The Digital Ballot: Transforming Bharat's Electoral Landscape

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Abstract:- Presently, Bharat's voting process involves visiting specific polling booths to cast our ballots via Electronic Voting Machines (EVMs). However, a more convenient and advanced approach is on the horizon. The Online Voting System allows citizens to vote from any nearby polling booth, irrespective of the place where their voting rights exist. This modernized Internet-connected system implements advanced Aadhar identification methods through fingerprint or iris scans to ensure a valid Voter Identity and eliminate the potential threat of duplicate votes, ensuring that each voter's voice is counted only once. Facilitating quicker election result announcements, the system eliminates the need for manual vote counting. Additionally, the integration of blockchain technology ensures the integrity and transparency of the electoral process, effectively addressing concerns related to tampering and fraud. The user interface is meticulously crafted to be user-friendly, inclusive, and accessible to individuals with diverse abilities and language preferences. This research underscores the potential advantages of transitioning to an Internet-based Voting System in India, which can modernize the electoral process, engage younger generations, and strengthen the overall integrity of the democratic system. However, it also acknowledges the importance of addressing security concerns and challenges associated with this transition.

Keywords:- *Online Voting System; Digital Democracy; Election Technology; Aadhar Identification; Secure Voting Platform.*

I. INTRODUCTION

The introduction of Electronic Voting Machines (EVMs) in India has played a pivotal role in enhancing the fairness and efficiency of the electoral process. Since their nationwide debut in the 2004 general elections, EVMs have bolstered the security and integrity of elections, reducing electoral fraud and instilling greater confidence in the voting process. However, they have not been without their challenges, including allegations of tampering and technical malfunctions that require regular maintenance. Looking ahead, an Internet-enabled Voting System has the potential to enhance efficiency, transparency, and security. It can reduce EVM maintenance costs, enable real-time vote counting, and engage younger voters. Advanced encryption and secure authentication methods can bolster its tamper-proof nature, and Aadhar authentication can enhance voter validity.

The paper aims to assess the advantages of implementing an Internet-enabled Voting System in India, emphasizing its potential to enhance security, transparency, and voter engagement. It will delve into security issues, such as risks and voter privacy concerns while exploring the necessary technological frameworks and innovations required for successful implementation. These innovations encompass robust authentication methods and user-friendly interfaces, ultimately contributing to a more efficient and secure electoral process in Bharat.

II. LITERATURE REVIEW

The Authors of [1] "Smart Online Voting System" have described an Online Voting System that uses the Facial Recognition Technique(FRT) and OTP system for Voter Authentication, Voters can Vote from any place in the world with an Internet facility which is beneficial for Voters with physical disabilities or Voters working far away.[1] Authentication through the Facial Recognition System is not a secure authentication as facial recognition accuracy can be affected by factors such as lighting conditions, image quality, and the subject's facial expressions. Facial recognition systems are vulnerable to cyberattacks and spoofing attempts, such as the use of photos or videos to impersonate voters. Safeguarding the system against such threats is essential but challenging. OTP is also not secured as a voter's smartphone can go into other people's hands which can lead to fake votes.

The Authors of [2] "Secure Digital Voting System based on Blockchain Technology" have described that Blockchain Technology can be used in Online Voting Systems to assure voter anonymity, vote integrity, and end-to-verification. Blockchain technology can play a key role in the domain of electronic voting due to the inherent nature of preserving anonymity and maintaining a decentralized and publicly distributed ledger of transactions across all the nodes. This makes blockchain technology very efficient in dealing with the threat of utilizing a voting token more than once and the attempt to influence the transparency of the result. [2] By harnessing blockchain's decentralized ledger, this approach addresses critical issues in electronic voting, such as fraud prevention and result transparency. It offers a robust solution that has the potential to bolster the security

and trustworthiness of our electoral processes, paving the way for a more resilient and inclusive democracy.

The Authors of [3] have proposed E-Voting on an Android device allowing voters to vote from anywhere in the world using the Internet. but this kind of system cannot be implemented on a large scale, especially in a country like Bharat, where most of the population resides in rural areas and there are voter verification issues as anyone else can vote from the voter's account. This type of system can be helpful in small-scale voting scenarios such as college elections or other organization's elections.

The Authors of [4] have proposed a practical application of the existing cryptographic schemes and a digital signature that ensures the integrity of the vote cast by the voter and authentication of a voter at the two levels to ensure accuracy, democracy simplicity, verifiability, consistency, privacy, and security.

III. EXISTING SYSTEM

Currently, General Elections for Lok Sabha and State Elections for State Assemblies (Vidhan Sabha) are conducted through Electronic-Voting-Machines (EVMs). Elections for Panchayat (local governance) Elections are conducted through the Paper Ballot Voting System.

A. Election through EVMs

Electronic Voting Machines (EVMs) feature individual buttons corresponding to each choice, connected through a cable to an electronic ballot box. Comprising a control unit and a balloting unit, these components are linked by a five-meter cable. Upon a voter pressing a button for their preferred candidate, the machine self-locks. Voters enter the polling booth, select their candidate by pressing the corresponding button, and, when the poll concludes, the presiding officer removes a plastic cap from the control unit and activates the CLOSE button, preventing the EVM from accepting additional votes.
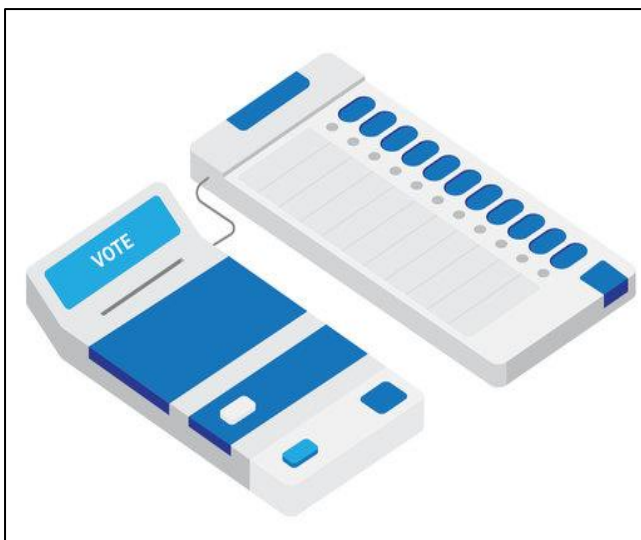

Fig 1: Electronic Voting Machine (EVM)

B. Election through Paper Ballot

In this system, Voters are provided with printed ballot papers that list the names and symbols of the candidates running for various positions, such as Panchayat members, Sarpanches (village heads), and other local representatives. To cast their votes, voters mark an "X" or a similar symbol next to the name of their chosen candidate on the ballot paper using the provided marker and submit it to a Ballot Box. After the poll, Manual counting of Paper Ballots is done which is an extremely time-intensive procedure.

IV. DRAWBACKS OF CURRENT SYSTEM

- EVMs, like other electronic systems, are susceptible to technical glitches and malfunctions, which can disrupt the voting process and raise concerns about the integrity of results.
- Despite efforts to make EVMs tamper-proof, security concerns persist. Allegations of EVM tampering have led to doubts about the accuracy and fairness of elections.
- Manual counting of paper ballots can be a time-consuming process, leading to delays in announcing election results and increasing the likelihood of human errors.
- Printing and distributing paper ballots incur costs, and there is an environmental impact due to the use of paper.
- Booth Capturing: Fake Votes by capturing polling booths is a big concern in the current scenario of the Voting System,
- After Poll, Secure transportation and storage of paper ballots can be a challenge and there is a risk of damage or loss or loss during transit.
- The manual counting process is a challenge to ensure transparency and may lead to disputes over the validity of votes.
- Expenditure on the election through the current voting system is too high. In the 2019 General Elections estimated expenditure was 55000-60000 crores (According to CMS Report)

Table 1: Lok Sabha Election 2019 Estimated Expenditure Report by CMS [5]

S.No		Percent	Amount Estimate (Rs in Crores)
1.	Voter directly	20-25	12-15000
2.	Campaign/Publicity	30-35	20-25000
3.	Logistics	8-10	5-6000
4.	Formal/ECI	15-20	10-12000
5.	Miscellaneous	5-10	3-6000
Total			55000-60000

V. METHODOLOGY

The methodology for developing an Internet-based Voting System comprises several key steps and components. It begins with voters reaching polling booths and authenticating themselves through Aadhar Biometric Verification to ensure only authorized voters participate. Votes are securely cast and encrypted before transmission. The use of blockchain technology records votes sequentially and immutably, ensuring tamper-proof results. The data is securely stored in a database, and the vote counting process is transparent. A user-friendly interface prioritizes accessibility, and the system allows remote voting at nearby polling booths, enhancing inclusivity and convenience in the electoral process.

In the proposed Internet-based Voting System, the following are the key components:

A. Database Creation

Creating an Online Voting System is a detailed and complex process that starts with setting up a strong database. The database serves as the backbone of the system, encompassing voter information, candidate profiles, election configurations, and voting transactions. It is designed with data modelling, normalization, and scalability in mind to ensure efficient data organization, integrity, and accommodation for an expanding voter base.

B. Encryption

Encryption plays an important role in ensuring the security and confidentiality of data in an Online Voting System. Essentially, encryption is a method of transforming data into a code that can only be understood by authorized parties. When a voter submits their votes or any data related to the election, it is encrypted before transmission. This means that even if the data were intercepted by malicious actors during its journey over the internet, it would appear as incomprehensible gibberish. Only the authorized recipient, in this case, the election authorities, possesses the decryption key to transform the data back into its original, readable form. This ensures that votes remain confidential and protected from unauthorized access.

C. Blockchain Technolog

A blockchain serves as a decentralized and unalterable ledger. In the voting context, every cast vote is considered a transaction, and these transactions are sequentially and immutably recorded on the blockchain. This ensures that once a vote is recorded, it cannot be altered or deleted. The beauty of blockchain lies in its transparency - anyone can view the entire history of votes recorded, and this transparency bolsters confidence in the electoral process. Furthermore, blockchain is highly secure due to its decentralized nature. This makes it exceptionally challenging for any malicious actor to manipulate or tamper with the vote count. In essence, blockchain technology ensures the integrity and transparency of the election process, two critical elements of a fair and trustworthy voting system.

D. Authentication

Authentication is the process of verifying the identity of voters accessing the Online Voting System. It is necessary to ensure that only authorized voters are allowed to cast their votes. The proposed system uses Aadhar Biometric Verification for identifying the valid Voters. When a voter wishes to participate in the online voting process, they are required to authenticate themselves using their Aadhar-based biometric information. This involves scanning their fingerprints or iris, which is then compared to the biometric data stored in the Aadhar database. If the biometric data matches, it serves as conclusive proof of the voter's identity, and they are granted access to the voting platform.

E. User Interface

User Interface is the bridge between Voter and the online voting process. It should prioritize accessibility, ease of use, security, and transparency. A well-designed UI ensures that voters can confidently and conveniently exercise their democratic rights while maintaining trust and integrity in the electoral process.

The UI should be designed with inclusivity in mind, ensuring that voters of all backgrounds and abilities can participate in the voting process. Features like multiple local languages, adjustable font sizes, contrast options, and compatibility with screen readers serve individuals with visual or hearing impairments. Voice-guided interfaces may be integrated to assist voters with disabilities in navigating the platform.

F. Accessibility

Any voter who is residing far away from the place where his/her vote exists can vote through a nearby polling booth for his/her region's best candidate. There is no need to come to his/her specific polling booth to cast his/her vote.
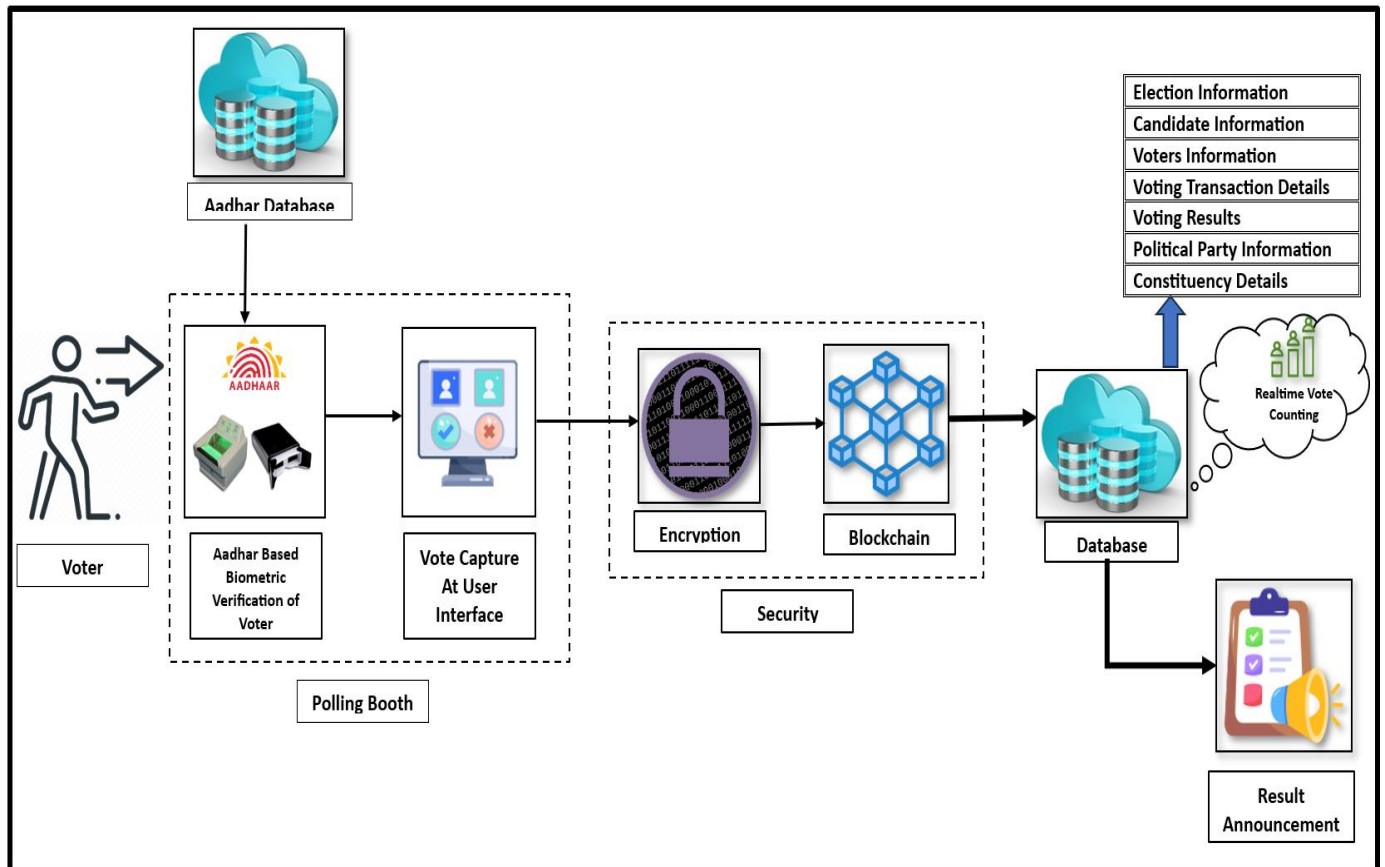

Fig 2: Proposed Online Voting System

➢ *Advantages of Online Voting System*

- Online voting significantly reduces the logistical challenges like transportation of EVMs, Ballot Boxes, etc., leading to cost savings and more efficient elections.
- Online voting reduces the need for paper ballots, minimizing the environmental impact of elections. It supports sustainability objectives by minimizing paper waste and lowering the carbon footprint linked to conventional voting methods.
- It accommodates individuals with mobility issues or those residing in geographically isolated regions, ensuring that their voices are heard through nearby polling stations.
- It cuts the cost spent by the Election Commission of India or Govt. of India over the maintenance of EVMs and Security of Ballot Boxes or EVMs after polls.
- It also reduces the need for a higher number of security personnel at the polling booths.

VI. CONCLUSIONS

In conclusion, the exploration of an Internet-based Voting System in India presents a compelling vision for the future of elections in the world's largest democracy. This research has outlined the numerous advantages of such a system, including enhanced efficiency, reduced costs, minimized environmental impact, increased accessibility, and improved transparency through blockchain technology. The proposed use of Aadhar biometric verification adds an extra layer of security to ensure the authenticity of voters, while the user-friendly interface serves a diverse population.

In essence, the adoption of an Internet-based Voting System in India holds the promise of a more efficient, inclusive, and transparent electoral process. However, achieving successful implementation is contingent upon the establishment of robust security measures and the on-going advancement of technology. As India moves towards a digital era, the careful consideration of these factors will be

pivotal in shaping the future of democracy in the nation.

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