election conducted in the year 2017 [13]. Laos recorded 98.02%, the 2<sup>nd</sup> highest voter turnout in the year 2021, during theparliamentary elections. Turkmenistan recorded 97.17% of the voting, during the Presidential elections conducted in the year 2022 and Singapore recorded 95.81% of voting in the year 2020 during their Parliamentary elections. Haiti has recorded 17.82% of voting, the lowest voter turnout during the 2015 Parliamentary elections. Afghanistan recorded the 2<sup>nd</sup> lowest voting percentage in the year 2019, during the Presidential elections. Algeria, during the 2021 Parliamentary elections recorded 23.03% of voting.

In India, between 1951 and 2019 parliamentary elections conducted so far, an average of only 51.94% voting has been recorded. India is a rule-based country with a population of 1.4 billion [13]. The Government of India

includes "all communities, individuals and institutions". Every citizen of India aged 18 years and above is an eligible voter and has the right to vote and choose their leader. The voting system started in India in the 18<sup>th</sup> century [1]. In the traditional voting system adopted in India, a voter will only be able to vote if his or her name is enrolled in the list of voters. This is done by providing a voter ID card issued by the Election Commission of India (ECI). Since many years till today, elections are being conducted in each country differently. Some of the most common ways of conducting elections around the world are paper voting, electronic voting machines, live recording electronic voting machines and optical voting machines.

The paper-based voting system or paper ballots was the first voting system introduced in 139 BC in Rome. Paper ballots or election ballots were first used in Rome in the year 139 BC to conduct the elections. In the paper-based voting system, the voter receives a blank ballot. The voter uses a pen or marker to vote for the candidate. Although paper ballots are easy to make and can be retained for verification, counting these paper ballots is a time and labor-consuming process [10]. This type of voting system was followed and is still in use in most of the developed countries like the United States of America (USA), France etc., [14]. This method is the most popular way of voting in most developing countries like India and African countries like Kenya, Botswana etc. [14].

The Electronic Voting Machine (EVM) was invented during 1990 in India by a team led by V. Hari Prasad. During 1998, elections were conducted using EVMs. These EVMs do nothave any mechanism to verify the identity of the voter before voting, therefore the fake voter can vote more than once. It takes a lot of effort and time to implement this sort of voting mechanism. There is a possibility of tampering with EVM during production and votes can be manipulated to change the result [8].

Recently, general elections were held in India in seven phases from 11<sup>th</sup> April to 19<sup>th</sup> May 2019 to elect members of the 17<sup>th</sup> Lok Sabha using EVM. Votes were counted and the results were announced on May 23<sup>rd</sup>. Around 912 million people were eligible to vote during this election, but only 67% of voting was recorded. However, this is the highest-ever voter percentage recorded, as well as the highest female voter turnout ever recorded in India during general elections [2].

In Brazil, direct recording EVMs were used massively in 1996, where all the elections in Brazil were conducted using these machines. The device is integrated with a keyboard, touch screen, or buttons. The voters can ballot their vote by pressing the buttons and this machine in parallel counts the votes casted [6]. Whereas the voter must come in person to the place where the elections are conducted. Also, this voting mechanism is a time and labor-consuming process. Furthermore, there is a possibility of equipment failure.

The earliest optical-scan voting system was introduced in the USA during the 1960s. To scan ballots, it employs optical mark recognition scanners. The voter can cast the vote by filling the circle corresponding to their favorite candidate on the ballot. Then the machine considers the boldest mark on each ballot as a vote and counts. This machine counts votes very quickly. However, if the voter doesn't fill the circle properly, those votes will end as erroneous optical scan results. Optical voting system was used until the 19<sup>th</sup> century [15].

A.D. Rubin's 2002 study states that an online voting system is a better option for voting which would increase the voting percentage. The verification of the Aadhaar [23] card is the security measure used in their study. As a part of the proposal, the authors tried to build a secure online voting system. This system is free from unauthorized access while voters casting their ballots [6], [18].

Himanshu Agarwal and G.N. Pandey, 2013 study states that the online voting system needs to have high security and reliability compared to that of traditional existing voting systems. To achieve this the authors proposed OTP, which would let the authorized user vote only once [5].

Ch. SaiPratap, D. Sumanth Rahul and Jithina Jose (2020) study states how an online voting system would bring an impact on the nation's development. This system monitors voting programs in a less complicated way and is safe to use. Their approach is better and faster than the traditional voting systems. This online voting system ensures transparency and continuity and maintains accurate voting procedure using Aadhaar that provides each voter with a special ID to avoid security breach. It allows a voter to vote from any location around the globe [1],[2]. From the year 1973, many countries including the USA, Belgium, Japan and Brazil began to adopt electronic voting, also known as E-voting, for their official elections.

## II. METHODOLOGY

The proposed online voting application verifies the registered voter through OTP while voting [11]. The user interface of this application is implemented using Hypertext Markup Language (HTML) and the backend of this application is implemented using Cascading Style Sheets (CSS), Hypertext Pre-processor (PHP).

The architecture of the proposed online voting web application is represented in Figure 1 and the workflow of the online voting application is given in Figure 2. As an initial step, the voter needs to register in the portal. After registration, the user can log in to the portal using the credentials. Then, the application generates OTP and sends it to the registered mobile number of the voter [4],

[11]. After the user enters the OTP and the application validates, the user can cast their vote [11]. After the voting, user votes are stored in the database for counting purposes.

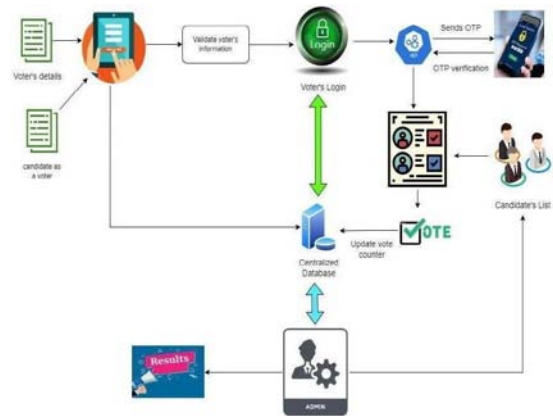


Fig. 1. Architecture of the online voting web application.

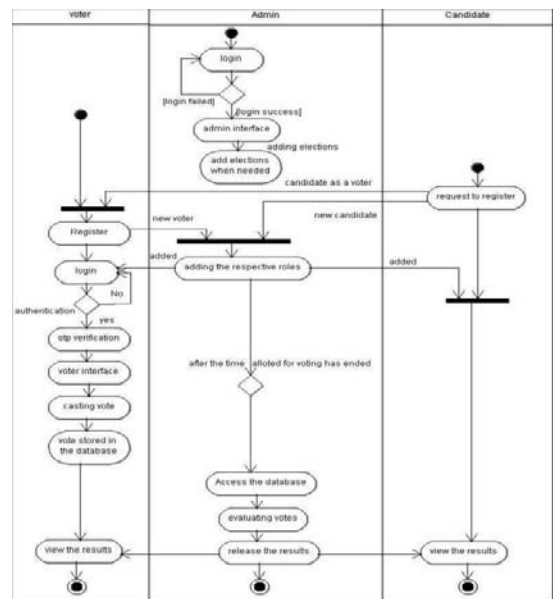


Fig. 2. Workflow of online voting system application.

The Admin/ECI is the official body responsible for registering the voters and manages the candidates during elections (refer with: Fig. 2). After the conduction of elections, the admin publishes the results in the application, which can be viewed by voters and candidates[4].

## III. RESULTS AND DISCUSSIONS

The proposed online voting web application will manage voter information, allow voters to login and exercise their right to vote online. This application integrates all the functions of the voting system. Each party's votes can be tracked through this application and the total number of votes for each party is counted. The database maintained by ECI through this application stores all the names of voters with their details [12].

An Indian Citizen aged 18 years and above should register in this application. Then the voter will be allowed to vote after logging in with his username and password and OTP verification. Each registered user will be allowed to vote only once. The details of the votes are stored in the

application's database and the results can be published after elections [12]. Through this online voting system, voting turnout will increase, as the registered user can vote from any corner of the globe using the gadget connected to the internet. This application helps in reducing the cost and time of the voting process.



Fig. 3. Sign-up page.

Figure 3 represents the registration page of the online voting application. By entering the details such as username, contact, password, and retype password in the respective field's user can register. Once the user gets registered successfully, the registered user data is stored in the application's database [19]. The password will be stored in an encrypted format [4]. The encryption is carried out by applying Secure Hash Algorithm (SHA1) [20].



Fig. 4. Login page.

After successful registration, the user can log in to the portal [4]. Figure 4 depicts the website's login interface, where the user or administrator can log in. This page contains the fields Contact No., and Password, as well as the "Login" button. If the user does not have an account, then the user is redirected to Figure 3 for registration [4].

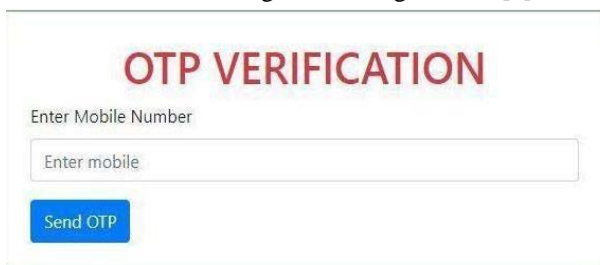


Fig. 5. OTP verification page.

Figure 5 illustrates the OTP verification page. An OTP will be sent to the user's registered mobile number. After verification, the page is redirected to Figure 9 [11], [24], [21].

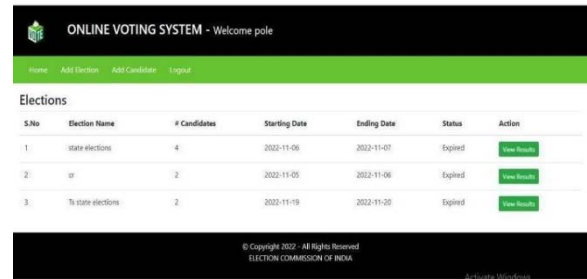


Fig. 6. Admin home page.

Figure 6 shows the Admin Home Page of this application. The admin dashboard displays the number of elections that are currently taking place. This page has details like election name, the number of candidates, the starting and ending dates of the elections, the status of the elections, and an action button for viewing results after the elections. The admin can only add election and candidate details and can publish the election results.

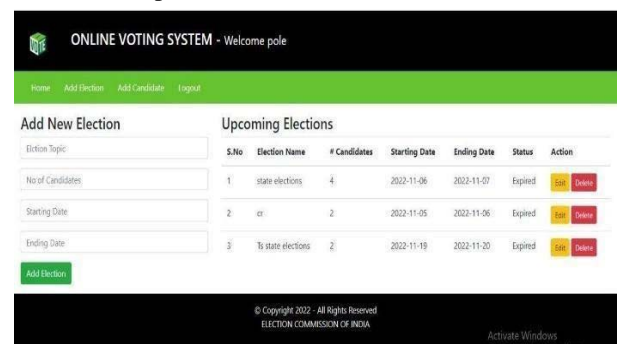


Fig. 7. Election Page.

Figure 7 depicts the Election Page of this application, which contains the details of upcoming, ongoing, and completed elections. On this page, the admin can check, add, edit or delete election details. While adding the elections the admin needs to fill up all the required details about the elections (refer Fig. 6).



Fig. 8. Candidate page.

The Candidate page of this application is shown in Figure 8. The admin can add candidates and edit or delete the details of the candidates on this page. The details such as candidate name, party name, and party symbol of each candidate will be collected from the respective party candidates by the admin [12].

Figure 9 represents the voter's page. The voter page displays the current elections, by which voters can vote. A voter can cast the vote only once, through this application.

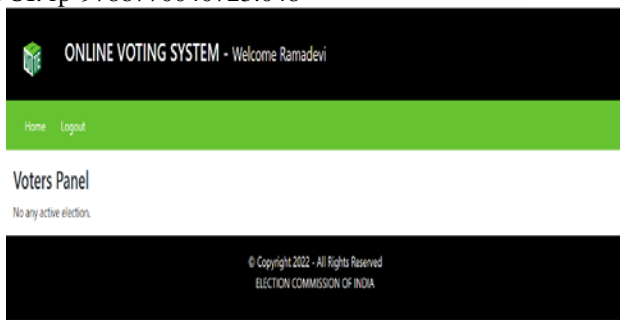


Fig. 9. Voter's page.

#### IV. CONCLUSION

In this paper, a secure online voting web application is proposed. This application has 2 levels of authentication through OTP, voter ID and any other government-issued ID card. This application is secure compared to the traditional voting system. With the application features, it is easier and convenient for the voter to use. A gadget with an internet connection and valid credentials is required for the user to vote securely from anywhere in the globe. This application also increases transparency and reliability in the voting system as all the details of the registered user's data are securely stored in the application database. As future enhancement, few more security features related to authentication, and authorization features can be added.

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