

Electronic Fingerprint Voting Machine

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ABSTRACT

In this project, an embedded fingerprint recognition system for authentication for voting systems has been proposed. The system is implemented on an embedded platform and equipped with a novel finger-vein recognition algorithm. The proposed system consists of two modules: image recognition module, human machine communication module. The Embedded main board including the Microcontroller chip, memory (flash), and communication port is used to execute the finger-vein recognition algorithm and communicate with the peripheral device. The human machine communication module (LED or LCD) is used to display recognition results and receive inputs from users. Our proposed system is an intelligent security system. Here we developed a secure voting system for elections. If an authenticated person voted it sends a GSM message to the mobile, otherwise it activates a buzzer and also SMS sent to the particular person.

Keywords: Voting Machine, E-Vote, GSM

I INTRODUCTION

Election is a feature of democratic government in which people govern themselves and are able to express their choices regarding various issues, such as constitutional amendments, piece of legislation or choosing the right person as their leader. An electoral system is present to layout the rules of the election. Political election is the most common form of election but there are many different fields where election is vital part of their organizational functions. Election is vital for business, informal organizations and non- profit organizations. Election is the way of democratic world but conducting an election in fair manner has been the challenge of every electoral body especially in the country with high corruption, weak rule or law and less transparency. On the top of that conducting election cost millions and billions of dollars. This study report mainly focuses on developing a prototype of embedded system that deals with fingerprint voting system which can help in progression of election in robust and secure manner. The system integrates different hardware components like micro- controller, fingerprint module, LEDs, switches that facilitates a flawless voting system. For the implementation of this system, DY50 fingerprint sensor is used to take user finger print image and store in internal memory, these images are further processed and analyzed using Arduino. The user interface is implemented using LCD screen, which is mainly used to print user instructions during the execution of the voting process and the result.

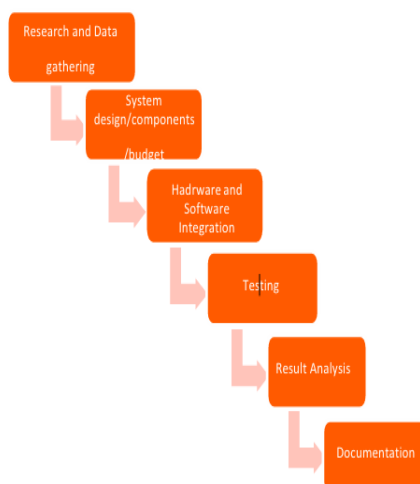
II. RELATED WORK

Several researchers have explored biometric-based voting systems. Rezwan et al. (2017) proposed an Arduino-based biometric EVM to prevent fake votes. Bhattacharya et al. (2019) integrated fingerprint and retina scanning for enhanced security. Shaw et al. (2018) developed an Aadhaar-linked biometric voting prototype. Blockchain-based voting concepts have also been introduced to prevent tampering.

However, most systems increase complexity and cost. The proposed system focuses on simplicity, low cost, and reliable implementation using widely available components.

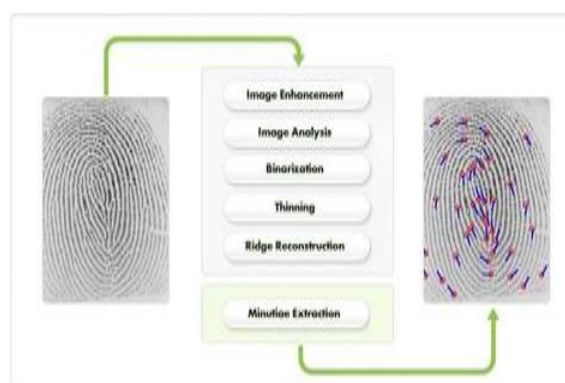
III METHODOLOGY WORKFLOW

Methodology as word suggest is the development steps or method that outlines the way to achieve certain goal or in this case design and build a prototype Fingerprint voting system. In other words, it is a constructive framework. Below in figure 2, methodology flow block diagram of this project is shown.



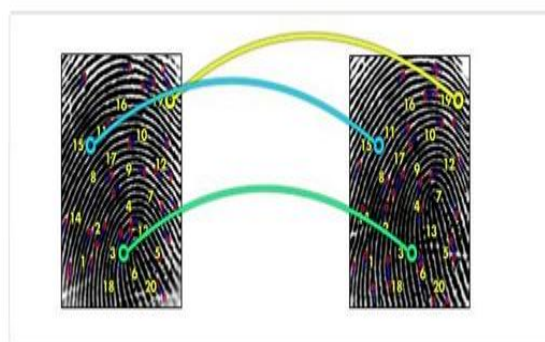
EXTRACTION ALGORITHM

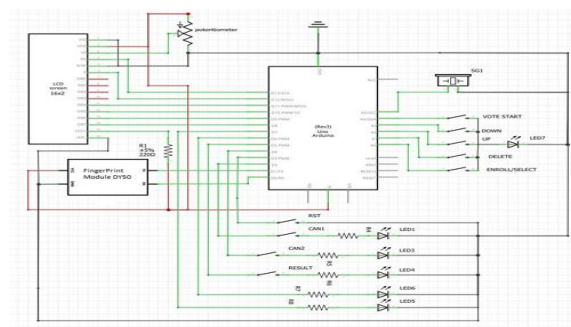
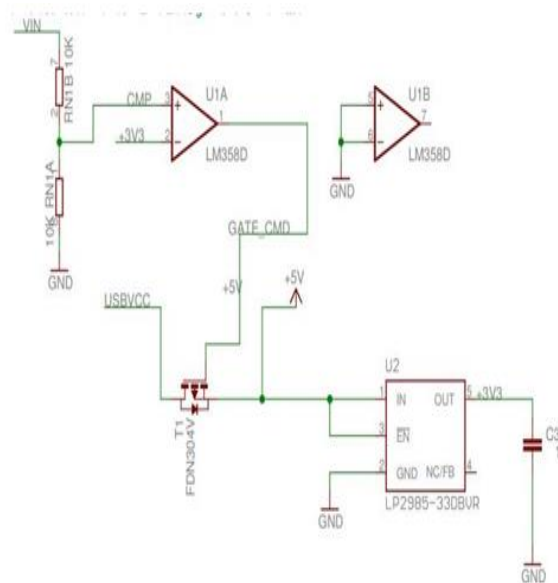
Correct representation of the fingerprint image is crucial to automatic fingerprint identification system. Therefore, a fingerprint image goes through various processes like enhancement, analysis, binarizing, thinning and ridge reconstruction before the minutiae is extracted. The process chart of this process can be seen in figure.



MATCHED ALGORITHM

This algorithm detects similarities between two templates extracted by characteristic point extraction algorithm. It is done by comparing the position of each structure and characteristics point as shown in figure





V WORKING PRINCIPLE OF THE SYSTEM

Prior to the voting process, fingerprints of all possible voters are required to be registered to the system to give them access to cast their votes during the voting process. Once the fingerprints are registered, the voting process can be started where voters cast their votes to desired candidate. The flow chart of working process of finger print voting system.

VI RESULT AND DISCUSSION

All the casted votes are collected and stored in EEPROM memory and analyzed at the end of the voting process. 'Result' switch connected to digital I/O pin 2 when pressed invokes function to decide and display the result. Result function basically calculates the total count of votes of each candidate by adding number of time switches allocated for each individual candidate were pressed, in this project only two candidates were implemented. Therefore, after numerical comparison candidate with highest number of integer value is decided as winner result is displayed on the screen. This can also be seen in figure. Simultaneously, the result is also stored in EEPROM memory of Arduino so that it can be accessed after the voting process.

'No Voting' message is displayed in LCD if the result function is called before the voting have been done. The focus of the project was to design a fingerprint voting system which makes the voting process swift, sound and eradicate defrauding caused by manual voting process. Since the system made in this project is just a basic prototype, there are certainly huge scopes for upgrading with better funding and research. Some ways this project can be upgraded are discussed below: • It is possible to add a WIFI module to this system. Many voting machines can then be connected with host server with secure LAN. This will allow to store data in host server placed at secure location in real time. Physical damaging the de- vice will not cause in loss of data since the data are now transferred to host server in real time. An example of various voting machine connected to host server is shown in figure. Also, a GSM module can be added to send the result to various partakers. Although the prototype made in this thesis project aims to facilitate safe and swift voting process, with some hardware modification the same device can also be used for various other things like finger print based access control, attendance, billing, etc. Better components with higher functioning calibre can be used to make the de- vice more reliable in practical situations. For example, the fingerprint module in this prototype can accommodate only 162 fingerprint templates. This amount can be increased to any number by adding an extra memory space such as SD card.



VII CONCLUSION

This thesis study aimed to design and develop a prototype fingerprint voting system that ensures the voting process be safe and swift. For this a prototype device was made namely Arduino Uno based fingerprint voting system using DY50 fingerprint module, LED (16×2) and EEPROM internal memory storage technique. The final system is the result of various successful hardware and software integration. The process includes review and analysis, designing the system and algorithm, hardwiring, hardware and software integration, test and troubleshooting and result analysis.

To summarize, the prototype device was successfully able to enroll the fingerprint of the voters in DY50 fingerprint module flash memory, verify the status of voters (registration and multiple voting), matching the new fingerprint input with saved fingerprint template, authorize the voter to cast the vote and was able to generate result. To conclude, the device is great alternative to other lengthy election processes especially ballot paper voting system.

VIII FUTURE SCOPE

Further improvement of the prototype device could be done at the later development stage. For instance, an addition of WIFI module could help send result wirelessly to host computer and adding external memory space could help store any amount of fingerprint.

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