



International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 8, August 2017

Secure Advanced E-Voting System using NFC and Thumb Matching

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ABSTRACT: Every citizen of our country has duty to make voting. Voting process is very big process and having task to maintain transparency, privacy in the process of electoral and cover the integrity of elections. It is also necessary to give result with equitable and withstand any fraudulence. Violence free elections are one of the critical issue in today's situation. There are lots of problems faced by people like name not found, don't know the exact place of poll, fake voting, don't have enough time etc. Proposed system used to avoid drawbacks of existing methods. With the inclusion of a Near Field Communication (NFC) card or Aadhaar card and biometric fingerprint device. This E-voting method is computer based voting system with several administrative and logistic challenges in terms of cost, voter misinterpretation and tally of votes. By using E-voting framework, elections can be conducted easily, securely and effectively in a proper manner. Using NFC or Aadhaar card and fingerprint module the user can vote from any place. Encryption and decryption algorithm of cryptography is used for data privacy and security. Here we use AES and DES algorithm. We can decrease our cost and time by using such E-voting system. So this system can perform fastest election with less time and provide immediate result with accuracy.

KEYWORDS: Bio-metric, Fingerprint, Near Field Communication (NFC), Aadhaar card, Reader.

I. INTRODUCTION

Elections are the fundamental defining characteristics of any democracy that upholds the very meaning of a system that is being governed by the people expressing their choices or articulate opinions in the form of voting. The traditional electoral process vacillates around tallying manually, which is time consuming and complicated and more erroneous and prone to fraudulency. Now the voting mechanisms have evolved from leaps and bounds of simple hand written ballots to online voting systems. The proposed design, also have the sui generis feature of being autonomous during the operational mode, which helps to diminish and eradicate the issues of hacking that happened in cases of traditional voting systems and also has an eagle eye view on the privacy constraint which directly conflicts with the capability to audit the data aptly.

This technology allows communication between the NFC card and the device equipped with the reader when they are brought together within less than five centimeters apart in a very secured and reliable manner, which ebbed the complicacy and preventing from the malicious attacks or frauds. NFC is a finely honed version of HF-RFID, operating at the frequency of 13.56 MHz and transmission of data rate is 424Kbits/sec . Peer-to-peer communication and auto-coupling are the feature that sets NFC apart and it also enables slick and intuitive communication between device and tags. NFC tag store the voter's details like name, age, gender and location which are used to authenticate, before they cast their votes. The user places the NFC tag near the device reader, than it scans the tag and verifies the details with the back-end system. One of the noteworthy features of NFC is its ingrained guaranteed security, as the transmission of data is initiated by bringing two devices in proximity range of each other, separating devices over a range limit will terminate the communication. The range of NFC is so short that if any hacker device comes in the vicinity, it will be clearly recognized. Once the user is verified, the person can proceed to the next level of biometric authentication. To make the system more stringent and robust, another layer of security is reinforced through the use of selecting secure unique fingerprint or any image. For matching the image Naïve finder algorithm is used . Instead using hardware module software algorithm is used. To maintain the transparency of the system, in the third tier of security level -each



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time a user casts his vote, a tweet will be generated that the specified user has submitted his/her vote and the total no of vote count increases to prevent from illegal voting (rigging). The proposed design VOT-EL looks into the multiple dimensions to endure the expectations of the voter's for a secured, reliable and efficacious voting system.

II. RELATED WORK

In this design, the viability study of the emerging technology NFC, in conjunction with biometric is done. The design, suggests the use of a promising technology, i.e. NFC cards for the identification purpose of the voters, which is a short range radio communication wireless technology, in the first tier of security level. This technology allows communication between the NFC card and the device equipped with the reader when they are brought together within less than five centimeters apart in a very secured and reliable manner, which ebbed the complicity and preventing from the malicious attacks or frauds. NFC is a finely honed version of HF-RFID, operating at the frequency of 13.56 MHz and transmission of data rate is 424Kbits/sec . Peer-to-peer communication and auto-coupling are the feature that sets NFC apart and it also enables slick and intuitive communication between device and tags. NFC tag store the voter's details like name, age, gender and location which are used to authenticate, before they cast their votes.

III. LITERATURE SURVEY

Gurpreet Singh Matharu, Anju Mishra, Pallavi Chhikara “CIEVS: A Cloud-based Framework to Modernize the Indian Election Voting System ”@2014 IEEE

This paper proposes the deployment model “Cloud-based Integrated Election Voting System (CIEVS)” that integrates the existing Electronic Voting Machine (EVM) System with the proposed I-Voting System by leveraging the emerging cloud computing technology. The proposed cloud-based model is expected to offer scalability, security, cost reduction, reliability and enhanced computing power, in addition to achieving its design objective by boosting the voter participation levels in the Indian Elections. Cloud computing would accelerate the I-Voting System due to its new architecture and virtualization technology by serving the needs of voters through the use of virtualized computing resources via the Internet.

Hanady Hussien , Hussien Aboelnaga “Design of Secured E – voting System” @2013 IEEE

In this design it utilizes cryptosystem and blind signature based on RSA as security tools. It consists of CTF that communicates with multiple local committee servers that distributed among poll stations. Each server is connected with group of embedded systems acting as voting machines. The system satisfies the vital security requirements. Pailier cryptosystem provides the secrecy requirement because of its additive homomorphic property, which allows CTF to tally the secret votes without decrypting them. The blind signature based on RSA blinds the votes and voter identity to achieve privacy and accuracy security requirements. The eligibility and uniqueness requirements are accomplished by the data stored in voter's RFID.

Robert Gripenog , Yoohwan Kim “Utilizing NFC to secure Identification ” @ 2015 IEEE

Securing NFC data have been developed when applied to door security, and payment transaction systems. This paper focuses on assessment of NFC security methods of passive “smart” chip cards and will include pros/cons for each, as well as a best practices suggestion. NFC will most likely continue its path of being highly utilized in all fields because of its ease of use for people. It is also very flexible when compared to identification devices of the past, allowing multiple types of identification. The result is NFC will be used more for identification and multiple protocols will be utilized

Pratiksha Bhosale , Sayali Mokashi, Priyanka Wadkar E-voting System using NFC” @International Journal 2016

The elections can be conducted easily and effectively in a proper manner by using this Mobile based voting framework using NFC module because the user can vote from the place where he is working by using this framework. It can be changed for public election and also parliament elections. Proposed E- voting framework is very effective and it will be useful for voters in many ways and it will decrease the cost and time. Internet-based voting offers many

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benefits including low cost and increased voter participation. Voting frameworks must consider security and human factors carefully, and in particular make sure that they provide voters with reliable and intuitive indications of the validity of the voting process.

IV. PROPOSED SYSTEM MODEL

The main motto to develop the E-Voting System is to increase a voting count in our country because of only few people are going to voting Centre due to their tight schedule or remote work. So the people can vote from any location in the world with using this system. The E- Voting System is to make secure with some algorithm and techniques. There is no need go at given voting Centre , Voter will vote from any polling booth center. Avoid the phishing attackers, decrease bogus voting and provides the security to the system. Proposed system does not require large scale hardware interfaces only internet connection is needed so easily accessible from any position. This system is useful for election commission to conduct their elections for different posts. The elections can be conducted easily and effectively in a proper manner with Proper security.

A. The system will execute using below procedure:

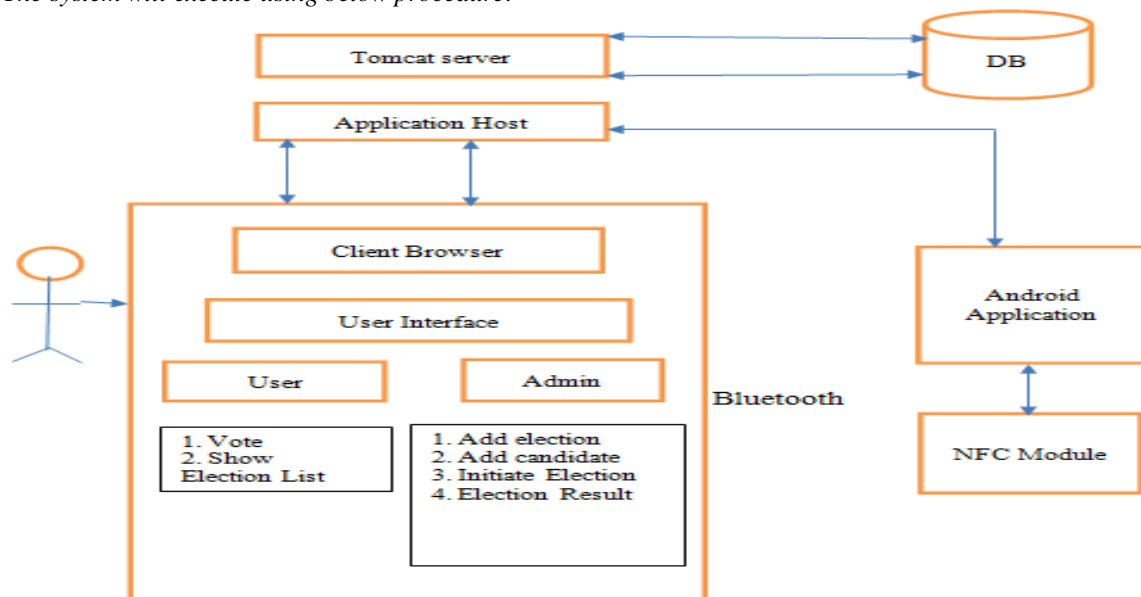


Fig1. Proposed System Architecture

NFC (Near Field Communication)-

Using NFC we afford guarantee to electronic voting framework. NFC store all information about voter .It is limited range radio communication .It empower network between two devices. User put NFC tag close to mobile phone, automatically its checks all the information and process this information .Confirm all the specifics and after the confirmation vote is adequate to vote desired candidate. Cryptography technique is again worn for security purpose. AES encryption algorithm is used for cryptography.

Each user will have a NFC voter id card which consists of the tag; all the baseline information like name, age, gender, location will be stored. The NFC cards come with a unique number for the identification purpose of each voter. The information is kept discrete by encapsulation process and the information can be manipulated at the starting set up procedure. The NFC cards are blank at the initial stage and have to be initialized to be entered into the back end system. Once the card id is held within the vicinity of the controller, through the use of serial monitor, the data or the baseline information contained becomes valid. When the user comes in the proximity range of the NFC reader, it retrieves the data from the tag and passes the information to the microcontroller. If the user is genuine, the id matches with the stored data in the database, he will be allowed to move to the next level of authentication, otherwise a message



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will be shown in the display that the person is not an authorized user. Only registered users may process further to cast their vote once they have placed their card within the vicinity of the NFC reader. Then the card is acknowledged by the reader, it checks for the unique identification number is present in the database, when this is done the voter is signaled to move to the next stage.

Once the voter cast his vote, he won't be allowed to vote again and if multiple votes are tried by the same person this will be reported to the screen. The Security image of the voter will be taken at time of registration and is being sent to the microcontroller. The processed image is transferred to match with the sample templates in the database. For Image matching Naïve finder algorithm is used. If the image matches, he/she can cast his vote in real time only once, choosing the candidate as per choice and if invalid user, then the buzzer will be raised and a message will be displayed as unauthorized user.

B. Keyword Points:

The different types of sub-unit and how they are connected is shown below.

NFC controller

NFC card interact with the NFC controller shield module by using EM radio field. NFC allows two-way communication between the card and the device, valid for a 13.56 MHz frequency.

16*2 LCD Display

The LCD display is connected to the 80C51 micro-controller, and microcontroller provides the data will be shown in the display.

Power Supply

The main components of the regulated power supply are 230 V AC mains, transformer, bridge rectifier (diodes), capacitor, voltage regulator (IC 7805), resistors and LED's.

Arduino

The Arduino-Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started [2].

C. Mathematical Module:

System Specification:

$S = \{S, s, X, Y, T, f_{main}, DD, NDD, f_{friend}, \text{memory shared}, CPU_{count}\}$

S (system):- Is our proposed system which includes following tuple.

s (initial state at time T) :- GUI of Advanced Technique E-Voting using NFC. The GUI provides space to enter a query/input for user.

X (input to system) :- Input Query. The user has to first enter the query. The query may be ambiguous or not. The query also represents what user wants to search.

Y (output of system) :- List of URLs with Snippets. User has to enter a query into Advanced Technique E-Voting using NFC then Advanced Technique E-Voting using NFC generates a result which contains relevant and irrelevant URL's and their snippets.

T (No. of steps to be performed) :- 6. These are the total number of steps required to process a query and generates results.

f_{main} (main algorithm) :- It contains Process P. Process P contains Input, Output and subordinates functions. It shows how the query will be processed into different modules and how the results are generated.

DD (deterministic data):- It contains Database data. Here we have considered Advance Technique E-Voting using NFC NDD.



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f_{friend} :- WC And IE. In our system, WC and IE are the friend functions of the main functions. Since we will be using both the functions, both are included in f_{friend} function. WC is Web Crawler which is bot and IE is Information Extraction which is used for extracting information on browser.

Memory shared: - Database. Database will store information like list of receivers, registration details and numbers of receivers. Since it is the only memory shared in our system, we have included it in the memory shared.

CPU_{count}: - 2. In our system, we require 1 CPU for server and minimum 1 CPU for client. Hence, CPU_{count} is 2.

Subordinate Functions:

Identify the processes as P.

$S = \{I, O, P, \dots\}$

$P = \{EV, NFC_auth\}$

Where,

- EV is E-Voting System.
- NFC_auth tag for Vote .
- P is processes.

$EV = \{U, MAX, CV\}$

Where,

- U= vote as a input Query
- $MAX = \{1, 2, 3, \dots, n\}$
- CV is output of vote taken through NFC tag.

$NFC_auth = \{V, DB\ Techniques, Info\}$

Where,

- V is input which is taken from user via NFC tag given to NFC .
- DB is use for Storing Votes, showing election results to Admin

D. Algorithms:

Voter

- Step 1: Register Voter.
- Step 2: Login Voter.
- Step 3: call NFC_auth function
- Step 4: call ThumbImage_auth function
- Step 4.1: Home Page.
- Step 4.2 : Show Elections
- Step 4.3 : Vote

Admin

- Step 1: Login.
- Step 2: call auth function.
- Step 2.1: Home Page.
- Step 2.2 : Add Elections
- Step 2.3 : Add Candidate
- Step 2.4 : Initiate Election
- Step 2.5 : Election Result

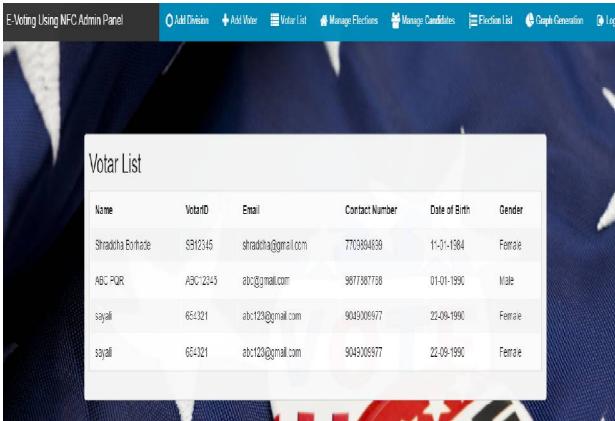
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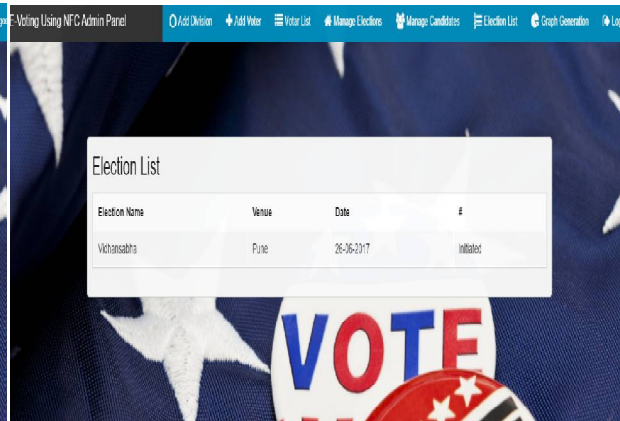
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V. SIMULATION RESULTS



Name	VotarID	Email	Contact Number	Date of Birth	Gender
Shradha Eshide	6912345	shradha@gmail.com	770394839	11-31-1984	Female
ABC PQR	ASD 2345	abc@gmail.com	9877887788	01-01-1990	Male
sajal	654321	abc123@gmail.com	9049306977	22-06-1990	Female
sajal	654321	abc123@gmail.com	9049306977	22-06-1990	Female

Fig.2. Votar List



Election Name	Venue	Date	#
Vidhansabha	Pune	26-06-2017	initiated

Fig. 3. Election List

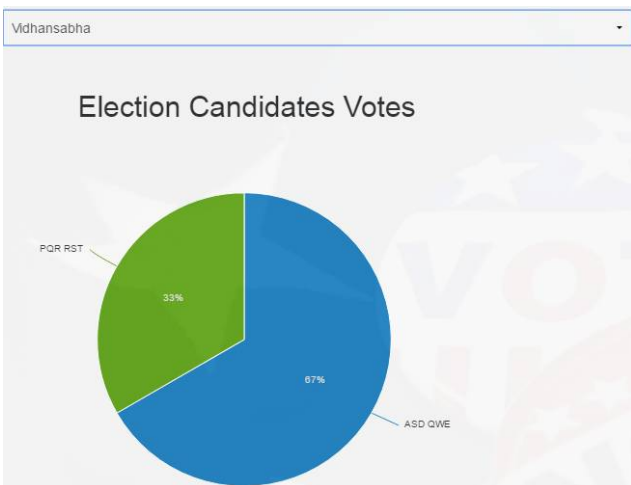



Fig. 4. Result pie chart.



Sr. No	Name	No. of Votes
1	ASD QWE	2
2	PQR RST	1
Total		3

Fig. 5. Result table chart.

This window fig.2, shows that Votar List. Voter can Login and Register from App using NFC Module. Voter will get noticed at the time of election (App). At the time of election, voter can elect candidate. (By mobile and Web Portal).

This window fig3., show list of elections with candidates. It contains election name, venue, Date. Here is the phase which provides the information of election section. In this section first the information of election is filling with time, venue, date and kind of election, etc. Then second the information of participant get filled. After that information this window get showed that the election name with participant.

This window fig4 & fig5, Can show list of Elections, Candidates and voter. After Election, admin can show election result in graph. It can show the overall graph i.e., the number of people register for voting, no of vote to particular candidate, the accurate result of voting.



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VI. CONCLUSION AND FUTURE WORK

Here, Conclude that the in this framework designed for election commission to conduct their elections for different posts. The elections can be conducted easily and effectively in a proper manner by using this Mobile based voting framework using NFC module because the user can vote from the place where he is working by using this framework. It can be changed for public election and also parliament elections. Proposed E- voting framework is very effective and it will be useful for voters in many ways and it will decrease the cost and time. Internet-based voting offers a lot of settlement including short price tag and increased voter participation. Voting frameworks must consider security and human factors carefully, and in particular make sure that they provide voters with reliable and intuitive indications of the validity of the voting process.

FUTURE WORK

This Advance E Voting system is used to conduct their elections for different posts. In future of E-Voting system ,at the day of election provide Google map location of nearest polling centre to voter for place convenience. Link Aadhar card with NFC card. Also it can provide notification for election initiation at the day of election.

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