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IOT BASED ONLINE VOTING SYSTEM WITH FINGERPRINT VERIFICATION

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ABSTRACT :

The advent of technology has ushered in a new era of innovation, impacting various facets of our lives, including democratic processes. The "Online Voting System" represents a paradigm shift in the way citizens participate in elections, leveraging digital platforms to enhance accessibility, efficiency, and security in the electoral process. This research paper delves into the design, implementation, and evaluation of an online voting system. It explores the key components, such as voter authentication, ballot casting, and result tabulation, while addressing the challenges associated with ensuring the integrity and confidentiality of the voting process. The study evaluates the system's robustness against potential cyber threats and analyzes the user experience to gauge its feasibility on a largescale.Additionally, the paper discusses the legal and ethical considerations surrounding online voting, examining the implications for inclusivity and voter turnout. Comparative assessments with traditional voting methods shed light on the advantages and drawbacks of transitioning to an online model. the findings of this research aim to contribute valuable insights to policymakers, election commissions, and technologists, fostering informed discussions on the future integration of online voting systems into democratic processes. As societies evolve in the digital age, understanding the nuances of online voting becomes imperative to ensure the continued integrity and legitimacy of democratic institutions.

Keywords ***:-Fingerprint based voting system,Online voting system,Online electionsystem,AADHAAR ID based, E-Government Remote Voting Election Technology.***

1.INTRODUCTION

An online voting system that integrates cutting-edge fingerprint sensor and face recognition technologies represents a transformative approach to democratic participation. By enabling eligible voters to conveniently cast their ballots via an internet-based platform, this innovative system revolutionizes the traditional electoral process, offering unparalleled security, efficiency, and accessibility.At its core, the system leverages the capabilities of modern mobile devices or computers equipped with advanced biometric features, including built-infingerprint sensors and high-resolution cameras for facial recognition. Through a streamlined registration process, voters are promptedto securely submit their biometric data, which is meticulously stored within a fortified database, ensuring the utmost

confidentiality and integrity.On the day of the election, participants seamlessly access the online platform, where they undergo a rigorous authentication process utilizing their unique biometric identifiers. This robust verification mechanism not only safeguards against unauthorized access but also verifies the legitimacy of each voter, bolstering trust in the electoral outcome.By eliminating the need for physical visits to traditional polling stations, the system enhances the convenience and inclusivity of the voting process, enabling individuals to exercise their democratic rights from any location with internet access. Moreover, it alleviates logistical challenges and reduces the strain on electoral infrastructure, facilitating greater participation and engagement among eligible voters.In essence, the convergence of fingerprint sensing and facial recognition technologies in online voting heralds a new era of electoral integrity and accessibility. As societies embrace technological innovation, this transformative system paves the way for a more inclusive and democratic future, where every voice can be heard and every vote truly counts.

2. LITERATURE SURVEY

To streamline the voting process and enhance efficiency, wireless and web technologies are leveraged in modern online voting systems. These systems offer a secure, convenient, and reliable means of capturing and tallying votes during elections. However, various challenges and considerations arise in the design and implementation of such systems, as highlighted in recent literature.

In the study by [1] titled "Online Voting System Based on Aadhaar ID," the authors propose an online voting system utilizing Aadhaar ID for authentication. While this system demonstrates efficiency and security improvements over traditional methods, its reliance solely on Aadhaar ID for authentication poses limitations. The absence of biometric authentication introduces vulnerabilities in the system's integrity and security.

In contrast, [2] presents research on "Secure Authentication for Online Voting System," where non-traceability and integrity of votes are emphasized. The utilization of smart cards to prevent multiple voting instances and biometric authentication for voter verification enhances security measures. However, concerns arise regarding the feasibility and reliability of relying solely on smart cards and voter ID cards for authentication during elections. The potential for loss or damage to these cards poses logistical challenges, and the cost and time required for their distribution may hinder widespread adoption.

Addressing the need for robust authentication mechanisms, [3] introduces an "Online Voting System Powered by Biometric Security." This system incorporates personal identification numbers, thumb impressions, and secret keys for voter authentication, along with encryption techniques for secure data transmission to servers. While the inclusion of biometric authentication enhances security, challenges remain in managing the vast amount of data generated during elections, particularly in online environments susceptible to congestion and potential cyber threats.

Despite advancements in security measures and authentication techniques, the inherent risks associated with online voting systems persist. The "online" nature of these systems introduces vulnerabilities to malpractice and cyber attacks, necessitating continuous efforts to enhance security protocols and mitigate potential risks. Additionally, scalability and data management issues pose significant challenges, particularly during peak election periods.

In summary, while online voting systems offer promising solutions to streamline the electoral process, careful consideration of security, authentication, and data management strategies is essential to ensure the integrity and reliability of these systems in practice. Continued research and innovation are necessary to address the complexities and challenges inherent in modernizing the voting process through technology.

3. EXISTING SOLUTIONS

There are several existing solutions for online voting systems with face recognition and fingerprint sensor. Here are a few examples:

1. VOTEC: VOTEC is an online voting system that uses face recognition and fingerprint sensor technology for biometric authentication. It allows voters to cast their votes remotely using their mobile devices or computers.

2. Biometric Voter Registration System: The Biometric Voter Registration System is used in several countries, including Kenya, Nigeria, and Afghanistan. It uses face recognition and fingerprint sensor technology to register voters and ensure that each person can only vote once.

3. BioVote: BioVote is an online voting system that uses biometric authentication, including face recognition and fingerprint sensor technology. It is designed to be secure and accessible, and allows voters to cast their votes from anywhere with an internet connection.

4. Voatz: Voatz is an online voting platform that uses biometric authentication, including face recognition and fingerprint sensor technology, to verify the identity of voters. It has been used in several elections in the United States, and is designed to make voting more accessible to people with disabilities or who are unable to go to the polls in person.

5. Biometric e-voting System: The Biometric e-voting System is used in Brazil to allow voters to cast their votes remotely using a mobile application. It uses face recognition and fingerprint sensor technology for biometric authentication, and has been used successfully in several elections.

6. These are just a few examples of the existing solutions for online voting systems with face recognition and fingerprint sensor technology. Each system has its own unique features and advantages, and the specific solution used will depend on the needs and requirements of the organization or government implementing the system.

3.1 SCOPE

i. Increasing number of voters as individuals will find it easier and more convenient to vote.

ii. Less effort and less labor intensive, as the primary cost and focus primary on creating, managing, and running a secure web voting portal.

iii. The system can be used anytime and from anywhere by the Voters.

iv. No one can cast votes on behalf of others and multiple times.

v. Saves time and reduces human intervention.

vi. The system is flexible and secured to be used.

vii. Unique Identification of voter through Aadhar number.

viii. Improves voting with friendly Interface.

ix. No fraud vote can be submitted.

3.2 PROPOSED SYSTEM

The Online Voting System is designed to efficiently manage voter information, enabling voters to log in and exercise their voting rights securely. The system relies on a comprehensive DATABASE meticulously maintained by the ELECTION COMMISSION OF INDIA, housing detailed voter information. During the registration process, voters are required to provide their full name, age, Aadhar card number, mobile number, email ID, fingerprints, and have their details verified by the administrator.Upon requesting to vote, the voter is prompted to enter their Aadhar ID. Subsequently, the system authenticates the voter's identity, granting them the ability to cast their vote for a candidate from the provided list. If a voter already possesses an Aadhar ID, there is no need for additional registration. However, if a voter lacks an Aadhar ID, they must complete the registration process in the Aadhar database before participating in the voting process. This meticulous authentication process ensures the integrity and security of the voting system, promoting a trustworthy electoral environment. to register, else before voting he/she need register himself/herself in AADHAR database.

3.3 IMPROVEMENT IN EXISTING SYSTEM

As we evaluate the current online voting systems, they primarily offer a generic platform for casting votes. Considering the diverse elections held by the Government of India, we are introducing a more sophisticated system. Our system allows voters to choose specific elections and submit their votes on a region/ward basis.Upon scrutinizing the existing system, it became apparent that it lacks the provision for state-wise and region-wise voting. This absence of restrictions poses a challenge, as voters may inadvertently cast their votes for candidates outside their designated area. To address this limitation, our proposed system ensures that voters can only vote for candidates belonging to their respective region/ward. The system will exclusively display candidates from the voter's ward, promoting a more accurate representation of local interests.This enhancement is particularly beneficial for smaller-scale elections, such as Gram Panchayat or Nagar Sevak Elections. By tailoring our voting system to be region-specific, we aim to facilitate a more precise and accountable democratic process. Additionally, our commitmentto user-friendliness ensures that the voting experience is accessible and straightforward for all participants.

4. METHODOLOGY FOR IMPLEMENTATION :

The implementation of the Online Voting System involves a secure login process, requiring a fingerprint scan along with the candidate's name. The algorithm employed for this system is the Minutiae-Based Algorithm, utilizing two key components: minutiae-extraction algorithm (for fingerprint detection) and minutiae-matching algorithm (for matching fingerprints, i.e., comparing input fingerprint with the database fingerprint).

ALGORITHM:

- **Minutiae Extraction:**

Orientation Field Estimation: Initial step involves estimating the orientation field of the fingerprint.Ridge Extraction: Identifying and extracting ridge patterns from the fingerprint image.

a. **MinutiaeExtraction and Post Processing:** Extracting minutiae points, such as ridge endings and bifurcations, followed by post-processing for accuracy.

b. **Minutiae Matching:**

Point Pattern Matching: Various strategies can be employed for fingerprint matching, and point pattern matching, specifically minutiae matching, is used here.

Alignment Stage: The minutiae matching process is decomposed into two stages. First, the alignment stage ensures proper alignment between the input and database fingerprints.

Matching Stage: In the matching stage, the minutiae points are compared to determine the similarity between the input and stored fingerprints.By employing the Minutiae-Based Algorithm, which incorporates both minutiae-extraction and matching algorithms, the Online Voting System ensures a robust and secure authentication process, utilizing the uniquefeatures of an individual's fingerprint for accurate and reliable identification.

5. SYSTEM REQUIREMENT

- **SOFTWARE REQUIREMENTS :**

1.MySQL Database Management System (DBMS): This robust system facilitates the combination, extraction, manipulation, and organization of data within the voters' database. Operating as a platform-independent solution, MySQL is versatile and can be seamlessly implemented across various platforms such as Windows, Linux servers, and is compatible with a range of hardware mainframes. Renowned for its speed, stability, and cost-effectiveness, MySQL provides a reliable foundation for the storage and retrieval of data.

2.NetBeans IDE 7.1.2: Recognized as an award-winning integrated development environment, NetBeans IDE is available across Windows, Mac, Linux, and Solaris platforms. The NetBeans project encompasses an open-source IDE and an application platform, empowering developers to swiftly create web, enterprise, desktop, and mobile applications. With support for Java, PHP, JavaScript, Ajax, Groovy and Grails, and C/C++, NetBeans IDE offers a versatile development environment catering to diverse programming needs.

3.Testing Environment - XAMPP/WAMP Server: For testing purposes, the XAMPP/WAMP server configuration is utilized. This server environment allows comprehensive testing of the developed system, ensuring compatibility and functionality across various web technologies.

- **HARDWARE REQUIREMENTS :**

Operating System: Microsoft Windows XP Professional /Windows 7 Professional /Windows 10.

Processor: 800MHz Intel Pentium III or equivalent.

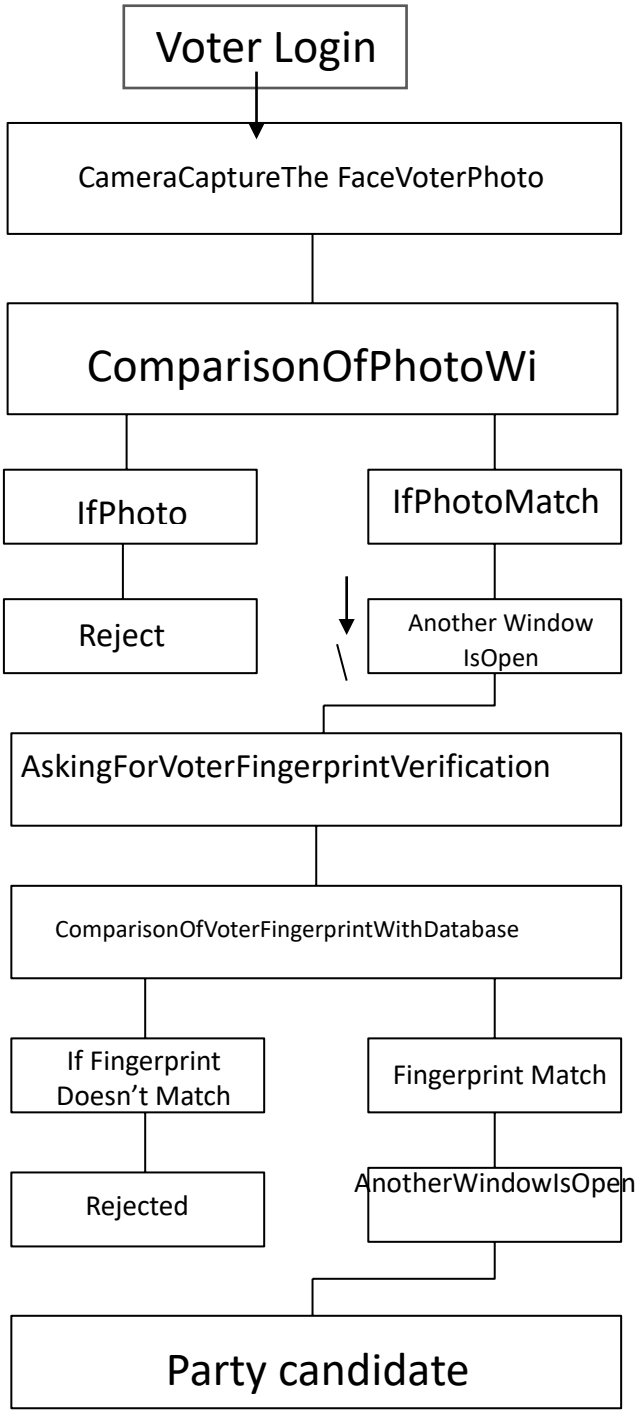
Memory: 512 MB RAM.

Disk Space: A minimum of 750 MB of free disk space.

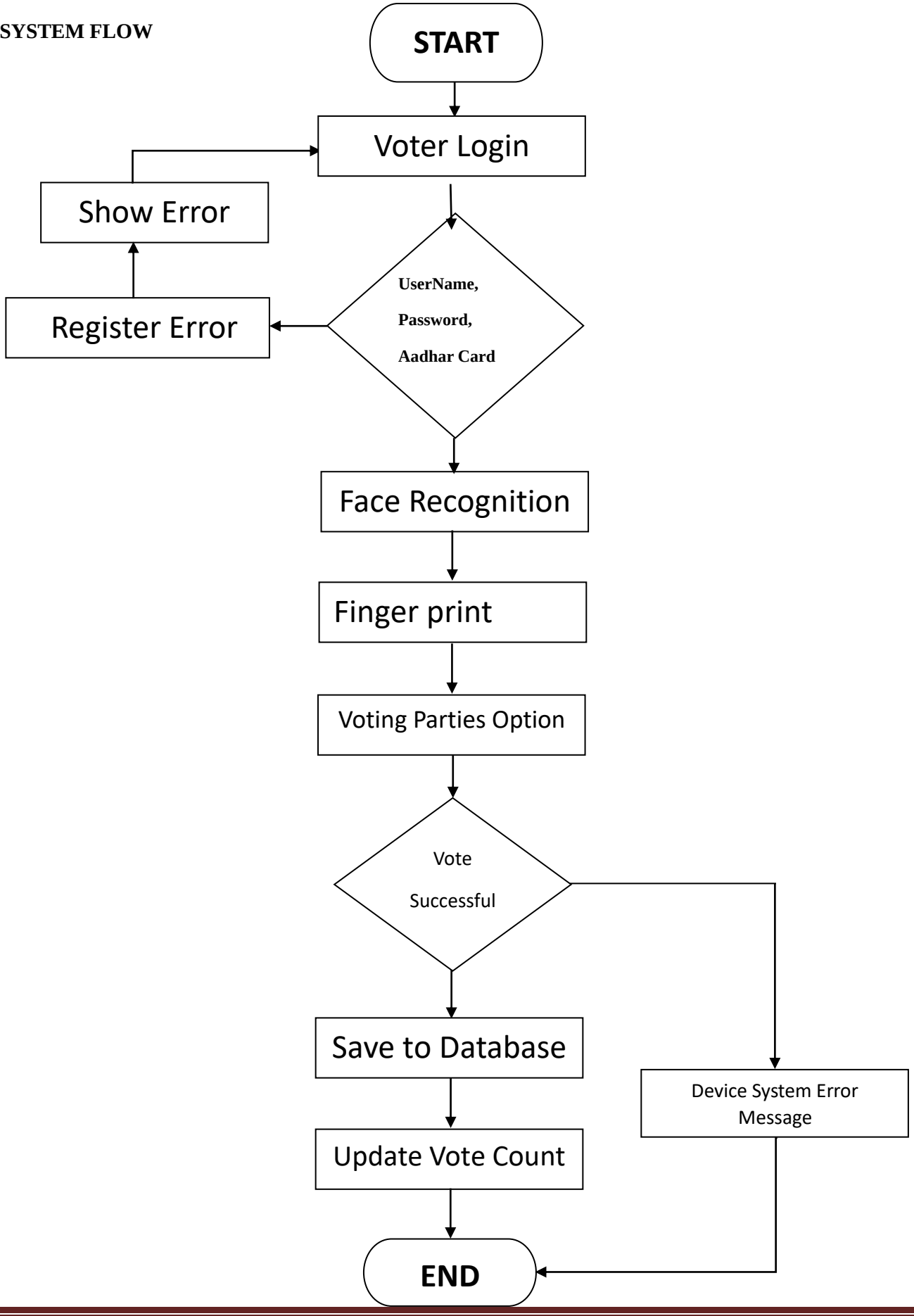
Peripheral Device: Finger Print Scanner - Essential for the secure and biometrically enabled authentication process within the voting system.

6.1 DESIGN DIAGRAMS :

Architecture



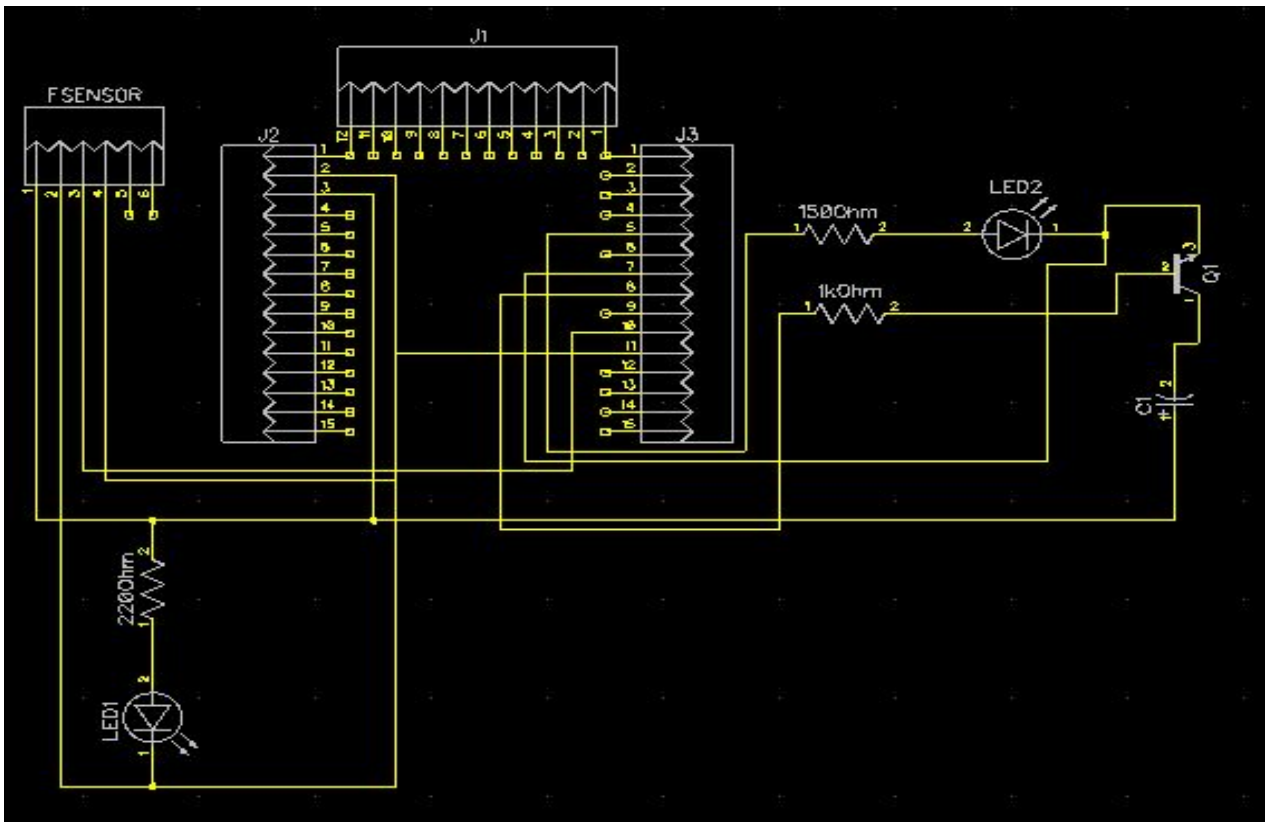
6.SYSTEM FLOW



Block Diagram

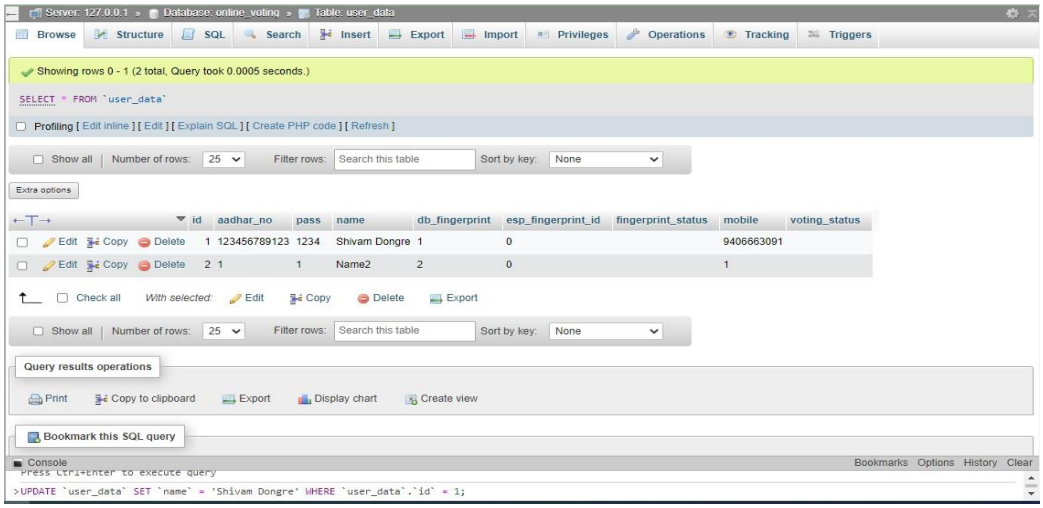
6.2DESIGN AND SCHEMATIC :

Circuit Schematic :

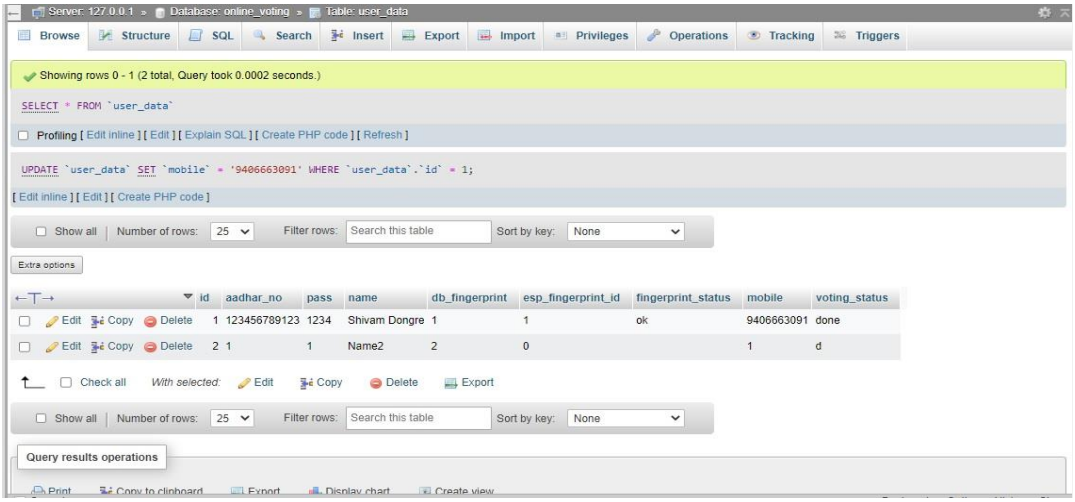


6.3Database Snapshots :

1st Database Snapshot: Before the voting users or voters information are saved in database:



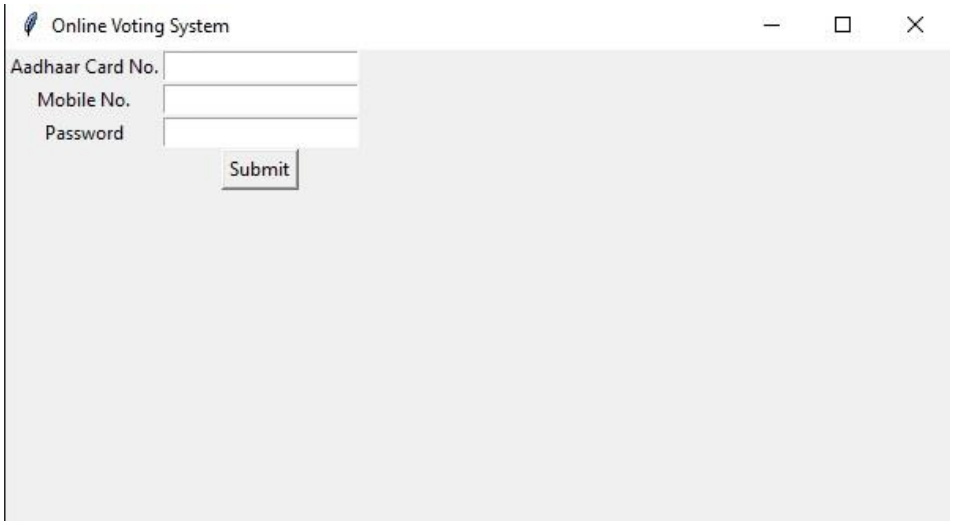
2nd Database Snapshot: After the voting is complete and voter can successfully complete all the process:



7. VOTING SYSTEM WORKING VIEW

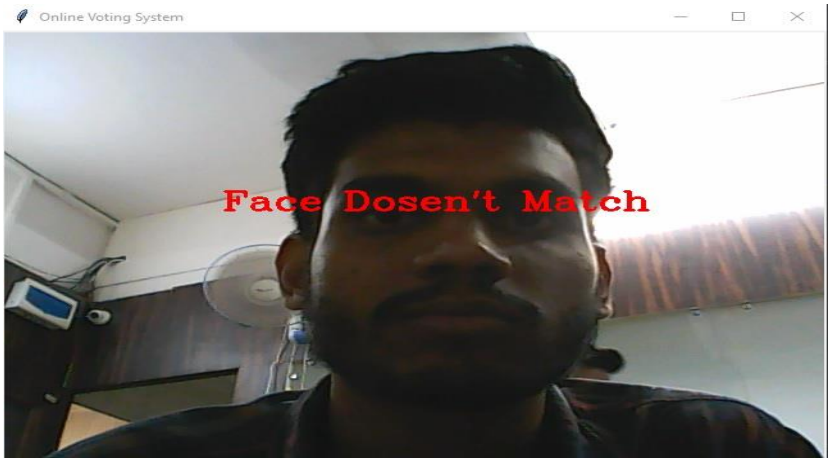
Step 1: Voter Login using Aadhar Card Number, Mobile Number and Password.

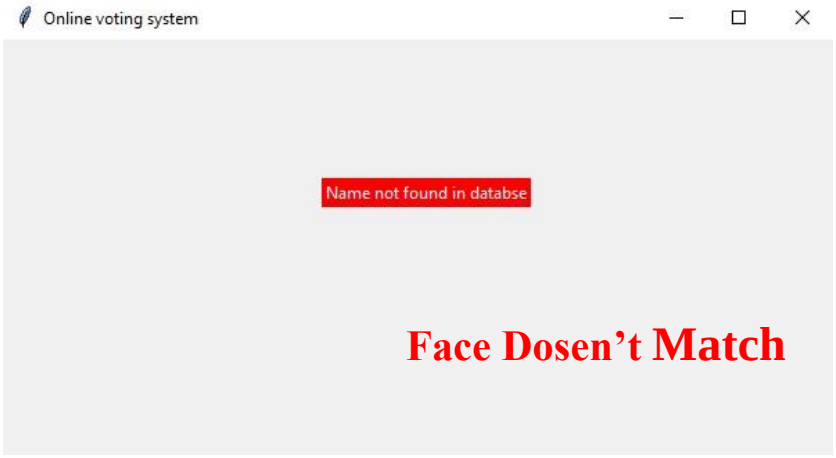
After fill this three information click on the submit button, if all the information is correct and match with user information which is saved in database the user can move forward to the further processes.

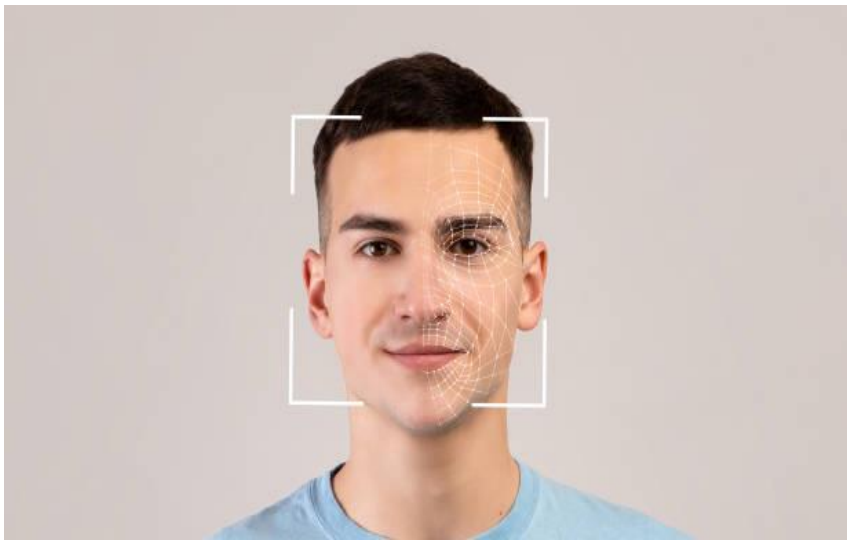


But, if filled data or information is not correct or without filling the data user click the submit button the message will generate that is in red box.

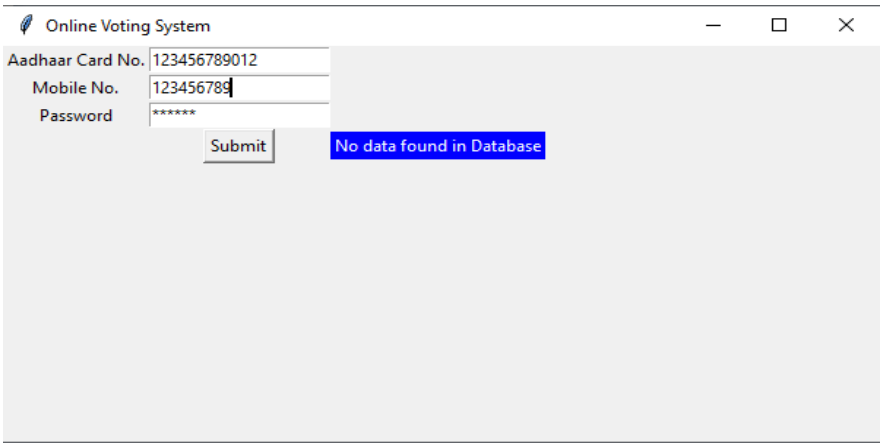
Step 2: According to the Step 1 all the information of user is correct and user click on the submit button the another window open for face recognition where the users face will be captured by camera for move to further process. Before the voting the photo of user are saved in database, if the photo is not saved in database the face of user which is captured by camera on the time of voting process is not match than the user can not move to the further process.



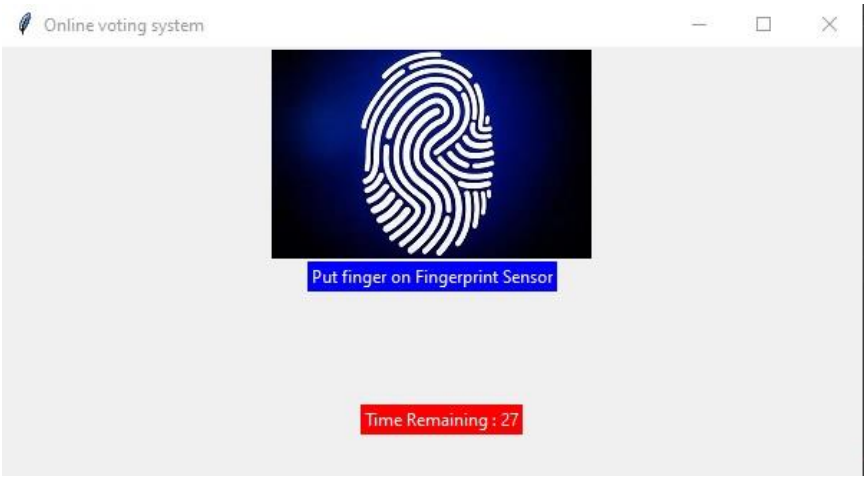




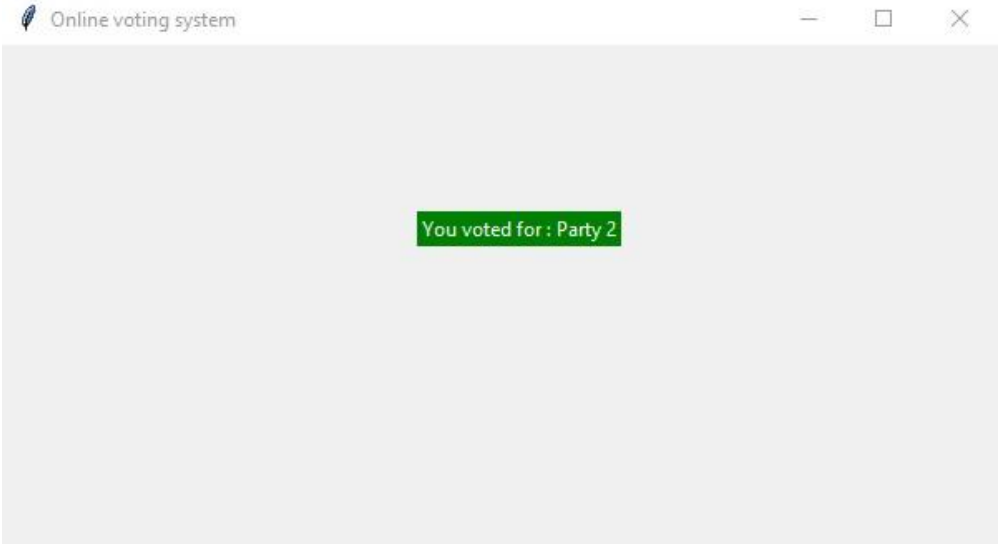
Step 3: According to the Step 2 if voters photo match with database the anotherwindow open for fingerprint sensor where the users finger will be sensed by the fingerprint sensor module for move to further process. Before the voting the fingerprint of the user are saved in database, if thefingerprint is not saved indatabase, the fingerprint of user is not match than the user can not move to the further process.



Step 4: When all the above steps are completed successfully the another window is open where the list of voting candidates or voting parties are open. Where user can select the candidate for voting.



Step 5: In this step, voter choose the candidate and click on the submit button the another window will open to show that which party or candidate you can choose.



8. CONCLUSION

The transition to Online Voting Systems presents numerous advantages compared to traditional voting methods. Key benefits include reduced costs, expedited result generation, enhanced accessibility, heightened accuracy, and a diminished risk of both human and mechanical errors. Developing an online voting system that ensures a high level of security and privacy poses a considerable challenge. Future endeavors should concentrate on crafting a system that not only prioritizes ease of use but also guarantees security and privacy at an acceptable level through robust authentication and processing protocols.

The ongoing evolution of online voting systems aims to strike a balance between user-friendly interfaces, efficient processing, and stringent security measures. The objective is to create a system that is not only easy to navigate but also upholds the integrity and confidentiality of votes. The inherent ease of use, reduced time consumption, and simplified debugging processes make online voting systems a promising avenue for the future of democratic processes.

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