Design and Implementation of Secure Electronic Voting System Using Fingerprint Biometrics

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Abstract: **Fingerprint-Based Voting Project is an application that recognizes users based on their fingerprints. Each person has a different finger pattern, so you can easily authenticate voters. This system allows voters to vote using their fingerprints. Fingerprints are used to identify users uniquely. As the fingerprint minutiae features differ for each human being, the fingerprint is utilized to authenticate the voters. Voters can only vote once for a candidate. The system will not allow the voter to vote for a second time. The system allows administrators to add names and candidate photos of candidates nominated for election. The administrator only has the right to add the names and photos of nominated candidates. The admin will verify voters and register voter names. Administrators authenticate users by verifying their identities and then enrolling voters. Users can log in and vote for candidates after receiving a user ID and password from the administrator. The system allows the user to vote for only one candidate for a particular election. The voter and the admin can view the election results using the election ID. Voting results will be updated immediately. This study shows that the proposed web-based voting system is fast, efficient and fraud-free.**

Keywords; Artificial intelligence, fingerprints, electronic voting, election, web-based voting system.

I. INTRODUCTION

The research is being conducted on this very topic of security, democracy and election systems. This situation emphasizes the need to modernize the election system with contemporary technology. This is because in many areas of Pakistan as well as other parts of the world, democracy is the way of governance where the people of that certain area elect the leaders. The voting system must be computerized to reduce the chances of vote rigging. This proposal will allow the PEC (Pakistan Engineering Council) to conduct elections more formally. This project will enhance the electoral procedures manifold, as this project introduces a unique system by adding a security level of fingerprints biometric.

The features of an online voting system that uses biometric sensors include Security; Biometric data is more difficult to forge than traditional forms of identification such as IDs or passwords. It is, therefore, difficult to vote multiple times or to impersonate other voters. Accuracy; Biometrics is more accurate than traditional forms of identification such as IDs or passwords. This reduces the likelihood of voter registration or voting errors. Scalability; The voting system must be able to handle a large number of voters. Simplicity; The procedure to vote in an online or web-based voting system is quite easy and simple. The voters will have to log in to their IDs, which are provided to them after all the user and candidate data has been stored in the database.

II. LITERATURE REVIEW

The first voting system was introduced by [1] and is based on a mixed network that all authorities agree on and accepts a series of encrypted entries as input and output sets of open notes by secret permutation. Elections and voting are familiar things in these days of Democracy. Online electronic voting on the Internet would be much more profitable. Many voters would like to appreciate the ability to dial from anywhere, and companies with offices in different locations can use it. Internet users vote for their choice among all their employees Offices will participate in the election from their own offices. As the name suggests, electronic voting is a voting process via electronic media, i.e., computers. Usually, this online voting system is supposed to answer, among other things, as follows: [1,2] Accuracy, simplicity, democracy, verifiability, confidentiality, and security.

Such an online voting system is about security and privacy.

From this point of view, implementing a Secure Online Voting System looks at different encryption and network security applications. Electronic voting has been extensively studied over the last twenty years. For this reason, many electronic voting systems have been offered for decades, and safety and efficiency have improved—the legal age for every voter aged 18 and over. In a new voting System, Security issues caused vote online casting. One of the shortcomings of electronic voting is the biometric integration of the voting system used. Biometrics refers to the uniqueness of each person Pieces of evidence, including a unique fingerprint, follow: The government takes the opportunity to give the Indians the right to do so and choose its leader. In this way, the task of the political racial commission is controlled to achieve Immediacy in voting on the voting system [2]. In 2002, tests of the electronic voting system were carried out in the UK. As part of this process, 16 offices were used to implement the electronic voting system. For the same, 18 other authorities after a year were awarded. In 2004, the United States did the following elections with the DRE electronic voting system for the first time nationwide. In 2000, elections in the United States were conducted using an electronic voting system. Also, although only parts of it were performed, Florida made history in developing electronic voting systems [3-5].

In this prototype project, we have developed a database in which the data of the voters and the candidates have been stored. For authentic verification, we have stored the voters' fingerprints so that when they go for a vote, they must first verify their fingerprints. This will help to reduce the chances of voting procedure rigging. The conduct of elections for public office via the Internet is a major concern and threat. The online voting system must ensure the integrity of the voting system and the election result, and voter secrecy must remain accessible and uncompromisingly available on the open network. is designed to serve the voters they connect with unreliable customers. Many security researchers have listed Internet threats votes [3]. However, other systems and protocols have suggested that could one day be a solution step now that many States and countries are developing online voting systems. Estonia and Switzerland have already introduced online voting for national elections.

The online voting system aims to guarantee the possibilities of a physical Internet voting system environment. Some important features of online voting systems are accuracy, democracy, confidentiality, and control. We can combine it with other features such as scalability, accessibility, fault tolerance, intruder tolerance and user training online voting systems. On the other hand, it includes web services, a new approach for distributed systems [4]. We can apply them to online voting systems and achieve good results [5]. Online voting systems such as [6-10] enable people to choose on the Internet, most likely through a web browser, at home or anywhere else they can access the Internet [11]. This type of vote is meant to encourage higher turnout and conduct accurate vote counting While this is easier, it also has the potential to facilitate abuse and is easier to perform on a large scale [6]

COVID-19 has forced countries to prepare for the possibility that voters may not be able to safely vote in person in upcoming elections as many jurisdictions use online forms Delivery and return of cards to facilitate remote participation. One way to do this is with Omni Ballot Democracy Live The system, an online platform that can be used for white card submission, voting, and online voting. Voters have long used Omni Ballot to print ballots, which will be returned, but in early 2020, three states announced plans for large classes for first-time voters to use to return their ballots online. New Jersey recently allowed voters to vote online deactivated, called "pilot on demand" [6, 7].

The risk is unacceptable for online voting, as agreed by election security experts and national security experts. Numerous studies on existing or planned online voting systems intended to be used in the election revealed critical vulnerabilities. This was stated by the National Academies of Science, Engineering, and Medicine technology ensures privacy, security, and audibility marked ballot paper distributed on the Internet" and that "[at] the current Internet (or any connected network). on the internet) may not be used to return Bulletins » [8] Several countries have experimented with voting on the Internet, but today no country uses Internet voting to a greater extent than Estonia on binding general elections [9]. When Estonia launched its online voting system, it was the first country to offer online voting in 2005. Since then, he has used the system seven times in local or national elections, and in the last election, over 30% of voters participating in the survey voted online [10]. Estonia inspires people around the world, and others wonder why they can't vote online as well [11]

The article "SEVEP: verifiable, secure and confidential performs remote queries with untrusted computers devices" describes only the author of "AMNA QUESHI." Designs a flexible interrogation system, uses fingerprint devices to provide an extra step of Authentication, authorizes different devices accessible to voters without using ballots, and generates poll tags [12]. In 2000, elections in the United States were conducted using an electronic voting system. Also, although only parts of it were performed, Florida made history in developing electronic voting systems [13].

III. PARTICIPATIONS

Hardware specifications:

Fingerprint sensor R305 in Fig. 1, Arduino Uno R3 shown in Fig. 2.

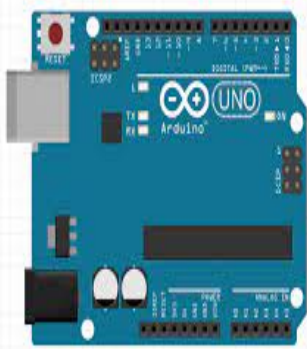*Figure 1: R305 fingerprint reader module*

Figure 2: Arduino Uno R3

Software specifications:

The languages used in this project are Python and HTML, and data base used is SQLite while Django framework is utilized.

IV. METHODOLOGY

It is an online voting system that allows voters to vote online using a web browser. A block diagram is shown in Fig. 3. This type of system has many advantages over traditional paper-based voting systems, including: Convenience: Voters can vote anytime, anywhere with internet access and fingerprint sensor. Clarification: Votes are counted electronically, reducing the risk of human error. Affordability: Online voting systems can be more convenient than traditional paper-based systems [14-21].

Web Server: This is the central server that runs the voting. It is responsible for storing the voter registration data, the election results, and the voting itself shown in Fig. 4. Database: The database stores all the voting system data, including voter registration data, voting results. This can be implemented using any relational database management system such as MySQL or PostgreSQL. Voting Registration: This is a web-based that allows admin to register voters and candidates, and allows voters to login through their ID and the password. Authentication Server: This server is responsible for

authenticating voters before they can vote. It should be of notice that in this project our authentication server is a fingerprint module. Voting Terminal: This is the device that voters use to vote. It can be a computer or laptop. Network: The network connects the web server, database, authentication server, and voting terminals.
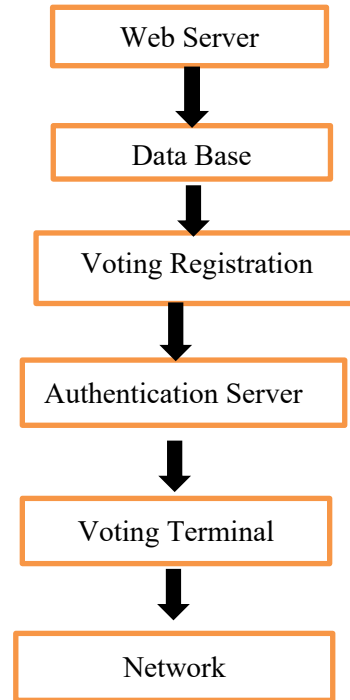

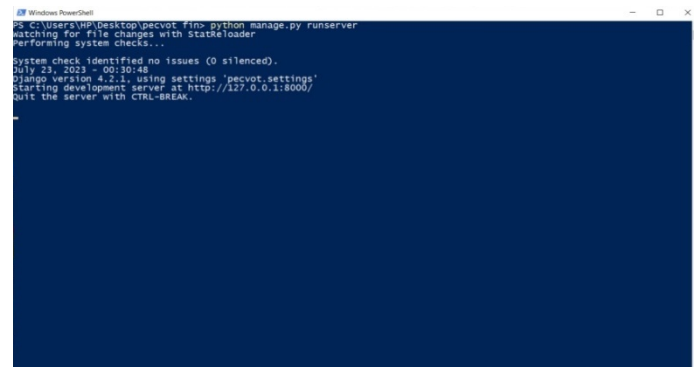*Figure 3:Block diagram of web based voting system*

Display of Prototype:

Figure 4: PowerShell page

Here you can see that first we have to write a command to open the portal. The command can only be known by the administrator, so this is the first security check on our website. The command or code that is used for our prototype project is "python manage.py runserver".

To open the website on chrome there is a link for this prototype project is http://127.0.0.1:8000/

At the very first page, User will login with his ID and password. After that user will select the preferable candidate

and vote for that person if and only if the user's fingerprint is validated by the database shown in Fig. 5, Fig. 6 and Fig. 7. A complete hardware is shown in Fig. 8.
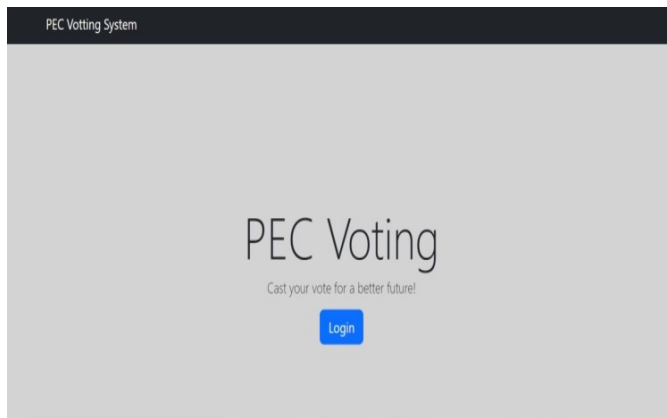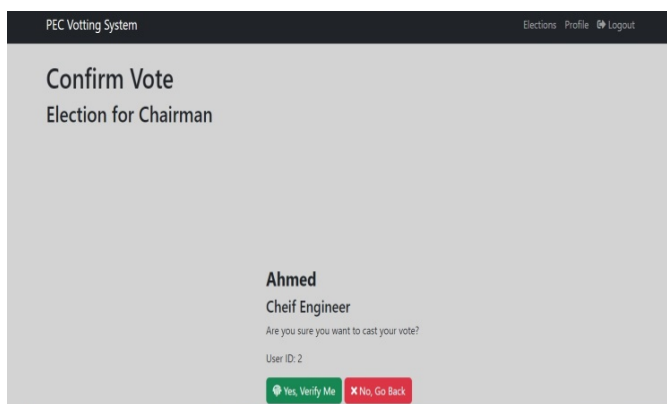

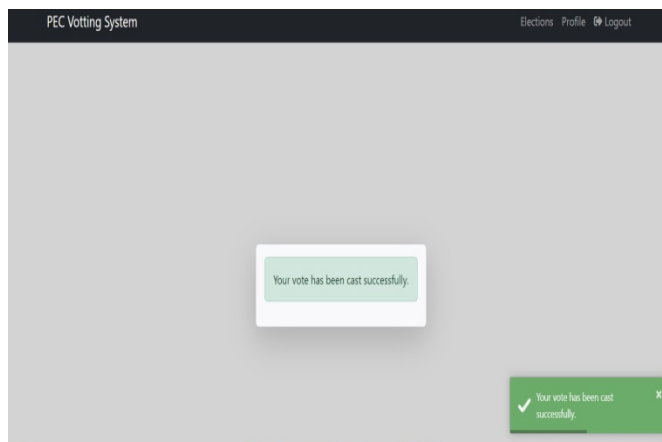*Figure 5: Front Page*

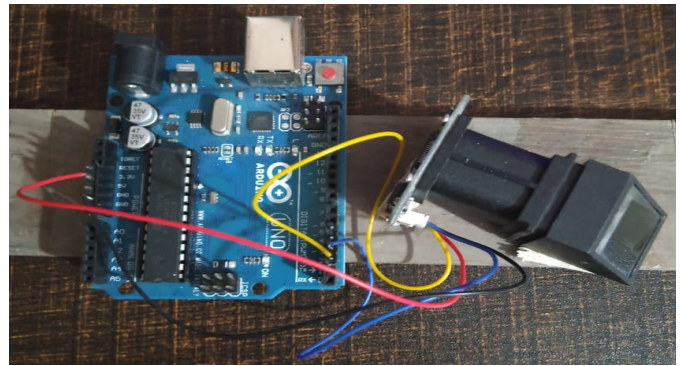*Figure 6: Voting screen*

Figure 7: Final screen

Figure 8: Hardware

V. CONCLUSION

Developing a web-based voting system with a fingerprint reader is a promising step towards making our elections easier and more accessible. With fingerprint authentication, we can ensure that only eligible voters can vote. This helps prevent voter fraud and makes it harder for hackers to manipulate election results. In addition to increased security, online voting with a fingerprint reader is more convenient for voters. Voters can vote with internet access and a fingerprint scanner attached, making it easier for them to participate in the democratic process. Of course, there are still some challenges to be overcome before the online fingerprint voting system can be widely deployed. For example, we need to ensure the system is secure from hacking. However, I believe that the benefits of such a system outweigh the challenges.

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