Fair Election System in India Using UID Data and Biometric Technology

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Abstract— India is the largest democratic country in the world, with an estimated 725 million eligible voters by the 2014 General Elections. With such a large population, the Election procedure is bound to be ridden with problems. The main issue here is fair elections. Every voting center has a list of eligible voters from that constituency who can cast their vote. But it is common knowledge that there are a lot of centers, especially in semi-urban and rural areas where strict checking of voter's id does not happen, as a result of which votes are cast on behalf of someone else, leading to unfair elections. The recent Unique Identification (UID) Aadhar system maintains a database of all residents of India along with their biometric data, which is unique to every citizen. This paper explores the concept of linking the biometric data in the UID database to the voting machine to ensure that every vote is cast by a person only once. Retrieval of data can be done and matched for every citizen with a UID. This can safeguard the citizen's right to vote and guarantee fair elections.

Index Terms— Democracy, Elections, Unique Identification Number (UID), Biometric, Database Management, Information Retrieval, Security

1 INTRODUCTION

A Democracy is typically defined as a country where eligible citizens vote for their representatives, thus forming a Government for the people, by the people. The first general elections were held in the year 1951, with 173 million voters, and from there we have grown into a massive 725 million eligible voters by the year 2014 [1]. India can be rightfully called the foremost epitome of Democracy. With such a large pool of voters, it is a difficult task to ensure that fair voting procedures are implemented at every polling booth in the country. The added fact that corrupt officials can be present at any polling booth, allowing malpractices and human errors in the process of voting is a concern. The sole underlying purpose of a Democratic nation such as ours is to ensure that every citizen gets a fair chance to vote, without any mismanagement or anyone abusing their right to vote by employing dereliction. Such chances of human error can be eliminated by converting the whole election system into a standard tamper-proof computerized system, which will leave no chance for errors or malpractice caused by human involvement.
Fig.1 demonstrates the procedure for General Elections followed currently in India.

At the grass-root level, votes are cast by every adult individual, at centers spread across the country. These votes are counted and consolidated results for every constituency are declared, thus deciding the political party which will govern that particular constituency. In the year 1999, Electronic Voting Machines were introduced in some parts of the country, and during the 2004 General Elections, EVMs were used at every polling booth [2]. This considerably reduced the time required in casting and counting the votes, which largely helped in declaring the results earlier and with greater ease. But many believed that the EVMs were tamparable and security issues cropped up, leading to many outcries. After a ruling from the Supreme Court of India and demands of various political parties, a Voter Verified Paper Audit Trail was introduced, which ensured that correct votes were recorded [2].

This procedure highly standardized the vote acceptance technique. The problem today is not in counting and tracking votes, but in ensuring that authentication of voters is done with high precision so as to guarantee fair elections.

2 ELECTORAL SYSTEM OF INDIA

Elections are conducted according to the constitutional provisions, supplemented by laws made by Parliament. The Presiding officer of every General Election is the Chief Election Commissioner of India. The following sections give us a brief idea of the working of the Electoral System.

2.1 Statistics

General Elections in India is considered one of the largest events in the world, with more than 670 million electors ranging over 7 lakh polling stations spread across the country. In the 2004 General Elections of India, 38,99,48,330 people voted out of a total electorate size of 67,14,87,930. There were a total of 1351 candidates from 6 National Parties, 801 candidates from 36 State Parties, 898 candidates from officially recognized parties and 2385 Independent candidates. The Election Commission employed almost 4 million people to run the election [3].

Fig 1- Procedure for General Elections in India

2.1 Statistics

The country has been divided into 543 Parliamentary Constituencies. Each Constituency has a seat reserved in the Lok Sabha, i.e. there is one MP from every Constituency in the lower house of the Parliament. The size and geographical are of each of these Parliamentary constituencies are determined by an independent Delimitation Commission, which aims to create constituencies which have roughly the same population [3]. State boundaries and geographical conditions are also important factors weighed while determining the constituencies. Each state has different number of constituencies, and the division of constituencies is important for understanding the ease of implementation of the system. [4]. Fig 2 illustrates the number of constituencies in the 35 States and Union Territories of India.

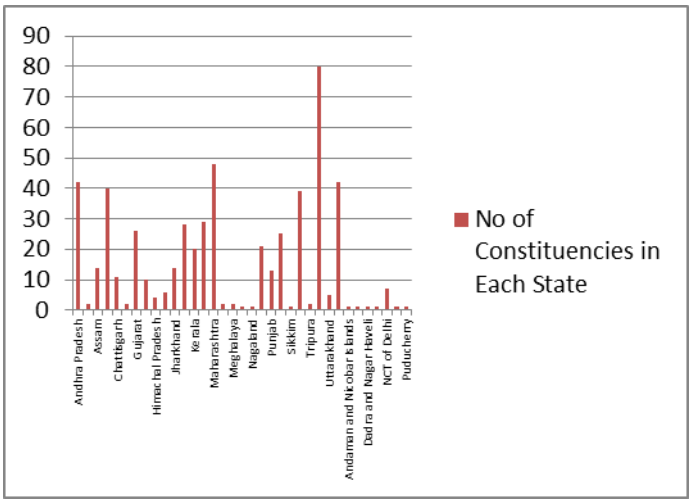

Fig 2- Number of constituencies in each state

2.2 Criteria for being an Eligible Voter

Voting in India is based on the principle of Universal Adult Suffrage; that any citizen over the age of 18 can vote in an election. The right to vote is irrespective of caste, creed, religion or gender. Convicted criminals and people who are deemed unsound of mind are not allowed to vote [3].

3 EXISTING VOTING PROCEDURE

Elections take place every five years, or when the House has been dissolved and elections have been declared by the President. Fig 3 illustrates the existing voting procedure.

3.1 Pre Work Involved

An Electoral Roll is prepared well in advance before the Elections. The Electoral Roll is basically a list of all eligible voters who are registered to vote in the elections. The electoral rolls are ideally updated every year. In 1998, the Electoral Roll was completely and thoroughly computerized, making it more efficient to keep a track of the voters. The Photo Identity card number is also printed on the electoral roll for cross reference. The Voter Id Card is mandatory for every voter whose name is present on the roll. More than 450 million Identity Cards have been distributed till date [5]. The Voter Id Card is used to authenticate the person giving the vote and hence every voter is required to have that.

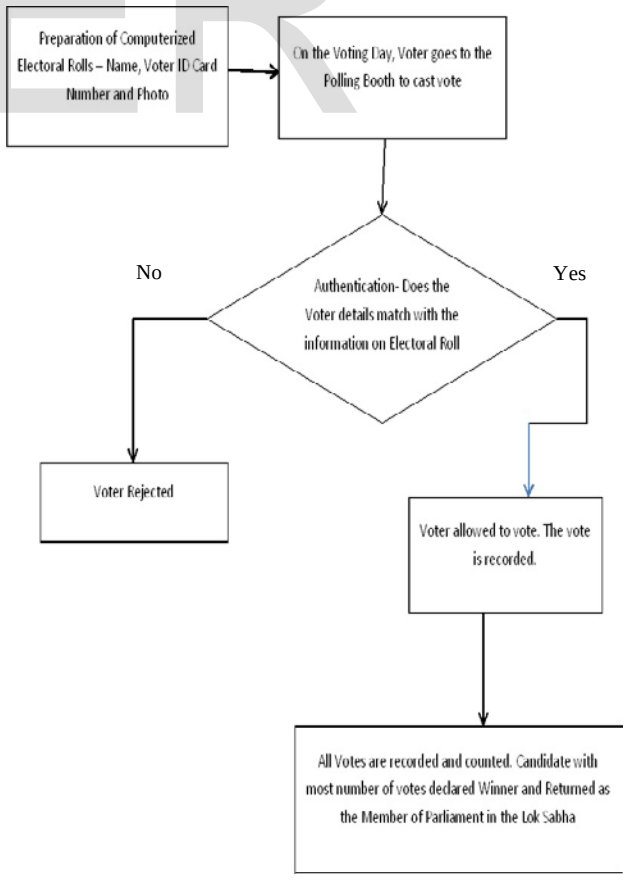

Fig 3- Existing Voting Procedure in India

3.2 Voting Day

The Secret Ballot System is followed for elections in India, which means that the voter can cast vote in private, without having to reveal who he has voted for. Polling Stations are set-up in public institutions and the Election Commission tries to ensure that a polling booth is available within 5 km of the voter's registered residence [5].

Authentication of the voter is done solely based on the Cross referencing of the Voter Id produced by the voter at the polling booth and the information available on the Electoral Roll. This can lead to human error and malpractice. Votes are cast using the Electronic Voting Machine, which records the vote.

3.3 Counting Votes

After the polling has ended, the votes are calculated under the administration of Returning Officers and Observers appointed by the Election Commission. After the counting of votes is over, the Returning Officer declares the name of the candidate who has secured the largest number of votes and is declared the winner, and as having been returned by the constituency to the Lower House of the Parliament [5].

3.4 Drawbacks

Manually managing data for voters can lead to error and wrong voting, as indicated earlier. The voter authentication process is left to Officials, and this can lead to errors and corrupt practices, thus resulting in unfair elections. At the core of any democracy is the capability to hold fair elections, and the purpose is not being fulfilled, if validation of voter is not done properly.

4 UNIQUE IDENTIFICATION - AADHAR

The Aadhaar Scheme is a unique identification project for the citizens of India, and is run by the Unique Identification Authority of India (UIDAI).

4.1 Features

Aadhaar is a 12- digit unique number which the UIDAI will issue for all residents. The number will be stored in a centralized database and linked to the basic demographics and biometric information of each individual. The UIDAI owns and operates the Unique Identification Number Database [6]. The Aadhaar data collection is the largest biometric data collection program in the world without any data protection law or data protection authority to provide any privacy safeguards.

4.2 Biometric Information

Biometrics is the identification of an individual using a distinctive aspect of their biology [7], such as fingerprint or iris scan. This information can never be the same for two individuals. The Aadhaar scheme requires every citizen of the country to register biometric data along with other demographics [8].

1) Fingerprint: Fingerprint scanners are probably the most commonly used biometric system. Fingerprint of two humans can never be the same; it is unique to every person [9]. Fingerprints of all ten fingers of the citizen are registered in the database.

2) Iris: Eyes are another static property of an individual. A retina scanner scans the blood vessels to create an individual data set. The iris of every individual is scanned and recorded in the UID Database.

3) Face: The Human face is also a feature that can be used in biometric systems. For the purpose of the Aadhar Scheme, a photograph of every individual is taken and archived. Facial Recognition is an important but not very reliable tool, as facial features can easily be altered by surgical procedures and authentication becomes difficult.

4.3 Advantages

The Aadhaar scheme aims at providing a database for the entire nation with all important demographics and biometric data; so that one consolidated information point of contact is created. This information can be used for authentication and verification of the citizens. Credibility can be established by verification of personal information and uniqueness of biometric data [10]. It is a universal system and is a revolutionary step in giving every Indian a unique Identity.

4.4 Disadvantages

The foremost flaw of the Aadhaar Scheme is the cost-effectiveness of the whole system [11]. Maintaining a database of more than 100 million citizens is a strenuous task, not to mention the time and human resource spent, which is a huge number, considering that India is still a developing country. Even though the biometric system can be reliable, the registering of the biometric data can be a problem. Scanners need to work accurately; information should be correctly linked and matched to the respective users. While registering the information, human errors might crop up as the administrator might not be experienced.

5 SUGGESTED AUTHENTICATION USING UID BIOMETRIC INFORMATION

For authentication with absolute accuracy, the biometric data collected by all citizens while registering for the Aadhaar Scheme can be used [12]. The Implementation has to be done with high precision because data retrieval from such a large database would be very difficult. Fig 4 provides an overview of the suggested method of authentication.

5.1 Data Retrieval

The UID Data for every constituency can be stored at one server, so that every constituency is allotted one server. Fingerprint, photo, name and UID number can are the main information, the UID Number acting as the Primary Key. On entering the UID into a computer from any polling station, the system will search for a match in the server allotted to that constituency and authentication is done by matching the UID. Data associated with that UID is retrieved. The Voter will have to provide his UID Number, and data associated with that UID will be retrieved.

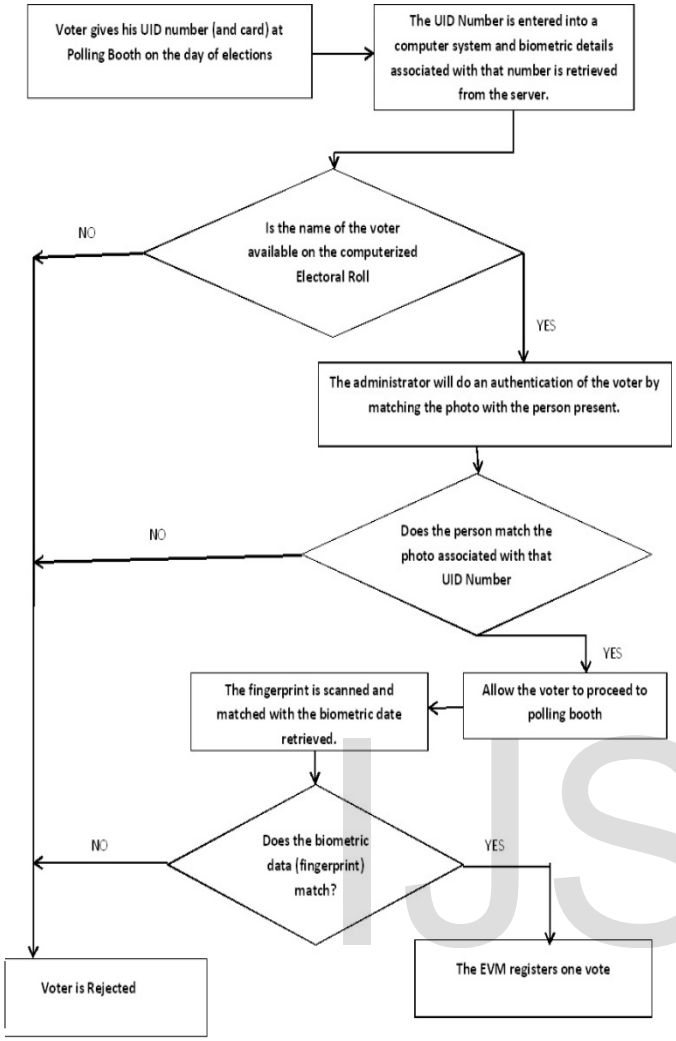

Fig. 4- Suggested Authentication System for Voting

5.2 Authentication Procedure

Once the data is retrieved, the administrator matches the photo associated with the UID with the person present. If it is okay, the voter is allowed to proceed to vote. The EVM can only be switched on by a verified fingerprint. Once the fingerprint of the voter is matched with the fingerprint retrieved from the database, the EVM registers the vote of the voter. The EVM will record the vote if and only if the fingerprint or biometric data is authenticated. The person is marked in the system that the vote has successfully been registered. This way, one voter cannot vote more than once. The voter is rejected if anyone condition is not met.

5.3 Data Management and Storage

The Database will be very large for every constituency, and every polling booth of the constituency will have access to the server, which means that there will be many Concurrent Users. Data Management and Retrieval will be a difficult task, with so many users. Voters have to be segregated according to the constituencies for easier data management.

6 CONCLUSION AND FUTURE WORK

A biometric technique for authentication of voter can be said to be a solid system, because biometric authentication can never be wrong. But a problem may arise in management of such a large database. Secure Connections are needed for confidential data retrieval of the information. Not every citizen has been registered in the Aadhaar System and implementing the procedure will take a long time, owing to the fact that there are more than 700 million projected voters. Cost will also be high, as biometric authentication devices are very costly. Illiterate voters will definitely face a problem in using the machine. The system is tedious to implement, but once it is done, can be a very effective authentication procedure. With proper authentication and voter registration, fair elections can be ensured.

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