

Enhancing Accessibility Through Digital Voter Id Integration

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Abstract: Sri Lanka's present voting system has few complications especially to young voters and to citizens living overseas. Lack of access, manual approaches and lacking a standard go hamper participation and effectiveness. With the ubiquitous nature of mobile technology, there is a chance to revolutionize voting through digital innovation. This paper contributes to the development of a secure and available digital voting system for the citizens of Sri Lanka. The Digital Voter ID, thus, should be conceived with the use of biometric. Three-level verification system is proposed where National Identity Card (NIC) number checking, face recognition and fingerprint comparison is maintained. People can register online with their NIC and then issued a Digital Voter ID. Local voters can vote at polling centers during the election period and overseas voters are voting in Sri Lankan embassies. The system is illustrated using a prototype and use-case simulation. The framework suggests expanded access, particularly for young and overseas voters. It provides for secure authentication, eliminates potential for human error and eases logistics of standard voting systems. This study provides a workable model that could be used to reform Sri Lankan electoral process. Through the use of mobile and biometrics, the suggested solution can increase voter participation; security as well inclusiveness and transparency in elections. With more refinement and state backing, such a system could very well become integral in the future of democratic participation in Sri Lanka.

Keywords: *Biometric; Electronic Voting System; Fingerprint; Verification; Validation.*

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I. INTRODUCTION

The development of Sri Lanka can be analytically evaluated through its economic progress. In many instances, economic challenges arise primarily due to the absence of effective administrative and governance structures. Establishing a sound governance framework is one of the foremost duties of every responsible citizen. In pursuit of better economic opportunities, many citizens particularly the youth migrate to other regions or foreign countries. Consequently, they are often unable to fulfill certain civic responsibilities within their homeland. Voting in democratic elections represents both a fundamental right and a civic duty of every citizen, as it plays a crucial role in shaping the

direction of the nation. However, a considerable proportion of citizens working abroad are unable to participate in national elections due to geographical and logistical constraints. To address this issue, it is essential that the government implement an efficient and inclusive mechanism that enables all eligible citizens to exercise their voting rights. Currently, several technological initiatives are being introduced to improve the electoral process, with biometric verification emerging as a key innovation. Factors such as electoral fraud, manipulation, and vote rigging highlight the urgent need for a more secure, transparent, and reliable voting system. In response to these challenges, electronic voting (e-voting) has emerged as a widely adopted solution across the world, offering a promising alternative to

conventional voting practices (Kohno, T., Stubblefield, A., Rubin, A. D., & Wallach, D. S., 2004). The rise of the internet has greatly enhanced electronic voting systems were among the first to propose an electronic voting protocol (Chaum, 1981). For more than forty years, researchers have strived to enhance e-voting systems to fulfill essential security standards and enable broader applications (Gao, W., Fu, T., Ren, S., Jin, S., Dong, X., & Zhao, Z, 2025). Public perception of voting systems, particularly regarding trust in both traditional and electronic methods, highlights various security concerns, though potential solutions exist, traditional voting processes are often criticized for their lack of transparency and susceptibility to manipulation. Moreover, conventional voting is frequently described as slow and inefficient, and for decades, it has been associated with instances of electoral malpractice (Ahmed, N., & Pattanasetty, P., 2024). Voting methods such as mail-in ballots, early voting, and other convenience-based approaches have generated significant debate. Proponents argue that these practices enhance political participation whereas critics contend that such methods may increase the risk of electoral fraud compared to in-person voting on Election Day (Cantoni, E., Pons, V., & Schafer, J., 2025). This system integrates three forms of identification national identity card, fingerprint, and facial recognition to ensure accurate voter authentication and prevent electoral irregularities. Furthermore, this technology can be effectively utilized through diplomatic missions, enabling citizens residing abroad to vote securely. Such initiatives are expected to significantly enhance overall voter turnout and strengthen democratic participation. The primary objective of this research is to propose an effective implementation strategy that facilitates secure, transparent, and inclusive voting processes within and beyond national boundaries.

II. LITERATURE REVIEW

During election periods, significant attention must be devoted to safeguarding citizens' personal data and votes. The adoption of digital platforms can enhance the efficiency of the voting process, helping to prevent fraudulent votes while ensuring the overall integrity and security of the electoral system (Haque, M. N. U., & Ansari, A. A., 2025). By leveraging digital technologies, citizens are able to register and manage their information online, thereby minimizing the need to visit government offices in person. Online submission of applications further reduces administrative delays and prevents overcrowding (Chaturvedi, 2025). Additionally, biometric technologies allow data to be securely recorded, thereby mitigating the risk of fraudulent information. This approach demonstrates strong potential for large-scale implementation during election periods (Revathi, S., & ELangovan, V. R, 2025). The integration of such digital systems enables faster processing and more efficient management of voter data. Consequently, voters can cast their votes more easily, fostering better public understanding of the system and greater trust among citizens (Rinda, 2025). The primary objective of implementing these strategies is to ensure that all voters, including differently abled individuals, are able to participate effectively in the voting process (Sari, 2025).

➤ Problem Statement

The primary reason for this issue is that young people often face difficulties in casting their votes during election periods. Many are employed in various locations due to occupational requirements, while some work abroad, making it challenging for them to return to their home country in time to vote. Even those residing away from their hometowns within the same country often encounter difficulties in participating in the voting process. Furthermore, individuals with disabilities also face significant challenges in exercising their voting rights, as attending polling stations at the designated time can be particularly difficult. Such challenges emerge as recurring issues during each election period and are often difficult to overcome or avoid. Employees, particularly those working in the private sector, must manage their time carefully to reach polling stations and cast their votes. However, many are unable to take time off work, and even if they do, returning to work on time can be problematic, potentially resulting in the loss of a day's wages. In addition to these barriers, several societal issues persist, including the occurrence of fraudulent votes, fake identities, and the participation of impersonators in elections. These factors create significant challenges in maintaining fairness and transparency in the electoral process. Therefore, to prevent such problems and mitigate future complications, it is essential that every individual fulfills their civic duty by casting their vote. Voting serves as a vital link that strengthens the foundation of democracy. In this regard, it is necessary to develop new initiatives aimed at improving voter participation and accessibility. This research has been undertaken with the objective of contributing meaningfully toward that goal.

III. ACCESSIBILITY METHODOLOGY

To ensure that the existing voting procedures are not disrupted, this new initiative can be implemented in a way that benefits specific groups of voters while maintaining compatibility with the current system. Consequently, it becomes the responsibility of the government to monitor and ensure that no complications arise within the traditional process. This study is particularly beneficial for individuals who have relocated due to employment or other obligations, as it offers a feasible solution without causing any disruption. As mentioned earlier, certain measures can be developed through future research to prevent fraudulent voting activities. Voters residing in any part of the world can participate as citizens of their respective country, as the proposed system enables accessibility for individuals living in different locations. The system is designed to address the issue of low voter turnout, depending on situational and geographical challenges. Citizens residing overseas may cast their votes by visiting the embassy of their home country, while local citizens can access designated centers where the system is installed. Furthermore, voters who prefer convenience may be provided with the option to cast their votes digitally through technological means. To effectively implement this approach, several procedural steps must be established, which are discussed in the following section.

➤ *Requirement Analysis*

There are three main sources required for this purpose: national identification, fingerprint access, and facial recognition. These components are essential for verifying a voter’s identity. Using these sources, voters can submit their information for registration and identity verification. The verifier must review and validate the submitted documents and registration details before the voter is allowed to cast their vote. The voter must possess a national identity

document as proof of nationality, which serves as verification for eligibility to cast a vote in the election. The system then authenticates the voter’s verification to ensure a secure and reliable voting process.

➤ *Registration Process*

The registration component is described in the subsequent section, detailing the functional process of the proposed system.

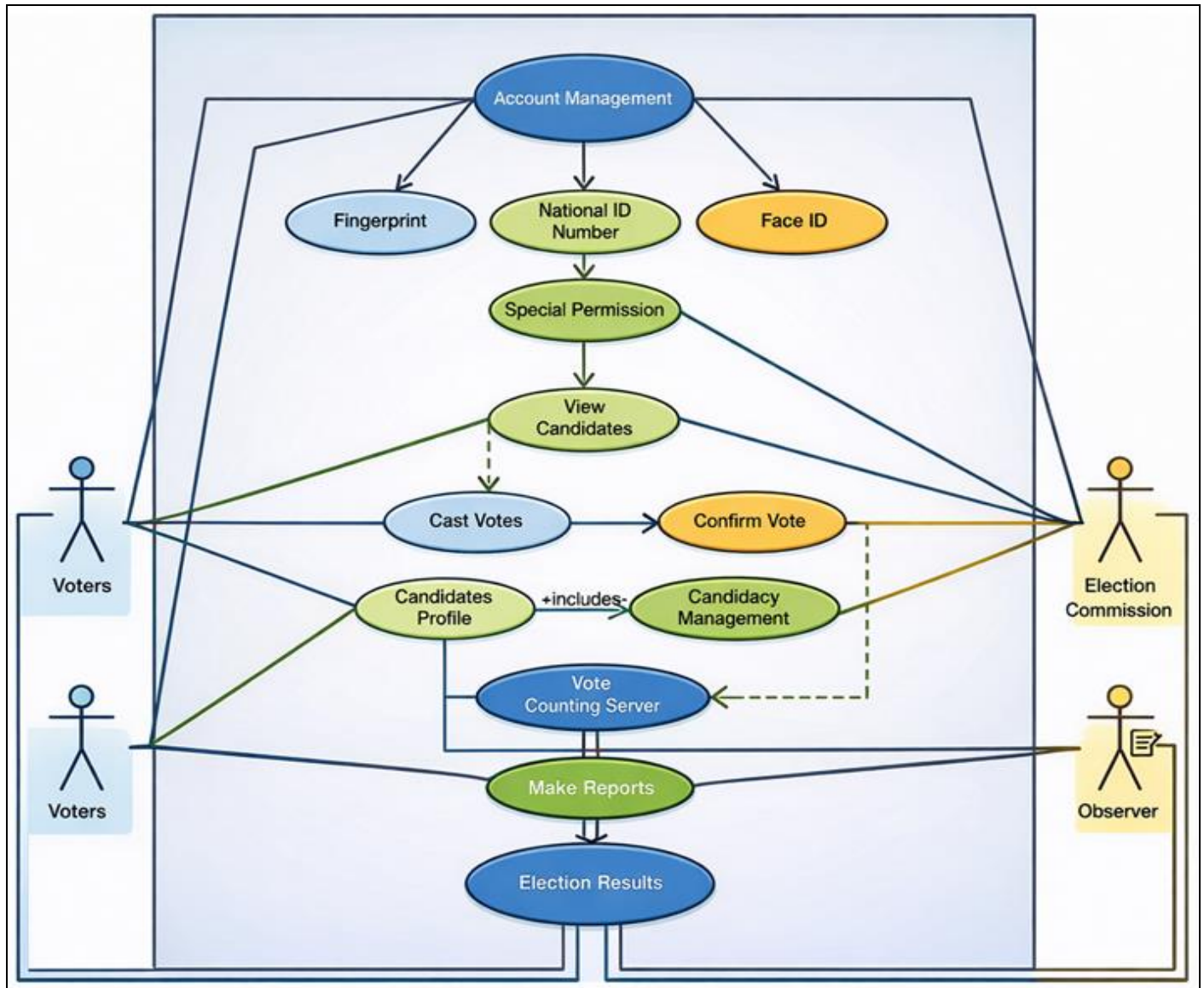


Fig 1 Illustrates the Registration Process of the Proposed System (Hossain Faruk, M. J., Alam, F., Islam, M., & Rahman, A, 2024).

➤ *Biometric Backend Process*

At this stage, the process flow diagram illustrates how a voter registers their personal identification details within the system. The method by which individuals are registered is clearly depicted in the image provided below. Specifically, data such as fingerprint and facial recognition are recorded and securely stored in the database. Once stored, the system verifies the authenticity of the voter’s information. During election periods, voters are required to visit their designated polling stations, where their biometric data are authenticated

to confirm their identity before casting their votes. This biometric verification ensures the accuracy and integrity of voter identification. Furthermore, this technology is designed to facilitate participation for voters who may need to travel long distances by enabling verification at distributed polling centers established across various regions Fig. 2 illustrates the process of enrolment, verification, identification, and matching within the biometric authentication system.

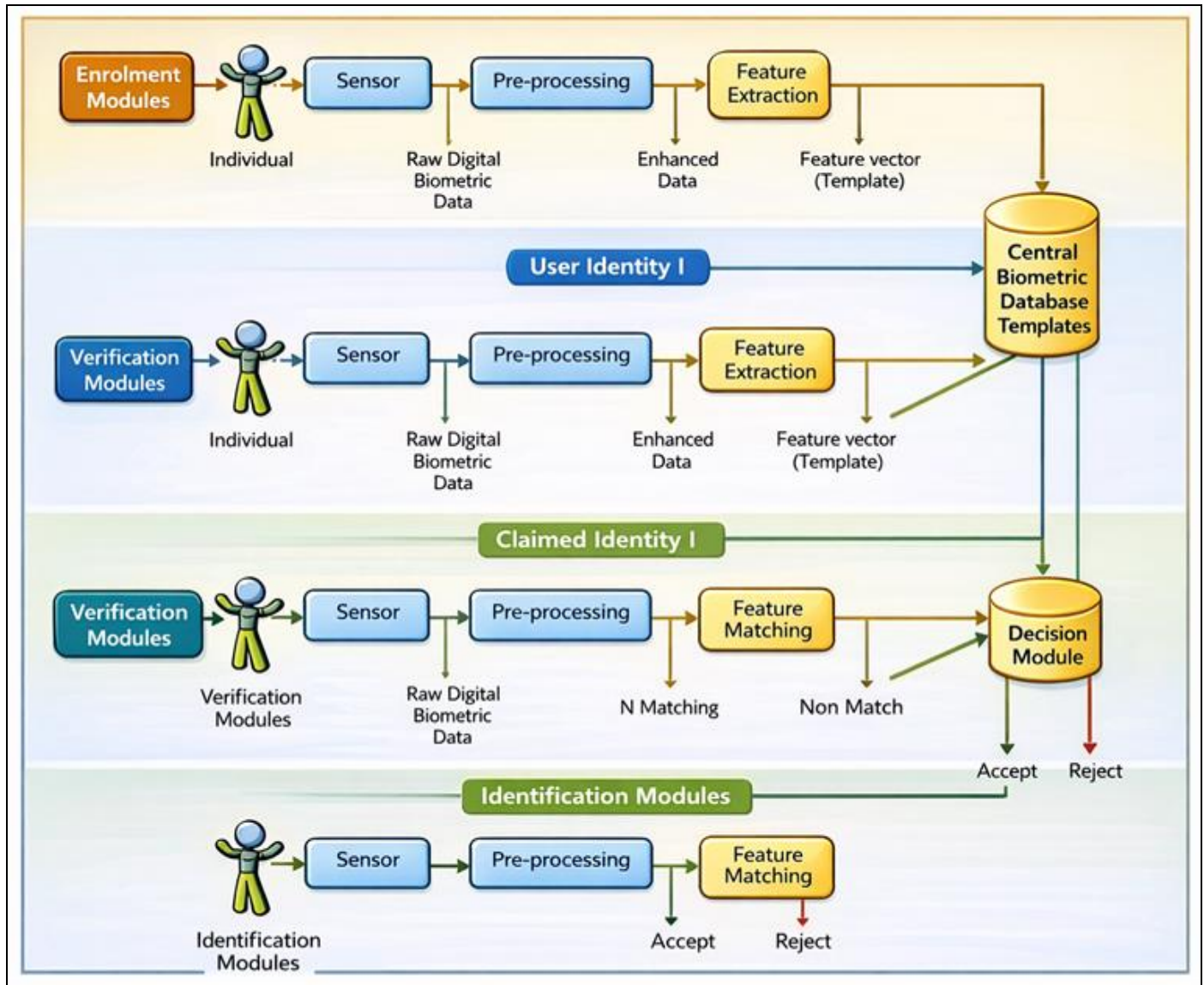


Fig 2 Illustrates the Process of Enrollement, Verification, Identification and Matching (Hossain Faruk, M. J., Alam, F., Islam, M., & Rahman, A, 2024)

IV. CONCLUSION

This research serves as a significant bridge toward societal advancement, particularly by providing a means to reduce the need for voters to travel long distances and enabling them to cast their votes efficiently and on time. Over the past several decades, such an initiative has not been undertaken, making this study a novel contribution aimed at enhancing voter accessibility. The research was conducted with the participation of more than 200 individuals, including employees from other districts and overseas, who were contacted through social media platforms. Based on their feedback and perspectives, the feasibility of this system was assessed, and approximately 95% of participants expressed positive opinions regarding its practicality. The findings indicate that the enhancement of democracy not only lies in transforming electoral mechanisms but also in ensuring active public participation in exercising their voting rights. The study further demonstrates that the proposed system minimizes the

possibility of errors, thereby establishing its reliability and effectiveness.

REFERENCES

- [1]. Kohno, T., Stubblefield, A., Rubin, A. D., & Wallach, D. S., "Analysis of an electronic voting system," in *In Proceedings of the IEEE Symposium on Security and Privacy*, 2004.
- [2]. D. L. Chaum, "Untraceable electronic mail, return addresses, and digital pseudonyms. *Communications of the ACM*," pp. 24(2), 84-90., 1981.
- [3]. Gao, W., Fu, T., Ren, S., Jin, S., Dong, X., & Zhao, Z., "Logarithmic NTRU-Based Certificateless Ring Signature in E-Voting Applications," *Electronics*, pp. 14(7), 1358, 2025.
- [4]. Ahmed, N., & Pattanasetty, P., "Online voting system," *Journal of Scientific Research and Technology*, pp. 41, 41–58, 2024.

- [5]. Cantoni, E., Pons, V., & Schafer, J., "Voting rules, turnout, and economic policies," *Annual Review of Economics*, pp. 17, 1–25, 2025.
- [6]. Haque, M. N. U., & Ansari, A. A., "Design and Implementation of an Aadhaar-Based E-Voting System with Facial Recognition for Enhanced Security and Accessibility," in *In 2025 IEEE International Students' Conference on Electrical, Electronics and Computer Science (SCEECS)*, 2025.
- [7]. S. Chaturvedi, "The Digital Transformation of Indian Elections: Opportunities and Challenges for Democratic Integrity," *IJSAT-International Journal on Science and Technology*, p. 16(1), 2025.
- [8]. Revathi, S., & ELangovan, V. R., "Fostering Democratic Transparency: A Secure Voting System with Aadhaar Cards on the Ethereum Blockchain Technology," in *In International Conference on Mathematical Modeling and Computational Science*, 2025.
- [9]. S. A. Rinda, "IMPLEMENTATION OF THE VOTER INFORMATION SYSTEM APPLICATION (SIDALIH) IN THE DIGITAL VOTER TRANSFER SERVICES AT KPU BANYUMAS," in *Diploma International Proceeding*, 2025.
- [10]. A. R. Sari, "Government strategies in increasing public participation in general elections," pp. 2(5), 1407-1511, 2025.
- [11]. Hossain Faruk, M. J., Alam, F., Islam, M., & Rahman, A., "Transforming online voting: a novel system utilizing blockchain and biometric verification for enhanced security, privacy, and transparency," *Cluster Computing*, pp. 27(4), 4015-4034, 2024.