PUSL3190 Computing Individual Project

Project Proposal

Let's Vote – Secured Voting system using Blockchain and Facial Recognition

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Chapter 1 - Problem Statement

When it comes to organizations, companies, associations or even in government sector or else in a regular election also choosing someone for a certain position should be a transparent and trustworthy process. But nowadays it's the very same thing that is missing. The main reason is the way, the process which is used. Also, this ongoing system is vulnerable to corruption and frauds. Almost in every occasion when a person or a board of people is to be selected manual, old-school paper voting system is used and it can be easily changed or misled. Also, when the drawbacks of this manual voting system is considered so many drawbacks can be listed as following

- Identity validation – whether the actual person who is eligible for voting is the one who is voting.
- Vote duplication – though one person is allowed with one vote multiple votes can be cast without alerting the staff.
- Misusing ballot papers
- Time – it would take a considerable amount of time to calculate votes and that process should be accurate and trustworthy.
- Cost - for ballot papers , for staff and expenses.
- No real-time results – this could lead to altering votes , and transparency of the election could be controversial
- For disable people - for an example blind people need someone's assistance , and that person can change their vote
- Buying votes
- Alternating vote count
- Ineligible voting

In United Kingdom 6 parliamentary elections were held in those elections there were 38 voting offences , 18 nomination and 13 registrations offences were recorded

Above mentioned are the drawbacks of traditional papers based voting system, now the electronic voting machines which were first proposed in 1839, though they seems like they are accurate and appropriate to replace the current paper based voting system some cons can be recognized

- Outdated and vulnerable to attacks – the software which are used in these machines are outdated and could be a easy target to hackers or any other interested party to exploit the vulnerabilities in the current system and alter the results
- Maintenance cost – as those machines are obsolete their maintenance cost is considerably high and its hard to keep up with current situation.

Another Problem which will affect to this field is identity theft. there total of 51,629 identity thefts in us happen in 2021 . when the voting becomes an online smart devices based service identity theft will be the next biggest crime that will take place.

According to above mentioned facts there are two ongoing methods of voting which are papers based voting and voting machines . though the papers based one seems like more convenient and accurate and easy it could be corrupted and could lead to frauds. Its basically same with the voting machines but in a different way. Those systems can be hacked by hackers as the software used in those machines are obsolete.

Chapter 2 – Project Description

As of the problem identification , a proper ,accurate and trustworthy approach Is needed so a mobile application would be appropriate rather than a website. Mobile application would always be more convenient for users as they don't want to navigate to the website and set up the settings . an user-friendly mobile application would be ideal for a smart voting system. This project is about creating a trust-worthy platform for elections ,where there is no chance for fraud, corruption , misleading or involving with any kind of election results tangling. As mentioned above a mobile application will do the front end duty while blockchain technology handling the backend process. Smart contract will act as the ballot paper , casting and counting votes will also be done using the blockchain technology. Basically this project's outcome; the mobile application will allow users to conduct elections for their associations, organizations and companies. It would need some extra development before it will be good for government elections when It comes to large scale. But it would be ideal for any kind of organization, institution or anyplace where unbiased and trustworthy election is needed
This mobile application will provide the facility to users to setup a election and its other components like time , date ,how many candidates , a description about the election, messaging feature to communicate among the people in the organization or in the certain circle. They will be able to pick whether the election is about choosing a single option or multiple options and according to that election can b customized . and after the election , voting ends results will be displayed Realtime. And if there are any disputes or any disagreement users will be able to communicate with the person who created the election and resolve the dispute.
The approach towards this project will be two phases which are,

1. Mobile Application development
2. Smart contract (Blockchain Technology to casting and counting votes)

The mobile application will be developed using Flutter as the framework and dart as the language . flutter's built in libraries and packages will be more useful for the process. Being able to develop ios and android applications from the single codebase is also another advantage. Mobile application will help users to login or create user accounts in order to proceed with the application . for the firebase will be used , firebase's built in functions like firebase authentication, firestore database, Realtime database will be used to store data, manage user details and authentications . and also firebase cloud messaging will be used to

deploy communication among users .using the application , users will be able to generate their preferred type of election and customize the allocated time, date and other things.
In Addition to that the next problem which will be faced is if the actual person is using the vote for that the solution in this project will be , when creating the account a photo of the user will be taken and then it is stored in the cloud and when the voter is going to vote using the mobile application a photo will be taken and using google cloud vision API facial features will be compared and then if the person is the same as the registered one then the person will be directed to vote unless he wont have access to vote.
The next process is the most important one. Backend process of the project . though there are some things are done by using dart as the backend programing language . after connecting the blockchain technology's smart contract with the mobile application. Solidity will act as the backend language. Solidity smart contract is written using solidity and it will be deployed to a test net and from there it will be connected to the mobile application
Blockchain Process

- Registering and authentication of users
  After registering using the mobile application users will be assigned with another two cryptographic keys in order to secure authentications these two keys will be private and public
- Ballot Creation
  When using the blockchain technology ballot paper's task is carried out by the smart contract which is written using solidity . the smart contract will contain list of candidates and their unique identifiers
- Casting votes
  Voters are signed in using their cryptographic keys and their preferred candidate can be selected.
  The transaction of voting is encrypted and signed digitally with their private keys and then the transaction is broadcasted to the blockchain network(test net)
- Validation and confirmation of votes
  Nodes of the network validate the voter's eligibility to vote and check it goes accordingly to the rules and regulations defined in the smart contract. And when the vote is confirmed it will be added to the pending transaction pool
- Blockchain consensus

In order to valid transactions to be included in the block, nodes of the blockchain work together to agree on set of rules

- Adding vote to the pool

  Once the consensus is reached , validated votes are bundled with other transactions into a new block

- Immutability and Transparency

  Once the above mentioned facts are checked and block is added it will be almost impossible to alter or delete any vote

- Vote counting

  A transparent ledger of all votes is supplied by blockchain . votes are counted by analyzing the data inside block using blockchain explorer tools

Advantages of Using Blockchain Technology

- Secure Storage
- Auditability
- Immutability
- Transparent process
- Trustless, no one is needed to count votes
- Provenance

Objectives

- A platform to conduct elections for organizations and institutions.
- Mobile Application with user friendly and convenient interface
- Mobile Application without any problems to use, easily understandable.
- With facial recognition , only eligible voters will be allowed to use the application
- Secure and trustworthy option for users instead of traditional methods
- Blockchain based mobile application.
- Without human interactions without any interference the process will be executed, and the results will be issued Realtime.

  Frameworks– Flutter , truffle , Ethereum development framework

  Languages – Dart , solidity ,JavaScript

  Tools – Android Studio, visual Studio code, Ganache

Keywords

Flutter | Dart | Blockchain | Ethereum | Solidity | smart voting | smart contracts | Firebase | Face recognition| Cloud Vision

Chapter 3 – Research Gap

With the development of the technology , when the ongoing , traditional paper based election system seem to be failing there are considerable amount of solutions which were built recently to avoid this issue. But in the research about them , some pros and cons were noticed. There are so many good features in those systems yet , when those features are combined and added to a single project that would be great for a smart voting system . for my research these are the websites and mobile applications that were tested

- VotemeApp
- Pollie
- Voting with friends
- Qvote
- ElectionBuddy

These are the problems that has been found out.

- Security issues
    - No proper way to confirm whether the user is allowed to votre
    - No sign in options , no registrations , no authentication
- Technical
    - Customizing elections are not sorted out properly
    - No messaging and communication options are not provided
    - Complicated options not user friendly , too much options
- Application wise
    - Doesn’t get the feeling of a voting application.
    - Hard to understand.
    - Not user friendly

Things that will be included in my project that were missing from above applications and sites.

- User authentication with secured login & sign in options – firebase authentication
- Facial recognition - before voting user will be checked by capturing a photo discreetly
- Voter’s identification verification - Private and Public keys (blockchain)
- Election type and other options customization – users will be able to customize the election type , no of candidates , what voters require in order to cast vote etc.

- Voting process – using the blockchain technology error free, immutable and impossible to tamper with voting process is delivered to the users
- Use of blockchain technology - with the use of smart contract where all the conditions are written , need of middlemen is eliminated and no one or any other mechanism is not required to calculate votes
- Secure messaging and communication – firebase cloud messaging
- Election Result Feedback

How this project differs from other projects

The projects, websites and mobile applications that have been tested in this research were some sort of simple and the website “Election Buddy” is too much professional and very confusing . too much of customizing and too much of setting up . its good but its kind of difficult work with. Also use of Blockchain technology was not found out any of those applications. Using blockchain technology in a commercial purposed applications might cost some amount of money. So for this project a test net instead of Ethereum main net will be used for the deployment of smart contract and other deployments. Blockchain smart contracts will provide users with error free trustworthy platform to pick their candidates for necessary positions. Also use of face recognition with the use of this no one who is not eligible for will be able to access the election . though they have credentials of another user they wont be allowed in to the system , from this feature Another thing which will be included in this project is, in all the above mentioned projects when some useful features are included some were missing , so in my project , those features that were missing from those will be combined and with the use of blockchain technology , this project is unique from current existing applications about voting systems

Chapter 4 – Requirement Analysis

The purpose of this project is to ensure that users are allowed to conduct an unbiased , trustworthy and untampered election to elect candidates for necessary positions. As current systems doesn't consist with some features , this project will come with those missing features powered by the blockchain technology. This will do the tasks like checking voter's eligibility , casting votes and calculating votes without any human interaction or simple backend coding of the mobile application .

Baisc objectives of this project is a mobile application where uses can conduct elections , others can cast vote to their preferred candidates using the application. Process will be done by smart contract written using solidity programming language. Simple yet attractive user interface will be there and users will be allowed to communicate with others to resolve their issues regarding the vote using messaging option

Target Audience will be organizations, institutions and other associations who are looking to switch from traditional way of electing their people for the positions

Functional Requirements

In this project ,

- Authentication system
- Facial recognition and verifying user identity
- Customizing election options
- Allowing users to vote after joining the election
- Using blockchain technology immutable voting and vote counting option
- Communicating among the people in the organization
- Dispute resolution

Use Case Scenario

Use case name : conducting a election to select the president for the IT society

Actors : candidates, election organizer, voters

Pre condition :

- users have the application installed on their mobile phones
- they have active internet connection
- users are logged into the application

post conditions

- voters have casted their vote for their preferred candidate

- elections results are issued and candidate is selected

Flow of Events

- user opens the application
- logs in to the system / register and then logs in
- creating the election
- customizing the election option according to the necessity
- opening the election
- voters login into app
- checking for their identity verification
- allowed in to the election
- voters voting for the candidate
- chosen candidate is announced
- if there are disputes they are discussed using the application

Alternative flows

- voters can skip voting

Exceptions

- internet failure
- failed to login due to wrong credentials
- face doesn't match and wont be allowed to vote
- failed to connect to the correct election

non Functional Requirements

- firebase authentication is used for secure login option
- compatible with android and ios devices
- permissions required :
    - camera
    - storage
    - call logs
    - camera
    - face id
    - fingerprint

Technical Requirement

- Programming languages
    - Dart
    - Solidity
    - JavaScript
- Frameworks
    - Flutter
- Libraries
    - Web3dart
    - Flutter_ethereum
    - Bip32
    - Xxhash3
    - Path_provider
    - Google_ml_kit

Software Requirements

- Android Studio
- Visual studio code
- Ganache

Hardware Requirements

- Computer
- Mobile phone
- Router (constant internet connection)

API s

- Infura
- MetaMask
- WalletConnect
- Cloud vision API

Integration Requirements

- Smart contract integration
- Wallet integration
- Backend integration
- Firebase integration

Chapter 5 – Budget Plan

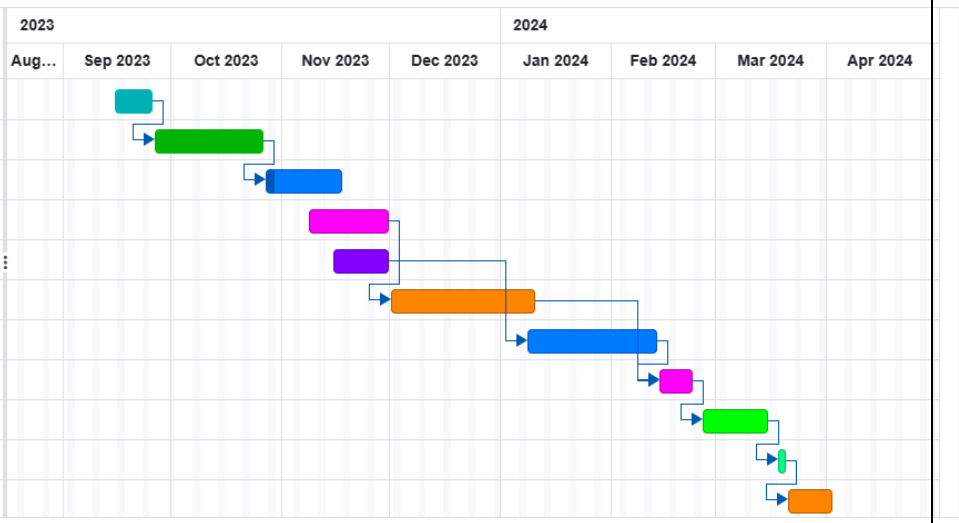
There is no cost for this project yet as this is developed using developer environments. If the project is to published as a commercial purposed application there will be a expense for purchasing Ethereum as for every transaction there Is a cost called gas and it needs Ethereum for that.

Chapter 7 – External organizations

There Is no specified client for this project . the target audience will be organizations, companies , institutions or any other place where a unbiased election is required

Chapter 8 – project time line

ID	Name
1	Problem Identification
2	Research about the identified problem
3	Research about Blockchain
4	BlockChain sample project developing
5	Flutter Advance Studying
6	Smart contract development
7	Mobile Application Development
8	Connecting Application with smart contract
9	Testing and Bug Fixing
10	Finalizing Project
11	Report Finalizing



Chapter 9 – Referencing and Bibliography

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