



Implementing Software Automation Process for Indian Voting System Using Slot Booking process and Biometric Authentication

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Abstract: India is a big democratic country and voting process plays a major role in election systems so that Indian citizens can elect the leaders of their choice for the state or country. In democracy, government is of the people, for the people and by the people. Without genuine elections, democracy has no meaning. Elections provide citizens with a uniformly managed way to voice their opinions and choose who and what is best for themselves and their nation. In India, there are three levels of government, i.e., Center level (Lok Sabha election to elect PM and MPs), State level (Karnataka Assembly election to elect CM and MLAs), and Local level (Panchayat). [1]

Voting system is the principle of a universal adult franchise which is the foundation of the democracy that gives every citizen a right to have one vote and each vote should have equal value. Every citizen of 18 years or more has the right to vote, irrespective of his caste, religion, gender, educational qualification, financial status, etc. The voters' list is provided to the voters of each constituency much before the election for the purpose of inspection and correction. On the day of election, the people cast their votes as per their names mentioned in the voter list. Voters whose name is on the voters' list go to a nearby 'polling booth' and cast their vote one by one to elect their leaders of their choice [2].

Current Indian election process is very tedious, many manual processes are involved which is very time consuming. The citizens need to wait in long queues for more time to cast their vote. This can be avoided by implementing software automation system in election process. Implementing software automation process would reduce the many manual processes like a) waiting in long queues during voting time b) avoiding human errors like one person voting many times c) authentication and validation of citizens during election (like manual verification of documents).

In the present investigation and research, an attempt was made to implement software automation process in Indian Voting System by utilizing the latest software technologies, methods, and tools. A web application was developed to validate the user/citizen by uploading all relevant documents (like Voter Id, address proof) before voting. These details can be verified against Aadhar DB for

validation. Also, a slot booking module was developed to avoid long queue during voting so that citizens can select a particular time slot for voting. Also, during voting process, every citizen can be validated using biometric or face recognition techniques so that only valid citizen can cast the vote for the designated area.

Key words: [Democracy, citizen, voting system, Software Automation, biometric, Slot booking.]

1. INTRODUCTION

Recently assembly elections were held, and first-time voters noticed that citizens were waiting in long queues for many hours to cast their votes. This was a major problem due to which nearly 28% of the people didn't vote during Karnataka elections held in May 2023. Some of the other problems faced in which a person might be able to vote multiple times due to lack of proper identification process. There are a lot of cases where human errors may occur due to manual process. Another problem is that lengthy waiting period to cast votes that discourage voter's participation. These issues can be avoided by introducing software automation process in the voting system.

The objective of this research is to create a web application with latest technologies whose functionality is to increase time efficiency and enhance security measures to prevent voter fraud, ensuring voting process is smooth, secure, and electoral process is reliable. This will ultimately enhance democratic participation and maintaining the integrity of the elections.

The application was developed using latest .NET technologies (ASP .NET, C#, Entity framework, Web API, HTML, CSS, JavaScript), which makes it user-friendly and easy to navigate. The application uses a relational database SQL server to store the voter's personal information.

1.1 Current voting process in India

Election Commission is responsible for monitoring and administering all the electoral processes of India. This body is responsible for ensuring elections are free and fair, without any bias. Election ensures the conduct of members pre-elections, during elections, and post-elections are as per the statutory legislation. Candidates are required to file their

nomination papers with the Electoral Commission. Then, a list of candidates is published. The polling is held between 7:00 am and 6:00 pm. The Collector of each district is in charge of polling. Government employees are employed as poll officers at the polling stations. Electronic Voting Machines (EVM) are being used instead of ballot boxes to prevent election fraud. After the citizen votes, his or her left index finger is marked with indelible ink. [3]

1.2 Automation

Process automation is defined as the use of software, tools and technologies to automate business processes and functions in order to accomplish defined organizational goals [4]. The software automation can be used in Indian Election process to authenticate the user, avoiding long queues during the voting process and to make sure that the eligible citizen can cast the vote to avoid frauds.

1.3 Biometric process

Biometrics is the measurement and statistical analysis of people's unique physical and behavioural characteristics. The technology is mainly used for identification and access control or for identifying individuals who are under surveillance. The basic premise of biometric authentication is that every person can be accurately identified by intrinsic physical or behavioural traits. Authentication by biometric verification is becoming increasingly common in corporate and public security systems, consumer electronics and other applications. The major biometric methods are fingerprint, face recognition and Iris recognition. [5].

1.4 Booking slots

Slot booking is a process in which a person is allowed to book an event (like exam or doctor appointment date and time) as per his preferences. In Election system, booking slots by citizen is essential to avoid long queues during the elections and they can cast the vote as per their preferred or convenient time. Slot booking also confirms nearly how much percentage of voting can be expected for a particular region.

1.5 Objectives

The main objective of this research is:

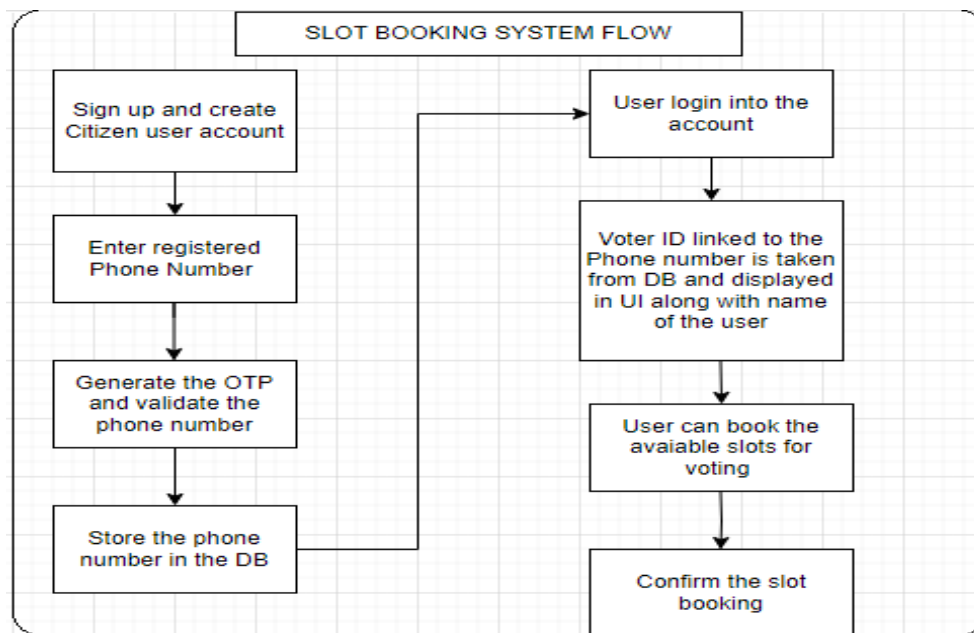
Develop a web-based application to get the details of the citizens for the voting process. These details are used for validation and authentication during elections.

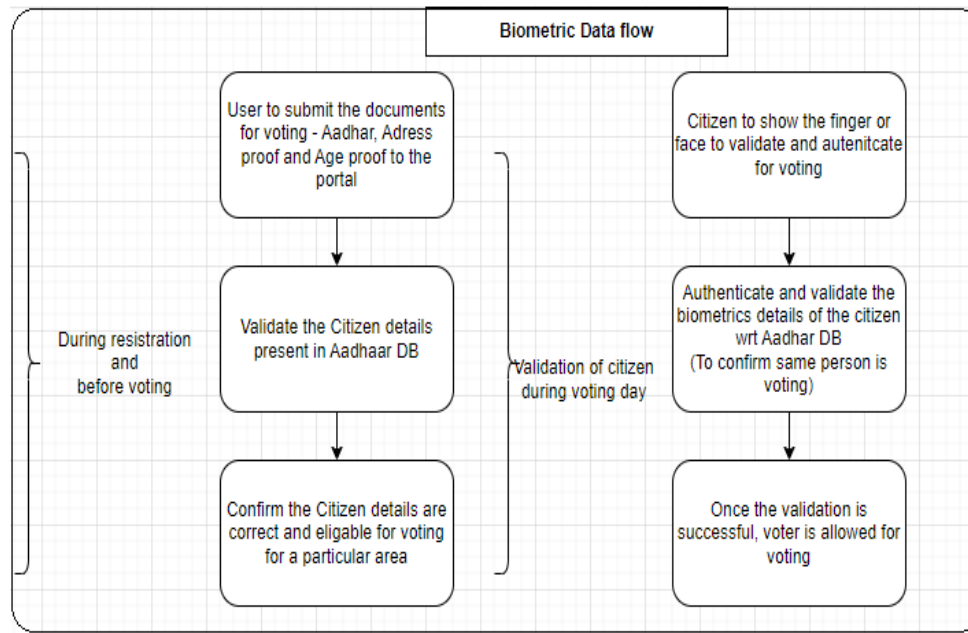
Develop a slot booking system to streamline the voting process and increase the efficiency. This system allows the voters to schedule a specific time slot for casting their vote, reducing waiting time and ensuring more organised voting experience.

A slot booking system enables planning and logistics for election authorities. They can estimate the number of voters expected at different time slots and allocate resources accordingly.

The election authorities can verify the eligibility of voters in advance and prevent instances of impersonation and multiple voting by incorporating security measures like biometric authentication during the voting process.

2. Data flow for Slot booking and biometric authentication.





3. UI and DB Design of the Automation system using biometric and booking slots.

3.1 Implementation details:

The web application was developed using .NET technologies (ASP .NET, Entity framework, Web API, JavaScript, jQuery, and Kendo)

The IDE used was Visual Studio and repository was used as TFS.

SQL server(RDBMS) is used as a backend to store the voter's information like phone number, address details and age proof details.

3.2 Different layers created for the application.

UI Layer was developed using MVC5, Kendo, HTML, CSS, Bootstrap, and JavaScript.

Domain Layer – Created classes such as Book Slot, VoterID and using those classes to bind data in database and rendered it to UI.

Data Layer – Entity framework was developed which establishes connection with Database and makes sure the service is available to access the database.

Service Layer – Creating Service Layer for Sign in, GeneratingOtp, BookingSlot, Biometric Authentication service, RestServiceApplication to facilitate communication between the Client Layer and the database.

API Layer – This will return data to the web API.

Web API Layer – This is visible to end user/client which will return data to the UI.

3.3 Use Cases:

3.3.1 Enter and submit citizen details in the web application and authenticate the user before voting-

Users/citizens to login to the web application.

OTP method is used to authenticate the user with their registered mobile number.

Once authenticated users are logged in to the application, they need to upload relevant documents like address proof (Aadhar card, PAN card etc), age proof and the identify proof) required for voting process.

Update the citizen dataset with valid details in the DB.

3.3.2 Slot Booking: -

Login into the web application with the user's password/OTP.

Voter ID information linked with respective mobile number is reflected.

Booktime slot for the election as per voter's choice.

Confirm slot for selected date and time of the election.

If the slot is full, allow the user to select next available slot.

Once the slot is confirmed, a SMS message is sent to the user informing about the date and time of their voting.

Authenticate the user during the voting (Biometric/Face Recognition method)

Validate and authenticate the citizen using his fingerprint or face recognition method during the day of voting by the polling officer. These details can be validated against the Aadhar/Passport Database to authenticate the user during voting process.

The authenticated citizen then allowed to cast vote for their desired leaders.

Valid user/voter can cast their vote successfully.

Dependencies: -

Voter's List database from the Election Commission of India (Aadhar/Passport).

Biometrics (Fingerprint or face recognition) of the voters from Aadhar database.

Fingerprint/Iris Scanner Machines.

3.4 User Interface Design

3.4.1 Home Page:

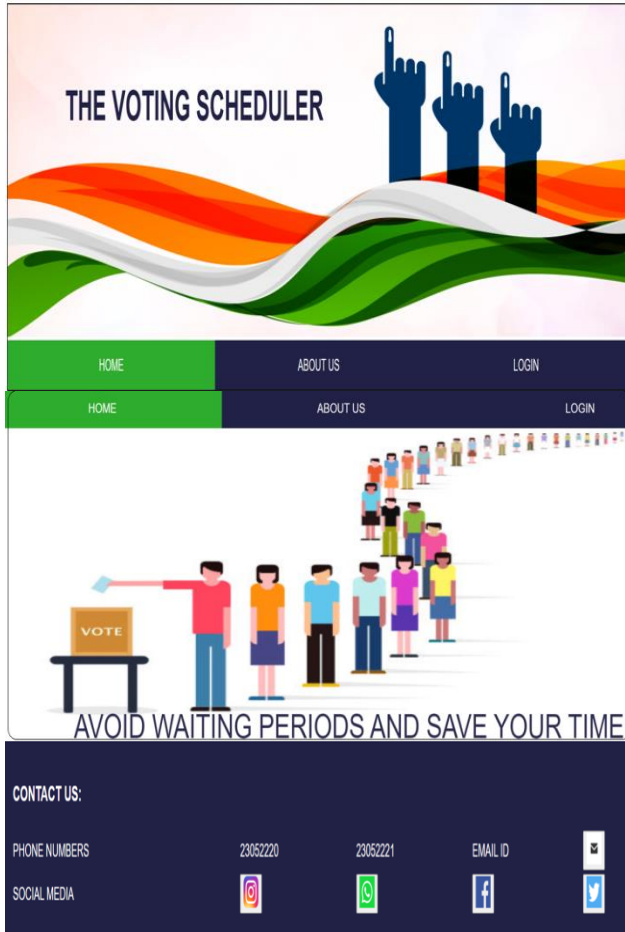


Figure-1: Home page of the application

3.4.2 Registration Page

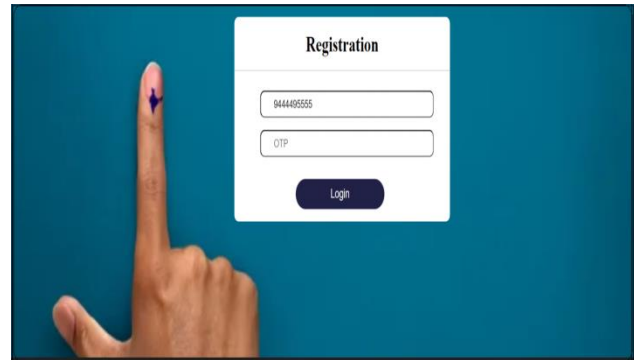


Figure-2: Citizen registration page for the user to submit their details for voting.

3.4.3 Upload required documents.

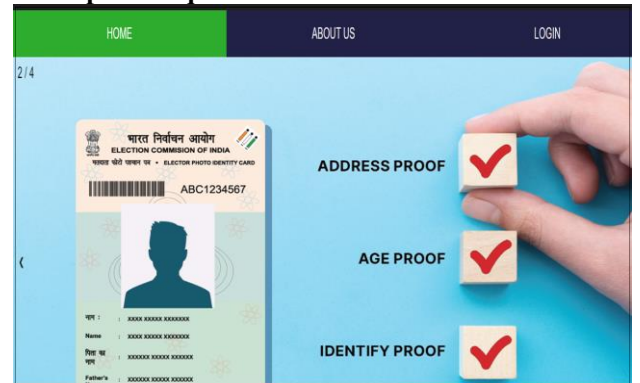


Figure: 3: Web form to upload relevant documents

3.4.4 Book slots for Voting.

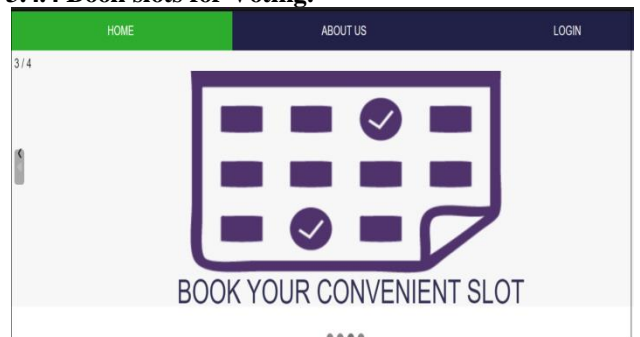


Figure: 4: Web form for booking the time slot

3.4.5 Display success message for after booking slot

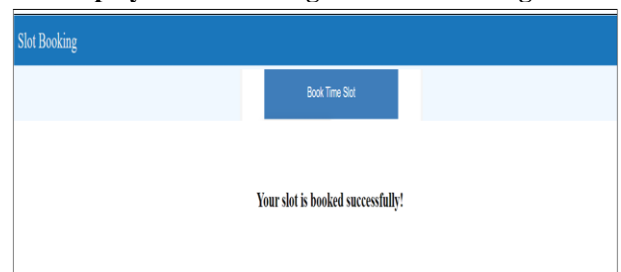


Figure: 5: Display success message for slot booking

Biometric process: Validate the fingerprint or face recognition of citizen using hardware devices allocated during the voting process. If this value matches with the Aadhar database, then the user is valid and allowed to cast the vote.

Results

The citizen needs to create an account and then login to the application using OTP which is validated against the Aadhar DB. Once OTP is validated, user will upload required documents: Aadhar number, Address proof and Age proof. These values can be used for validating the user later during the election day.

The details of the user are displayed on the UI.

Voter ID Info:	
NAME:	Nikhila
VOTER ID:	ABC121314
PHNO:	944495555
WARD NO:	5

Figure 6: Display user details in the UI after successful uploading

Slot booking result: In slot booking page, citizens can choose required slots of their choice during the voting. Once slot is selected, SMS messages will be sent to their phone number to confirm the date and time of the slot.

TIME SLOTS	CHOOSE YOUR SLOT
7:00 am - 8:00 am	<input type="radio"/>
8:00 am - 9:00 am	<input type="radio"/>
9:00 am - 10:00 am	<input type="radio"/>
10:00 am - 11:00 am	<input type="radio"/>
11:00 am - 12:00 pm	<input checked="" type="radio"/>
12:00 pm - 1:00 pm	<input type="radio"/>
1:00 pm - 2:00 pm	<input type="radio"/>
2:00 pm - 3:00 pm	<input type="radio"/>
3:00 pm - 4:00 pm	<input type="radio"/>
4:00 pm - 5:00 pm	<input type="radio"/>
5:00 pm - 6:00 pm	<input type="radio"/>

Figure 7: Slot booking page

Validating the citizen during voting

During voting, polling officer can check the documents uploaded by a citizen before voting. Later, citizen needs to provide his fingerprint or face details to the device provided by polling officer. This helps to validate that only authorized citizens can be allowed to cast the vote.

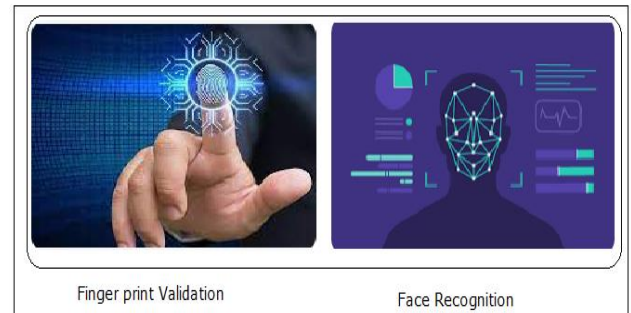


Figure 8: Finger and face recognition Techniques

CONCLUSION

The web application developed helps to automate election process such as verification, validation, and authentication of the user before casting the vote.

The address proof, age proof and identify proof of the citizens was verified. Also, it was integrated into Aadhar system for authorizing candidates before the voting.

The slot booking system helped to avoid long and big queues during the day of voting.

A biometric system helped to authenticate citizen before voting and can make sure that valid citizen can cast the vote. This helped to prevent single person casting vote multiple times which avoids the fraud during voting.

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