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Biometric-Based Electronic Voting System

M. Satyanarayana[1], Rajiv Pranam. T[2], P. Sai Charan Reddy[3], S. Sai Srinivas[4]
[1]*Assistant Professor,* [2, 3, 4]*UG Students, Department of Electronics and Communication Engineering, TKR College of Engineering and Technology, Telangana, India*

Abstract: ***This project presents the design and implementation of an electronic voting machine (EVM) that uses fingerprint verification to enhance the security and accuracy of the voting process. The EVM is integrated with an SQLite database to store voters' fingerprint data and personal details.***
The system allows voters to cast their votes by verifying their identity through fingerprint recognition and pressing a button on the EVM. Once a vote is cast, the voter receives a message on their mobile device to confirm that their vote has been recorded. The project aims to address the challenges of traditional voting systems and offer a more secure and reliable method for election management.
Keywords: Raspberry Pi, Fingerprint scanner, GSM module, SQlite3, Python.

I. INTRODUCTION

In a democratic country like India, the right to vote and elect leaders is a fundamental right of every citizen. Voting is not only limited to the election of government leaders but is also conducted in various institutions like colleges, societies, etc. As technology progressed, electronic voting machines (EVMs) were introduced as an alternative to traditional paper ballots. EVMs were designed to improve the efficiency and accuracy of the voting process, making it faster and more reliable.

EVMs allow voters to cast their votes by pressing a button corresponding to their chosen candidate's name and symbol. The votes are then recorded and stored electronically on the machine. While EVMs were designed with tamper-proof features, they have still been susceptible to tampering during the verification process. This tampering may involve the use of fake voter IDs or bribery of officials at the polling stations.

To ensure the integrity of the voting process and eliminate the possibility of tampering, new technologies are being explored. Biometric-based electronic voting systems utilize fingerprint verification to authenticate voters, thereby reducing the possibility of malpractices. The objective of such systems is to safeguard citizens' right to vote and guarantee fair elections. As technology continues to evolve, it is essential to explore new ways to ensure the accuracy and integrity of the voting process to maintain a democratic society.

II. LITERATURE SURVEY

Surveys played a very vital role in this project we have learned about various e-voting systems and the challenges associated with their implementation. The paper on "Design of a secured e-voting system" uses the homomorphic property and blind signature scheme, and verifies voter eligibility using RFID.

The paper "A better ballot box?" explores different technologies being used to address voting challenges, including mark-sense balloting, Internet, and ATM kiosk-style computer-based systems. However, it also highlights the risks associated with new electronic voting systems, such as less accountability and greater potential for fraud. The paper "A Secure e-Government's e-voting System" presents a cost-effective and secure e-voting system that overcomes challenges such as election result alteration, unauthorized voting, uncounted votes, and maintaining ballot data secrecy.

It also provides security evaluations to validate the system's privacy, accuracy, reusability, eligibility, and integrity. Overall, the information highlights the importance of ensuring the security and reliability of e-voting systems to foster public trust in the electoral process. It also emphasizes the need for thorough testing and evaluation of different e-voting technologies to address the challenges associated with their implementation.

III. OBJECTIVE

The primary aim of this project is to establish a secure and trusted environment that ensures voters can cast their votes without any risk of fraudulent voting practices, thereby minimizing the possibility of fake voting incidents.

IV. BLOCK DIAGRAM

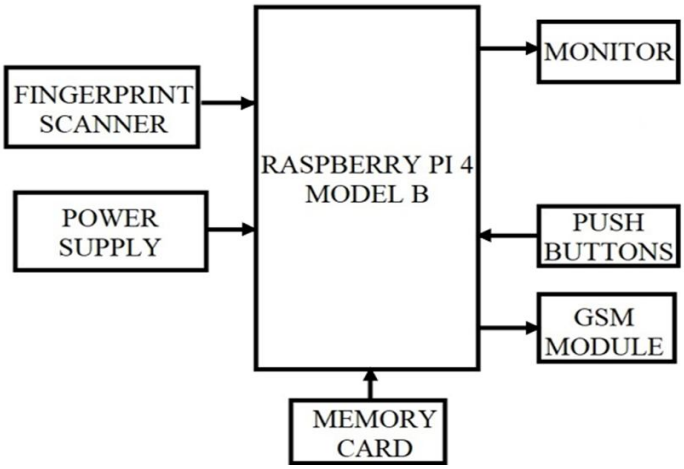

Fig. 1 Block Diagram

A. Raspberry Pi 4

The Raspberry Pi 4 Model B is a single-board computer developed by the Raspberry Pi Foundation.

B. Fingerprint Scanner R307

The R307 fingerprint scanner is a small, low-cost module used for fingerprint recognition and authentication.

C. GSM Module

GSM SIM900A is a quad-band GSM/GPRS module that can be used to make or receive voice calls and send or receive SMS messages.

V. PROPOSED SYSTEM

The proposed system is a Biometric based Electronic Voting System. The voter's details and fingerprints are stored in our database. The voter is identified based on his biometrics and if authenticated he will be eligible to cast his vote by pressing the button beside his favorable party, we indicate the count of the vote with a LED and a Buzzer. The proposed system stores the results of voting in an Excel sheet. A GSM Module is connected to the Raspberry Pi so that a "Thank you for casting your vote" message is sent to the respected voter's mobile if a vote is cast.

VI. WORKING

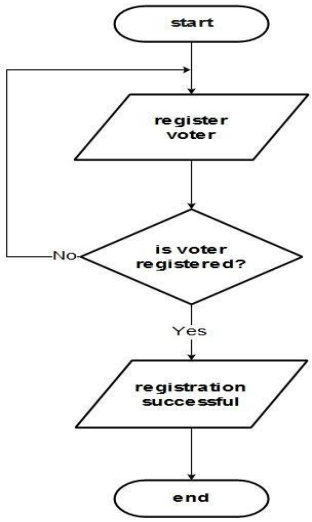

Fig. 2 Flow Chart of Voter Enrolment

The above fig is a flowchart of the fingerprint Enrolment of a voter.

1) *Step 1:* The first step is to initiate the enrollment process where the voter's details such as name, age, and phone number are collected.
2) *Step 2:* The next step is to capture the voter's fingerprint image using a fingerprint scanner device.
3) *Step 3:* The captured fingerprint image is then processed and stored in the SQLite database along with the voter's details.
4) *Step 4:* If the fingerprint image is not of good quality and cannot be stored in the database, the system prompts the voter to re-register by capturing the fingerprint image again.
5) *Step 5:* The system ensures that only one set of voter details and fingerprint images is stored in the database, and multiple registrations are not allowed.

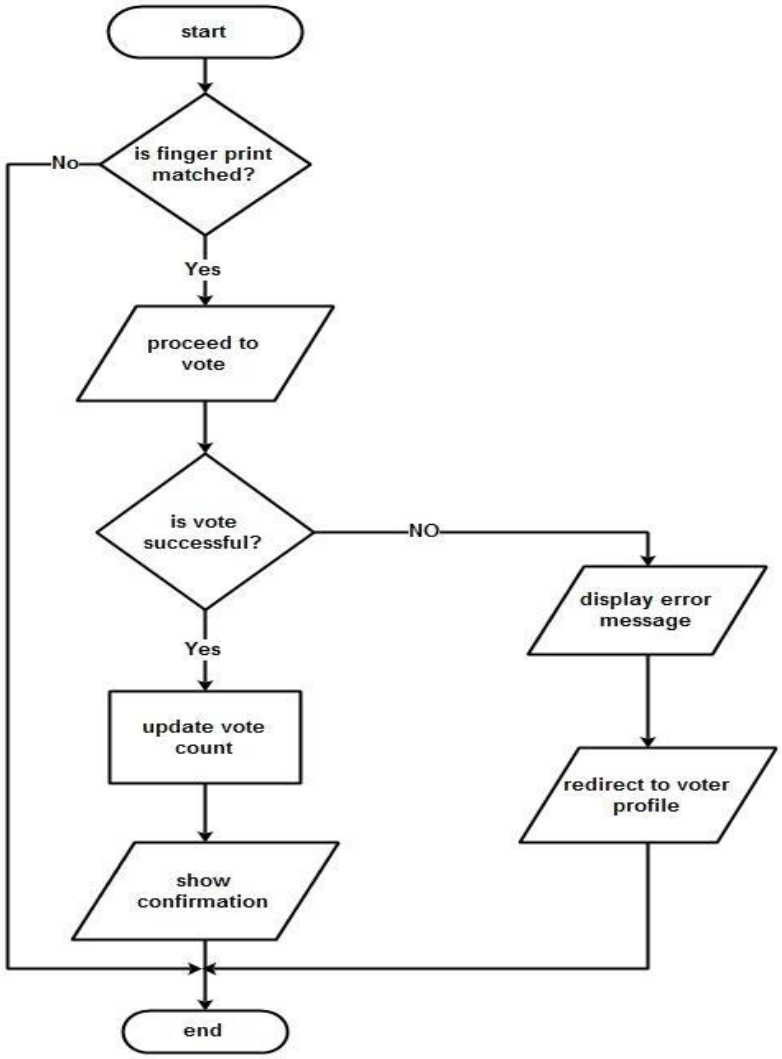

Fig. 3 Flowchart of Voter Verification

The above fig shows the flowchart of fingerprint verification

1) *Step 1:* The voter places his finger on the fingerprint scanner for verification.
2) *Step 2:* The system searches for the voter's fingerprint in the database.
3) *Step 3:* If the fingerprint is found, the voter is allowed to cast his vote.
4) *Step 4:* The voter selects his preferred candidate by pressing the button beside the party symbol.
5) *Step 5:* After the voter has cast his vote, the system generates an alert message and sends it to the voter's mobile number.
6) *Step 6:* The voting results are stored in an Excel sheet for later analysis and reporting.

VII. RESULTS

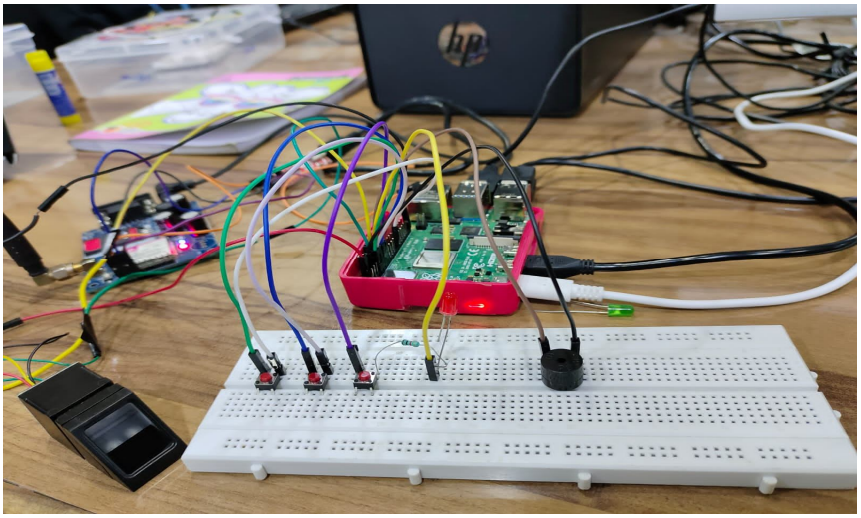

Fig. 4 Biometric-based EVM

voting_results

	A	B	C	D
1	Candidate	Votes		
2	Candidate 1	2		
3	Candidate 2	1		
4	Candidate 3	0		
5	Total Votes	3		
6				
7				
8				
9				
10				
11				
12				

Fig. 5 Voting Results in Excel sheet

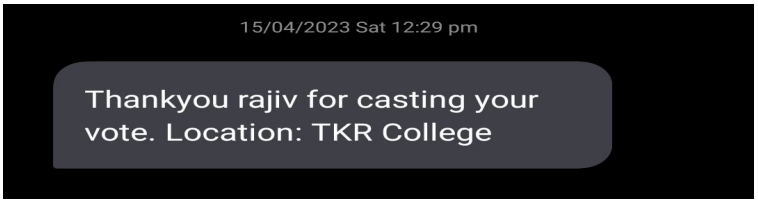

Fig. 6 SMS Sent through GSM

VIII. CONCLUSION

In conclusion, the implementation of a Biometric based electronic voting system is a significant step toward ensuring the security and accuracy of the voting process. By enrolling voters and storing their details in an SQLite database, the system is able to verify their identity and allow them to cast their votes. The added feature of sending an alert message to the voter's mobile after casting their vote enhances transparency and builds trust in the electoral process. Moreover, the ability to store voting results in an Excel sheet enables easy analysis of the election outcome. This project has the potential to revolutionize the voting process and contribute to the development of more secure and reliable electronic voting systems in the future.

IX. FUTURE SCOPE

The future scope for biometric verification-based Electronic Voting Machines (EVMs) in India is significant. With the growing need for secure and reliable voting systems, biometric verification can provide a higher level of security and accuracy in the electoral process. The system can be enhanced by incorporating additional security measures such as facial recognition and iris scanning for voter authentication. One potential area of development is to integrate the biometric verification system with a blockchain-based voting system. This would provide an even higher level of security, transparency, and accountability in the electoral process, making it virtually impossible for any kind of manipulation or fraud.

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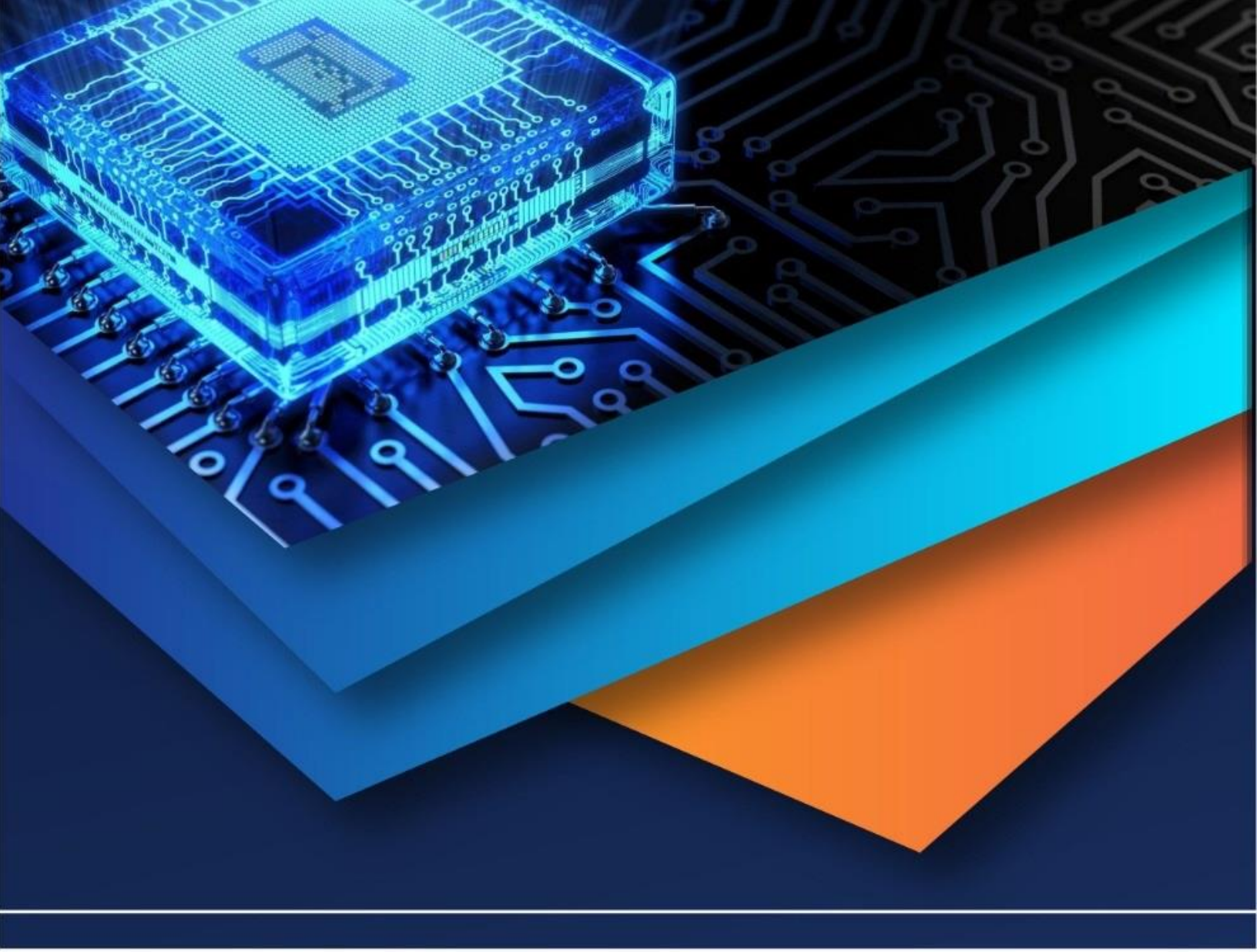

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