Fingerprint Based Voting System Using Arduino Nano

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ABSTRACT
A fingerprint-based voting system based on arduino, fingerprint and GSM technologies is a smart way to ensure voter authentication and simplify the voting process. In the current model, the voter enters the machine and presses a button to vote. The pollster then chooses from a list of switches denoting the appropriate candidates or measures. The machine is set up to avert multiple votes by excluding other candidates once a candidate's switch is and the push button is pressed, which opens the curtain and increments the appropriate counters for each candidate.

This paper focuses on a secure method of casting a vote. A Fingerprint Based Voting System is an application that recognises the user based on his or her finger pattern. The voter can only vote for a candidate once; the system will not allow the candidate to vote again, and it also displays instructions on an LCD screen that must be followed step by step in order to vote for a candidate. The main advantage of using this system is that votes do not get rigged as fingerprint is used for authentication. In addition, if a voter is registered but does not vote, an automated message is sent to the registered mobile number.
Keywords: Arduino Nano, GSM SIM 900A, R307

I. INTRODUCTION
A vote is a powerful right that every citizen of their own country possesses. The country's economy is built while the culture is preserved during the term of the elected leader. As a result, it is critical that fair and free elections be authorized. Even in countries with strong rule of law, the voting process can be manipulated. In the current system, a direct-recording electronic (DRE) voting machine records votes through a ballot display with mechanical or electro-optical components that the voter can activate (typically buttons or a touchscreen); processes data with computer software; and stores voting data and ballot images in memory components. It generates a table of the voting data after the election, which is saved in a removable memory component and printed. This system uses a vote count method to summarize ballots at polling places. They usually tabulate votes as they are cast and print the results after the polls close. The proposed system simplifies and speeds up the authorization process.

II. LITERATURE REVIEW
A. Piratheepan, S. Sasikaran, P. Thanushkanth, S. Tharsika, M. Nathiya, C. Sivakaran, N. Thiruchchelvan and K. Thiruthani Gesan [1] proposed a system offline version of an electronic based fingerprint based voting machine using arduino. This system employs fingerprint authentication, and the interface accepts voters' national ID card numbers, provides a voting interface, and displays confirming status or error messages.The number stored in the local database will be checked and then the central database is checked if the voter is not found. If the central database also doesn't contain the voter's ID, the person is said to be trying to cast the vote illegally.

Mr.L.Jones Nirmal, M.S.Vikram Madhavan, C.Arul Murugan, S.V.Charan Kumar, M.Surya [2] proposed that fingerprint based biometric voting machine is divided into two parts, in first part user needs to register and in second part user will vote for desired candidate. They designed a voting machine that is suitable for small scale purposes like institutes and organizations.

S. Charan , K. Hari Prasanth , D. Anand Joseph Daniel [3], three literate surveys were conducted on fingerprint capture, direct pore matching for fingerprint verification, and an online fingerprint identification algorithm. It is based on a

basic fingerprint recognition system, which has four stages: first, the sensor for enrolment and recognition, which captures biometric data. The second stage is pre-processing, which is used to remove unwanted data and improve the clarity of the ridge structure using enhancement techniques. Finally, the feature extraction stage extracts fingerprint features from the input from the pre-processing stage. Fourth, the matching stage compares the acquired feature to the database template.

Abeesh A I, Amal Prakash P, and Arun R Pillai [4] proposed a fingerprint voting system which allows the user to scan his/her fingerprint in order to check his eligibility by comparing his current fingerprint with the one already stored in the system's database; this paper proposes a project which is designed using the PIC16F877A microcontroller and other associated peripherals such as GSM module, Finger print module, LCD, and so on. After completing the identification process, users will be able to vote using a user-friendly graphical user interface. The votes will be counted immediately, making the voting process efficient, quick, and secure. The GSM communication that provides feedback to the voter immediately after they cast their vote.

Venkateswara Rao. Ch, M. V. Pathi A, B. S. Sailesh. A [5] attempted to modernize the conventional voting system by interfacing GSM Module with an Arduino while providing biometric features. Whenever, a fake vote has casted, an alert message for the candidate has been sent to the registered mobile number of a voter. The proposed voting system based on Arduino is trustworthy in terms of security, reliability, fairness and transparency of election.

Sanjay Kumar, Manpreet Singh [6] designed a model which can be used as a public voting system based on biometric fingerprint method to make the election process transparent and efficient. In this project, a framework for an electronic voting system based on fingerprint biometrics is proposed and implemented with the goal of eliminating bogus voting and vote repetition, lowering election costs, increasing transparency, and delivering results quickly.

III. PROPOSED SYSTEM

The major objectives of this project is to create a prototype which ensures more security for the voters by using biometric for storing the voter details and authorizing the individual by using his/her fingerprint so that we can stop rigging of votes and also ensure the right person to get elected.

The interfacing of Arduino with the Global System for Mobile Communication module, also known as the GSM Module, assists the registered voter in determining whether his vote has been cast or sends a reminder message to cast his vote if it has not been cast, this helps in the principle "Every vote holds a value".

IV. BLOCK DIAGRAM:
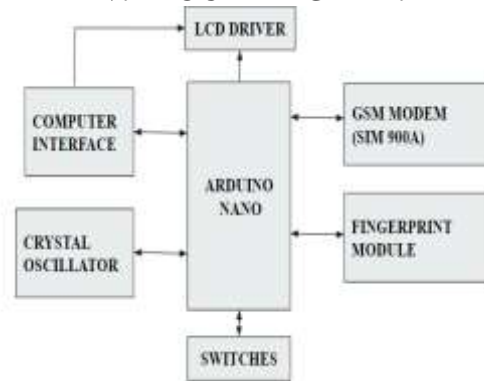
Block diagram of proposed system

Components of the Block diagram
Arduino Nano

Arduino Nano is a microcontroller board created by Arduino.cc. It is built using an Atmega328 microcontroller. It is a small board which is versatile, with a wide range of applications. This board, like an Arduino Duemilanove board, has many functions and features. However, the packaging of this Nano board is unique. It lacks a DC jack, so power is supplied via a small USB port rather than being directly connected to pins such as VCC and GND. Using a mini USB port on the board, this board can be powered from 6 to 20 volts.

LCD Display

LCD is an abbreviation for Liquid Crystal Display. It is a type of electronic display module that is used in a variety of circuits and devices such as mobile phones, calculators, computers, televisions, and so on. These displays are most commonly used with multi-segment and seven-segment light emitting diodes. The main advantages of using this module are economic in nature; it is easily programmable, has animations, and there are no restrictions on displaying custom characters and even special animations, etc.

R307

R307 is an evolutionary standalone fingerprint recognition module consisting of an optic sensor and processing board. As CPU and

highly upgraded algorithms are embedded into a module, it provides a high recognition ratio even to small size, wet, dry, calloused fingerprint. High speed 1:N identification and 1:N verification.

R307 has functions of fingerprint enrolment, identification, partial and entire deletion and reset in a single board, it does not require connection with a separate PC, thereby offering a convenient development environment.

GSM SIM900A

The GSM module used in this proposed system is SIM900A. The module includes GPRS/GSM technology for communication with a mobile sim card. It operates on the 900 and 1800MHz frequency bands and allows users to receive and send mobile phone calls and SMS.

The SIM900A is integrated with the TCP/IP protocol; extended TCP/IP AT commands have been developed to allow customers to easily use the TCP/IP protocol, which is very useful for data transfer applications.
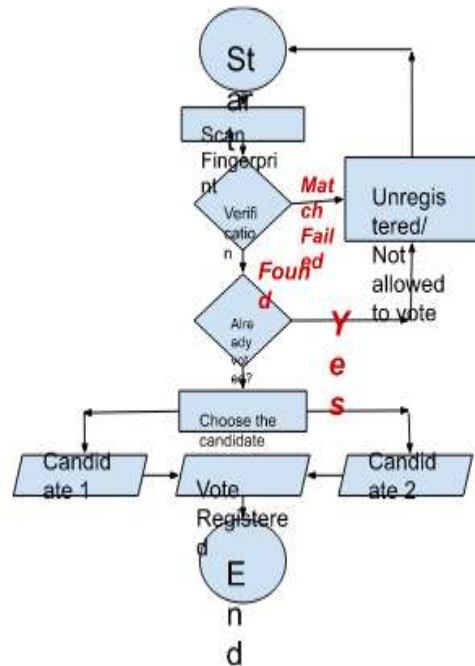
Process

The voting process consists of two steps. They are as follows
1. Voter Registration
2. Vote Casting

Voter Registration:

In this step, we first register the voter's fingerprint in the database, which in this project is the flash memory of the finger print module R307. Each finger is scanned twice during registration to ensure proper storage. All instructions are displayed on the LCD screen while registering and voting.

Vote Casting: After registering to vote, a voter can cast his vote by first placing his finger on the sensor, the LCD will verify that the voter has been authenticated, and the voter can then vote using the switches assigned to each candidate. The number of push buttons is determined by the number of candidates. When the result button is pressed, the votes for each candidate are displayed on the LCD.


Flowchart of the process

## V. RESULTS AND DISCUSSIONS:

1. **Enrollment**

When the enroll button is clicked it is asked to enter figure id and the fingerprint placed is stored at the given id and after the polling is completed we can delete the registered candidates using the same button.When the fingerprint is stored successfully it displays stored on the LCD. This procedure is done to store the votes before the polling has begun.
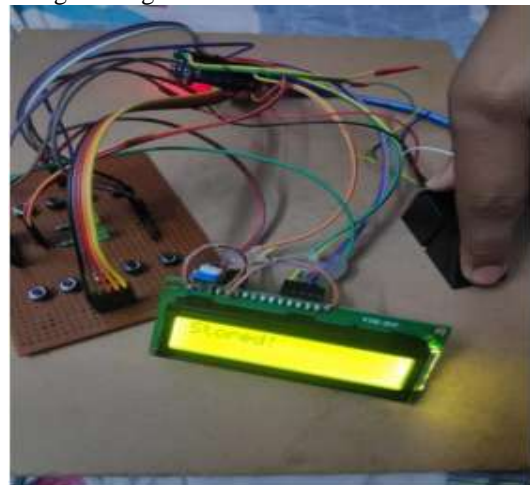

Registration of fingerprint

2. **After Successful Authorization**

When the candidate comes, it displays that the match button must be pressed and the authentication of fingerprint is done. If the fingerprint is matched when the matched button is pressed then it displays as shown in fig and the candidate can place their vote by pressing the button of the respective parties.
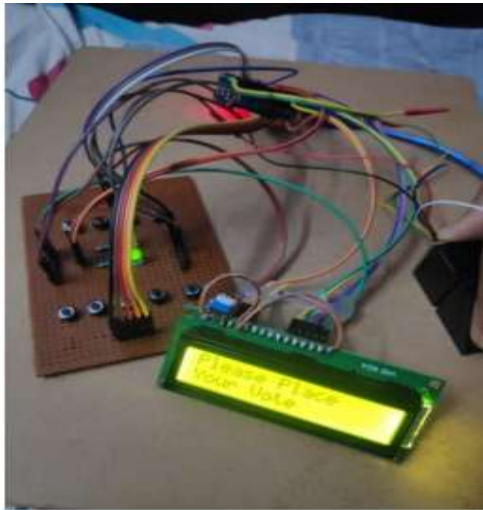

Starting of the voting process

If the candidate has already voted and tries to poll his/her vote again, the module doesn't allow them to vote again and displays the message "Already voted" as shown in fig. and helps in rigging free elections.
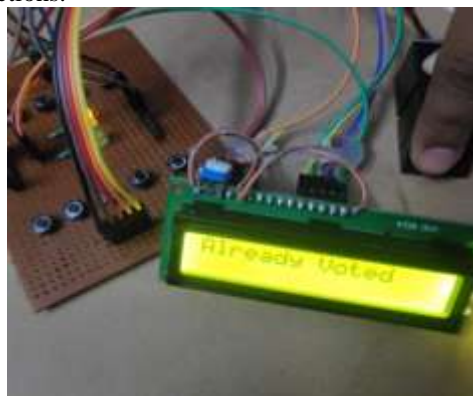
Already voted message display

3.   Result
An inbuilt result switch is added to look at all the casted votes to each and every candidate in the election process.
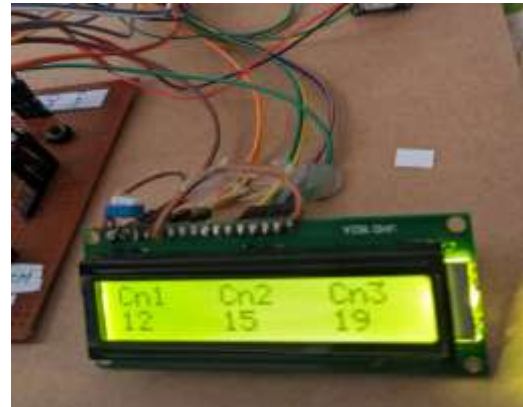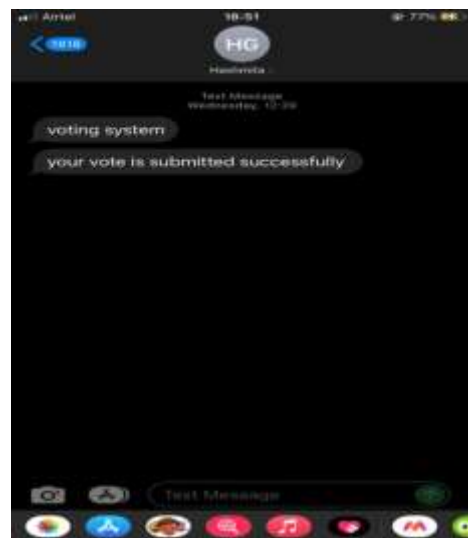

Total number of votes for each candidate

4. Automated message using GSM Module
The messages are delivered to the registered mobile number when the voting system is ready to be used and also when the voting was casted.

Message display on the computer screen

Message received to the phone by the voter

V. CONCLUSION
This project presented an overview of the voting process with the help of fingerprint scanners. This project helps with the fingerprint recognition and authentication steps and also the

flow in which the electoral process takes place with this new technology. The addition of a fingerprint sensor to the voting machine authenticates the voter and increases the credibility of the Elections.

The smart voting machine that we built is very easy to use, collects the data(finger print) of the voter at the time of registration itself and the voter can only cast his vote if his finger print matches with that in the database. Using the smart voting machine voting process can be implemented with lesser man power.This methodology increases the security, safety and transparency during the voting process. To ensure proper security and authorization, each fingerprint is scanned twice and appended to list of database

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