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An AI driven voting system for blind individuals

Dr Chanchal Antony[1], Anaum Fathima Shameem[2], Dhriti R Sherigar[3], Adithi A Shetty[4], Shreya G[5]

HOD, Department of Artificial Intelligence and machine learning, A.J Institute of Engineering and Technology, Mangaluru, Karnataka, India[1]

Department of computer science and engineering, A.J Institute of Engineering and Technology, Mangaluru, Karnataka, India[2]

Department of computer science and engineering, A.J Institute of Engineering and Technology, Mangaluru, Karnataka, India[3]

Department of computer science and engineering, A.J Institute of Engineering and Technology, Mangaluru, Karnataka, India[4]

Department of computer science and engineering, A.J Institute of Engineering and Technology, Mangaluru, Karnataka, India[5]

Abstract: Blind voters often face significant challenges in participating in elections independently and securely, primarily due to the lack of accessible voting mechanisms. This paper introduces an AI-driven voting system designed specifically for blind individuals, leveraging Natural Language Processing (NLP) and speech recognition technologies to create a secure, accessible, and independent voting experience. The system enables voters to authenticate, navigate, and cast their ballots through intuitive voice-guided interactions, ensuring privacy and accuracy. By eliminating reliance on physical assistance, the solution upholds the principles of democracy and inclusivity. Anticipated outcomes include a 30% increase in voter participation among the blind and enhanced user satisfaction due to its streamlined and user-friendly interface. This innovative approach signifies a crucial step toward making elections more inclusive and accessible for all citizens.

INTRODUCTION

In a democracy, voting is one of the most basic rights accompanied by freedom and privacy. However, blind individual people face major obstacles that challenge these principles. Blind voters usually cannot vote safely and independently because voting methods do not accommodate their needs. Since a blind person would not be able to operate it without assistance, its operation compromises the secrecy and privacy needed in voting. The project on the "AI-Driven Voting System for Blind Individuals" is aimed at finding this solution by creating an easier voting system for use by the blind through cutting-edge machine learning and artificial intelligence technology. This system will enable blind voters to independently authenticate, navigate, and cast their ballot through simple voice-guided interactions. This project-folding under the theme of rethinking voting accessibility-seeks to promote equal participation by all citizens in the Indian political processes. The technology used here applies machine learning and artificial intelligence to generate an interface that meets the demands of the blind voter. It uses voice instruction in a manner that visually challenged people are allowed to vote without compelling others to do so. In-the-moment instructions would be given by voice guidance, thus helping the users to understand the ballot options as well as receiving audio feedback that would confirm their selections. The system has an essential part in its user-centered design, emphasizing usability and accessibility. Interactive voice prompts will guide voters with complete instructions to make their voting decisions independently. The final verification stage will allow the voter to verify their choice, thereby reducing errors as well as giving the voters an added layer of confidence. Besides technological capabilities, this particular project stands out as a testament of regard for democratic inclusion. Such an environment strives to save democracy by giving equal value to every individual citizen so that those with impaired vision can wholly determine the destiny of the nation.

PROBLEM STATEMENT

The "AI driven voting system for blind individuals" can be one of the possible solutions to the very serious problem of exclusion of the blind from democratic processes. Traditional voting methods do not take into account the special requirements that blind voters have: they will have problems accessing interfaces, finding reliable help, and keeping

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their votes secret. The initiative, in this respect, looks to remove all obstacles by giving an up-to-date technology solution using artificial intelligence and machine learning. In this process, the system hopes to design a more equal and just political process for India in which each citizen of this country, including the blind individual, contribute towards the future development independently and actively.

LITERATURE REVIEW

Dema Choki et al. "**Design of Electronic Voting System for Blind individual Persons Using Arduino Mega 2560**" [1], is Arduino-based electronic voting device can safely and independently vote for the candidates by the blind individual. In this system, the main constituent parts include an Arduino Mega 2560 microcontroller, buttons, a buzzer, a GSM SIM900A module, an SD card module, an LCD, and headphones. One of the functions of headphone is that private voice where names of candidates are available on the SD card have been read to the voters, and hence voting is exercised. The system has recorded casting a vote, indicated by a buzzer and refuses to accept any more input till an official depresses the control button to halt multiple voting. This is voter's unit, which still remains independent of the control unit by a poll worker. As such, this result button displays and stores the votes for each candidate on the SD card. The GSM module simplifies the sharing of results due to remote data transmission. Under this configuration, voting shall be safe and accessible because it is possible to guarantee a confident vote to those who are visually handicapped.

Abhishek Parmar et al. "**Secure E-Voting System using Blockchain technology and authentication via Face recognition and Mobile OTP**" [2], Digitalization has made voting and all such procedures involving data highly vulnerable to data tampering. Blockchain technology is sure to give non-apprehensible, safe solutions for data integrity. In order to enhance security and transparency for the elections on the national level, it hereby proposes an electronically voting system based on blockchain technology that is decentralized in nature. The system features an admin panel for managing candidates, planning voting events, and publicizing results. A voter log in into the website application, uploads a picture and inputs his Aadhar ID. The Aadhar ID is used as verification; an OTP is received on the phone for verifying the voter. Votes are given using a webcam to monitor the same with an extra layer of security, post-authentication. Since each vote is safely stored on the blockchain, it is nearly impossible to manipulate and in case of discrepancies, it can be identified very quickly. The backend of this process verifies the voter's residence and constituency to maintain accurate records. The administrator manages the outcome that has been released on a given date and represented visually. This system apart from guarding the voting process guarantees openness and confidence in democratic process through making historical results and statistics available.

N Sreenivasa, Gopal Agarwal, and Rishab Jain. "**Online Voting System by Using Three Step Verification**" [3], Organisational and democratic decision making includes voting methods. Traditional physical voting procedures in India tend to fail, are labor-intensive and also take considerable time to compile results. To overcome these problems, this research develops an online voting approach with no one requiring physical attendance and reducing the complexity of its operations that may increase participation in voting and expedite the electoral process. The three-stage authentication technique employed in designing the proposed system, based on which it is built, ensuring security and authenticity thereby overcomes the fraud and dependable issues. First, the Aadhar verification by facial recognition technology, i.e. face verification for voter authentication is implemented at the level one of the authentication processes. In level two of authentication, another layer for confirmation of the identity issued by the government is added due to integration with Aadhar verification. The verification of the voter card is done to ensure that only the registered voters cast votes. The current e-voting system attempts to raise the security and preserve the integrity of the voting process through these three verification methods. Our model provides a reliable and efficient means of holding elections with minimum monitoring in the manual form while faster and more accurate results.

Ramya Govindaraj, P Kumaresan, et al. "**Online voting system using cloud** " [4],this study focuses on the weaknesses and shortcomings of traditional paper-ballot voting systems, which are usually associated with politics and vulnerable to errors and possible fraud. Ballots are mainly cast in person, causing problems such as long queues, time commitment, and sometimes unfairness. They proposed an electronic voting system that shifts from a manual to a digital environment in order to solve these problems and offer more access, convenience, and security. this technology removed the necessity for in-person presence and reduces time limitations by allowing voters to participate from any location. The inclusion of particular programs and projects that each political party has put into place is a distinctive element of this web platform, enabling voters to base their votes on meaningful results and suggestions. Apart from enhancing speed and convenience, this online voting system will empower voters and gain voter confidence in the use of digital voting by fostering a fairer and more transparent electoral process.

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Puja Sharma et al. "**secured smart voting system using aadhar**" [5], the proposed system aims to provide a voting process as much as possible secure and tamper-proof by using advanced authentication. A biometric authentication that is linked to the Aadhaar card of the voter is used to authenticate the same and the correctness of the vote. It is very well known how vote rigging takes place during elections. This authentication method removes all scope of fraud and, thus, aims at providing a higher integrity of voting. This feature, in the system, highlights increased percentages of voters to this electoral process- which includes, in this case, migrants. Keeping this objective in mind, an application was devised as a voting platform which would allow the voting migrant to vote from afar too. Their authentication mechanism depends upon their Aadhaar but would not require a voter ID card to access the system to ensure maximum checks via linkages under Aadhaar. It seeks to promote higher voting and greater confidence in the outcome of elections since it invokes accessibility to the polling station for those very voters who are based far away from each other and effective biometric authentication. Besides seeking to address major problems with traditional voting, this suggested approach aims at promoting a more effective and inclusive democratic process.

Rohit Sroa et al. "**A Visionary Approach to Smart Voting System**" [6],with issues of ballot cheating, EVM hacking, and booth capturing constantly plaguing the current election system in India, the COVID-19 pandemic has actually really brought home the need for an online voting system that could be trusted. Our study thus brings forward a new online voting system that employs hashgraph technology-which, by the way, is a better alternative than blockchain. Hashgraphs offer greater speed and security with the retention of anonymous voter identities and transparency for public validation. Layered authentication requires identification, an Aadhaar card, and face recognition for adding extra layers of security and legitimacy to each vote. The login process is secured and unwarranted entry prevented using JWT: JSON Web Token authentication.With each voter, this system assigns a unique encrypted ID as soon as the individual casts his ballot, hence confirming whether or not he was counted. The entire database is held in utmost secure conditions, and each vote is collected using homomorphic encryption, which permits votes to be tallied safely without jeopardizing private information. The system also comes with a chatbot, offering voters real-time support during voting, to assist them even more. This paper studies the usability of proposed systems in rendering an exhaustive, end-to-end verifiable, and safe online voting solution, which is, in itself, a critical component in developing India's electoral infrastructure.

Uma Hombal 1 et al. "**Online Voting System with Face Recognition and One Time Password**" [7], democracy itself starts with the procedure of an election, but the current system of voting in India with the usage of EVMs or secret ballot is cumbersome, costly, and full of cheating. The chances of fraudulent voting are high in the old systems that basically depend upon document verification for most cases. Our proposed system aims at building an online voting platform that blends face recognition with a camera and OTP authentication as a way of greatly minimizing voter fraud that is constantly observed in manual and former online voting methods.For those who cannot attend their designated polling station, the system provides a remote voting platform. The voting mechanism will be ensured to be reliable using several layers of security including face recognition, OTP verification, and data validation. The voting mechanism will be accessible only to voters confirmed through validation against the official voter database. As the matching facial data will ensure authenticity and correctness, each voter can securely select his favorite candidate after authentication. This scheme enhances the integrity of voting by making it safer and easy to use.

S. Prakash, V. Sahu and L. Kumar, "**Blockchain Based E-Voting System**" [8], in our experiment, we designed a blockchain-based electronic voting mechanism within a Django web application. Utilizing the security and transparency of blockchain, this approach is hoped to bypass digital voting challenges. Although voting is very integral to democracy, many nations are still using archaic paper-based voting processes, which seem out of the realm of the twenty-first century. With technology advancing, the world requires a highly secure, dependable, and flexible digital voting system that meets the demands of today's world. Digital voting will make voting easier because people can be able to cast their ballot electronically using either web browsers or polling station machines. In our project, we have an electronic voting system implemented inside a Django web application using blockchain technology. The strategy here is to avoid the troubles associated with digital voting and utilize the security and transparency of blockchain technology. Voting is very fundamental to democracy yet most countries are still using very primitive paper-based voting procedures that do not seem relevant for the twenty-first century. A very safe, reliable, and flexible digital voting system is needed as the world continues to advance with new technologies. Digital voting will make voting easier because voters will cast their ballots electronically either by using web browsers or by using computers in the polling stations.

V. Nanammal, J. Jebastine and R. J. Balajivasan, "**Voting Machine for Blind and Amyotrophic Lateral Sclerosis People**" [9], their initial research focuses on an innovative voting system designed for individuals with ALS or visual impairment. ALS is a debilitating condition that affects mobility in various parts of the body, rendering some people incapable of movement, speech, and even head turning. Nevertheless, they must still participate in voting processes. Sadly, due to the current system relying on visual emblems, they depend on assistance when it comes to casting votes

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which can result in voting for the wrong candidate. To address this concern, we introduce a voting characteristic based on a brain wave sensor whereby the voter listens to the audio version of a candidate's logo through headphones. The voter is expected to blink at a certain time, and the system registers the blink as a vote.

K. M, G. P. V, K. Ramar and S. Hariharan, "**Secure E-Voting System using Deep Learning Techniques"** [10], the study proposes ways to protect voter's privacy and voter's identity by employing fingerprint scanners and other biometrics based on machine learning algorithms. The major issue is also the data security and privacy due to the lack of adequate and proper planning for the safe storage and management of sensitive voter data. In order to maintain public confidence, the demands for data protection are growing higher than ever. In addition, an over-reliance on finger and other biometric scans at the polls risks excluding some voters such as the physically challenged, aged without thumbprints due to manual labor, or those without biometric devices. Lastly, the study does not address the issue of the performance of the machine learning models in regard to the biometric variations that come with aging, health or environmental factors.

S. P, P. P and S. L. R, "**Voting System based on BlockChain and using Iris Recognition"** [11],this project's voting database will be highly secure and efficient within the Block Chain sphere. Another aspect of this technology that is commendable is the use of iris authentication. With a blockchain-enabled database, the voting information will be trustworthy, non-corruptible and swift in retrieval. The approved results monitoring makes the election exercise secure, expeditious and efficient. Iris Recognition utilize infrared strikes to capture the unique patterns of the iris and then, it translates them into an encrypted bit pattern that must be presented at the time of voting. This is because, the Iris Scanning technique does not work well, based because the Iris Recognition System is not capable of scanning their iris patterns accurately.

Odikwa, H. N., Ekong, A. P., & Thom-Manuel, O. M. (2020), "**Design and implementation of electronic voting system for blind individual and blind persons in Sub-Saharan Africa"** [12]**,** this paper propounds an accessible means by which blind individual and blind people vote in elections and campaigns through preferring their candidates by electronic devices, especially those needing color differentiation. This led to the web-based voting application, that is designed meeting the accessible standards of websites for all blind individual users.The application was tested to check functionality using structured data flow diagrams. In results, 90% of the participants expressed interest in the use of the system, realizing it is a better alternative than the commonly used paper-based voting model by electoral bodies in much of Sub-Saharan Africa. Majority answered that this application would move them to vote in such elections. However, for 10% of all respondents, the fear had been that governments would become oblivious of the deployment such tools, hence further alienation from electoral processes. Anyway, these respondents said if they were provided with one of the devices, possibly they would vote from the comfort of their homes from where, if assured; their vote would count.

S. -i. Kang and I. -y. Lee, "**A Study on the Electronic Voting System using blind Signature for Anonymity**" [13], the rapid development of information technology has highly improved electronic government, which now facilitates people's access to civil and government services easily and efficiently. Apart from civil affairs management, electronic government has expanded to online voting systems that support democratic principles. The overall system is devised to securely manage and record voting data, thus avoiding any interference from third parties or system errors in results. So voters cannot be identified, with robust techniques to secure then make trustworthy electronic voting systems. Techniques such as "blinding signatures" may so that the voting can go on anonymously and in the sense of no receipt being used. Conversely, for all eligible voters, produce an electronic paper receipt such that the voter can check correctness with complete transparency and belief in the voting process.

Cross E.V. et al. "**The Experience of Accessible Voting: Results of a Survey among Legally-Blind Users**" [14], the Help America Vote Act of 2002 required all polling stations to provide the opportunity for voting for disabled people in federal elections, but there is hardly any information available to assist with the design of voting systems that would accommodate the needs of the blind individual citizenry. To this end, we conducted an online survey of 180 voting-age Americans who are legally blind to get input on their voting experiences and ideas about how voting technology could be improved. We learned that most of our respondents want to vote in person at polling places. Among the accessible voting options, the audio systems using a recorded human male voice were preferred to other alternatives, such as Braille. But we also found important challenges: 24% of our respondents reported having a problem because poll workers had not received adequate training with accessible technology. This problem was reported by more respondents who had experienced a previous need for assistance from poll workers. Such insights are further used in developing more accessible and easy-to-use voting interfaces and guiding the way toward much more inclusive voting experience among the blind individual persons.

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Gilbert, J.E., McMillian, Y., Rouse, K. et al. "**Universal access in e-voting for the blind**" [15], since the advent of elections, not all voters have enjoyed equal access to privacy, security, and ease in casting their ballots. Modern electronic voting systems have tried to make voting accessible for people with disabilities, but these efforts have often been inadequate. By leveraging recent technological advances, a secure, user-friendly, multimodal electronic voting system has been developed to explore how different modes of interaction can enhance equity in voting access, privacy, and security. The paper discusses results from research at the Alabama Institute for the Deaf and Blind with more than 35 participants who were blind or blind individual, using a multimodal voting system. This is an approach that proves easy to use, trusted as a method of casting one's vote, thereby holding great potential in providing a more accessible vote.

METHODOLOGY

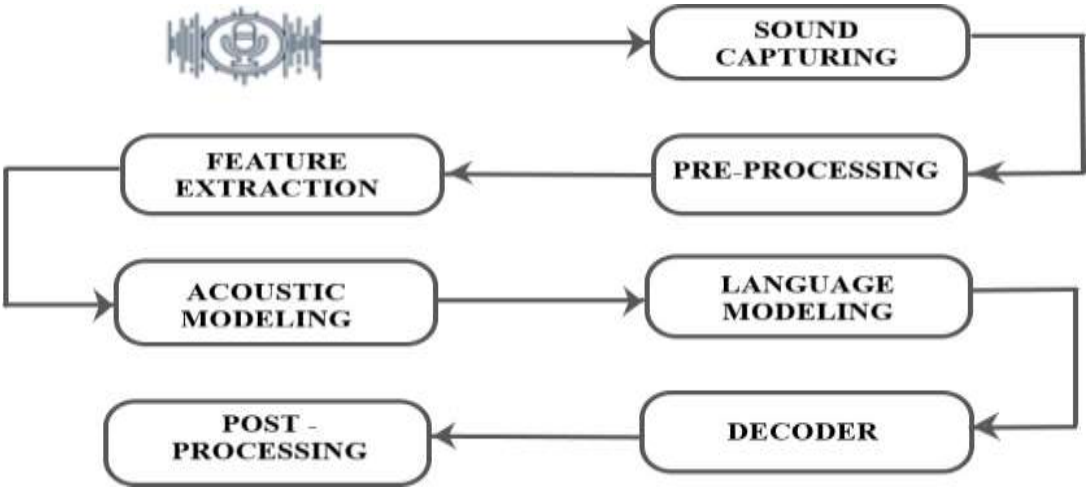

Figure 1.1

The "AI driven Voting System for the Blind individuals" develops step by step, commencing from sound capturing, which is defined as the act of recording the voice of an individual using a microphone or any other audio device. In the feature extraction process, the unprocessed sound or audio is transferred into encoded vectors also known as feature vectors that capture various characteristics of pronunciation either in terms of its energy levels or frequency content. Normalized features are corrupted on purpose and corrected in inverse methods. The next stage of the acoustic modeling process is to train on previously created datasets of labeled speech and then to apply machine learning forms to relate phonemes with vectors known as feature vectors. As a means of enhancing the effectiveness of the system, even the phase of language modeling tries to look and understand the arrangement of the languages in order to predict the possible sequences of words. The output is made better through corrective measures by addressing common errors and formatting the output to make it more user-friendly after speech processing. The feature vectors are then processed in the next phase called the decoder, where again the two models linguistic and acoustic are applied, and the best-matching word sequence according to the voice input is anticipated. This systematic approach ensures that everyone, even those with visual disabilities, can take part in domestic elections and guarantees the simplicity and user-friendliness of the voting system.

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SYSTEM WORKFLOW

Figure 1.2

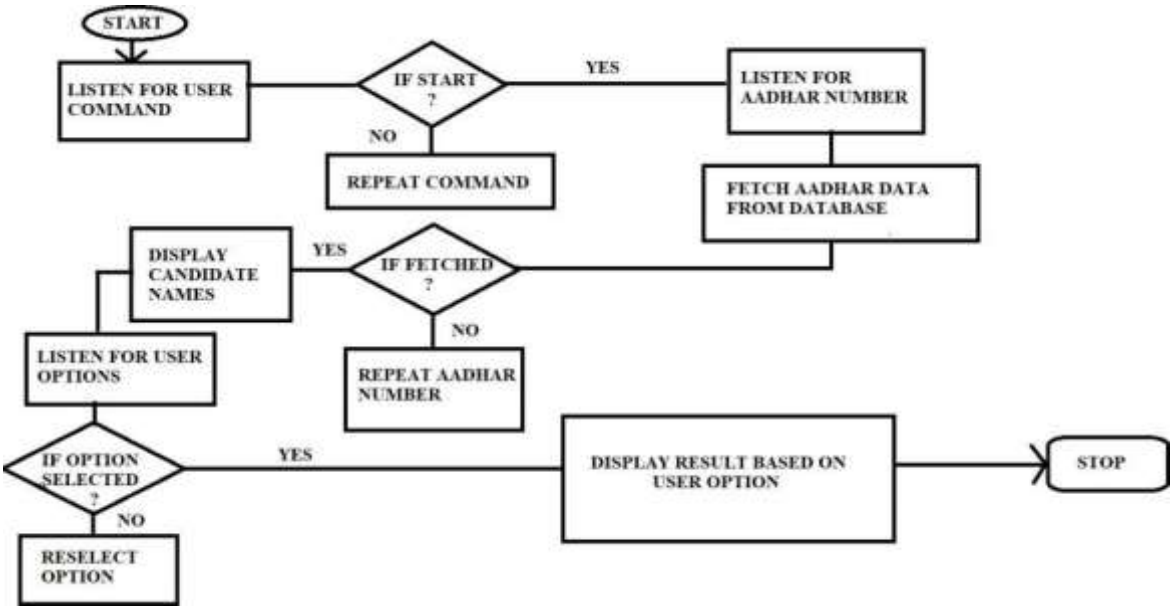

Figure 1.2 is designed to facilitate voting for blind individuals using voice interaction. The key features are:

1. **Start and Stop Commands:** The program is initiated with the voice command "start" and terminated with "stop."
2. **Aadhar Authentication:** Upon starting, the system prompts the user to speak their Aadhar card number, using speech recognition to capture the input and retrieve corresponding data from a MySQL database.
3. **Candidate Selection:** The system displays and reads aloud a list of candidates using Streamlit and text-to-speech (pyttsx3). The user selects a candidate by speaking the corresponding number.
4. **Confirmation:** The selected candidate is displayed and confirmed.
5. **Graceful Exit:** The program can be stopped at any point with the "stop" command.

EXPECTED OUTCOME

This sophisticated approach ensures a smooth and user-friendly voting experience by allowing voters to cast their ballots using straightforward voice commands employing Natural Language Processing (NLP). The technique effectively does away with the requirement for paper ballots and conventional biometric authentication by using speech recognition technology to protect the privacy of voters' selections. Ultimately, the satisfactory outcome is uniformly inclusive election system which will allow blind individual to participate in the electoral process without fear and with great ease.

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