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Design of an Electronic Voting Machine to Ensure Proper Voting Process, Minimizing Rigging, Using Radio Frequency Identification Technology

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***Abstract* -** Electoral fraud is one of the biggest threats to democracy in India. As a solution to this problem we have proposed a modified Electronic Voting Machine which can help in reducing electoral fraud in India to a large extent. The system utilizes RFID technology to scan voter ID cards and prevent any invalid voter from casting a vote and also register only a single vote per voter. The voter ID card is also read at an electronically controlled gate, which will also have an RFID reader installed in it. It will scan the voter card and prevent any ineligible voter from entering the booth.

***Keywords*—** Electoral fraud; EVM; RFID; Stamp microcontroller; Voting.

I. INTRODUCTION

India is the largest democracy in the world. It is the fundamental right of each and every citizen of our country to exercise their voting rights and elect the personnel who would govern our country and its states. However, in our country the voting process itself is severely manipulated. Electoral fraud is prevalent in various places especially in the rural areas. Various anti-social elements capture booths; intimidate voters to affect the poll results; thereby taking away the democratic rights of Indian citizen. In ballot stuffing, a kind of electoral fraud, the polling process is manipulated to cast repeated votes. This is the single biggest cause of electoral fraud in India. As a possible solution to this problem we have proposed a system which utilizes RFID technology to greatly reduce ballot stuffing. It will allow only valid voters to cast a vote and will also prevent any voter from casting his/her vote more than once. There will also be an electronically controlled gate with an RFID reader installed in it to only allow those voters inside the voting room who are eligible to vote. In this voting scheme the control of the polling officer over the entire voting process is greatly reduced. Thus manipulation through human intervention is prevented**.** The overall voting process becomes much smoother, faster and transparent.

II. DESCRIPTION OF KEY SYSTEM COMPONENTS

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A. RFID SYSTEM

RFID or Radio Frequency Identification is a technology that uses radio frequency waves to uniquely identify an object. The method to identify an object uniquely is to store a serial number or other information on a chip and to attach the chip with an antenna. The chip and the antenna together is called RFID tag or RFID transponder. The chip stores the ID and the antenna enables that chip to transmit the ID to RFID reader. An RFID reader converts the radio wave transmitted by tag into digital information that is passed to a host computer to store or retrieve any information from database.

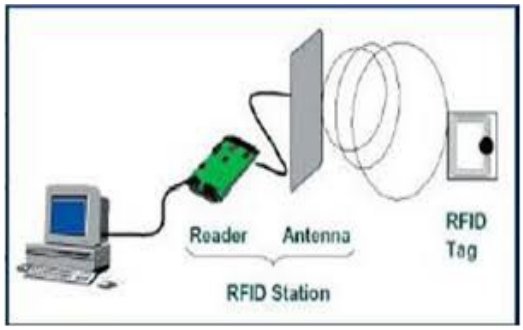

Fig. 1. Basic RFID system

Any conventional RFID system consists of three basic components along with a host computer.
Those three components are:

a) RFID tag:
RFID transponder or tag is able to store data. A change in impedance at the transponder antenna results in backscatter. Data transfer between tag and reader takes place due to backscatter and not by means of inductance.

b) RFID Antenna
An RFID antenna consists of a coil with one or more windings and a matching network. It is capable of radiating electromagnetic waves. An RFID system is designed in such a way that electromagnetic field is constantly generated or activated by reader. RFID antenna is also capable of receiving radio frequency signal from the transponder.

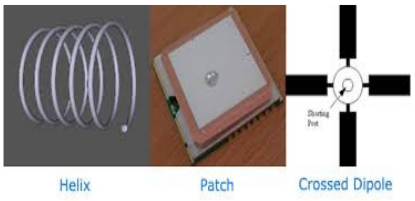

Fig. 2. Various types of RFID antennas

c) RFID Reader:
RFID reader is used to decode the radio waves that are transmitted by the tag and to get a digital data from it. An RFID reader can sense tags those are at a distance of one centimeter to thirty meters or may be more than that. That region is covered by electromagnetic wave of a reader. If a transponder enters that region the reader detects the data stored in chip of the transponder and communicates with the host computer database.
Most of these devices can both read from a tag and also write into it. This makes communication a two way data transfer. That is why it is one of the major components of the system.

B. MICROPROCESSOR:

The BASIC Stamp microcontroller has been used for development of the proposed system. It is a microcontroller with a small, specialized BASIC interpreter (PBASIC) built into ROM. Although the BASIC Stamp has the form of a DIP chip, it is in fact a small printed circuit board (PCB) that contains the essential elements of a microprocessor system:

- A Microcontroller containing the CPU, a built in ROM containing the BASIC interpreter, and various peripherals
- Memory (an I²C EEPROM)
- A clock, usually in the form of a ceramic resonator
- A power supply
- External input and output

A 9 V battery is required to be connected to the BASIC Stamp. The BASIC Stamp is programmed in a variant of the BASIC language, called PBASIC.

III. DESCRIPTION OF THE SYSTEM

The elements in our new voting scheme will consist of:

a) Voter ID card - In our new voting scheme each voter ID card will be replaced with an RFID tag, each having a unique identity. The details like the photo of the voter, address, date of birth, signature, voter ID card number etc. will be printed on tag similar to the present system.

b) EVM - In the present system the EVM consists of two parts

i) Control Unit – Controlled by the presiding officer. Used to read the voter ID card inside the voting room.
ii) Ballot Unit – Has buttons corresponding to each of the candidates. The voter casts his/her vote by pressing these buttons.

In our proposed system the control unit will have an RFID reader installed in it. It will contain a database of the all the valid voters in the area and will keep a record of all the votes that are being cast. So the presiding officer now only checks the photo ID of the voter takes a reading of his/her voter card with the control unit and it is checked for validity. If the card is found to be valid the voter is allowed to cast a vote else an alarm is raised.

c) ELECTRONICALLY CONTROLLED GATE – The electronic gate will also have an RFID reader. It will have a database of all the valid voters. It only allows voters inside the voting room who are valid and have not cast their vote earlier.

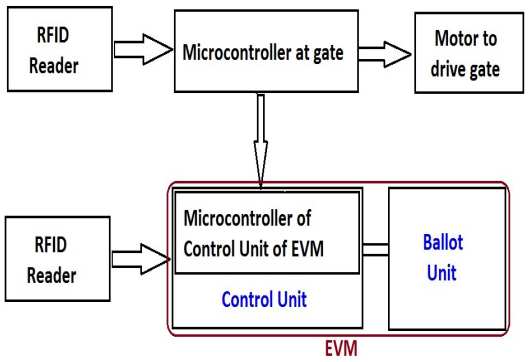

Fig. 3: Block Diagram of the system

IV. WORKING PRINCIPLE OF THE PROPOSED SCHEME

In this system, each voter ID card is actually an RFID tag and has a unique identity number. Using this identity number each of them can be uniquely identified using an RFID reader. The voting process itself is carried out in 3 stages:

STAGE I: During the voting process each voter must be carrying a voter ID card and the eligibility of each voter will be checked at the queue/gate of the voting premises by a security personnel. This will result in quick elimination of illegal voters.

STAGE II: The room where the EVM is kept is provided with an electronically controlled gate. An RFID reader is also installed at this gate. It will read the voter ID cards and will open only for valid voters and those who are yet to cast their vote. It will also contain a database of the valid voters and update its memory as it reads the IDs on the voter cards.

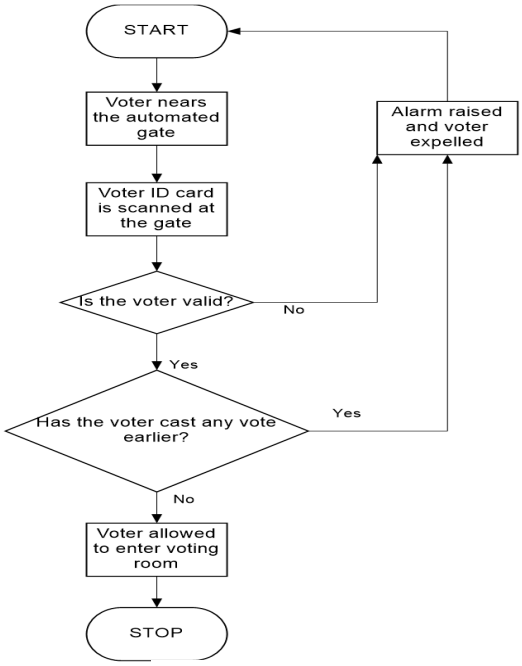

Fig. 4: Flowchart for stage II

STAGE III:

The EVM machine itself is kept inside the voting room and the control and ballot units are separated by a partition. The polling officer sit at one side of the partition with the control unit and the ballot unit is at the other side of the partition. The polling officer is placed inside the voting room to facilitate smooth conduction of the voting process and perform necessary task like checking photo ID of the voter and taking the reading of the voter card at the control unit of the EVM which also has an RFID reader. The process of photo ID checking has to be there so as to prevent any voter from casting vote by using someone else's voter ID. The buttons on the ballot unit corresponding to the candidates, which must be pressed to cast a vote are inactive by default. To vote, a voter must first place his voter ID card on the RFID reader at the control unit. The unique identity of that voter card is read by the reader and it is then checked against the database for valid voters as well as against the list of votes already cast. It also checks if the voter ID card is same as the one read at the gate. If the voter is found to be satisfying all these conditions, he/she is allowed to enter the voting booth. This also activates the ballot unit. The voter casts his/her vote and the system registers a single vote, stores it and moves that particular voter ID to the votes cast list. The ballot buttons become inactive once again. If the control unit reads an invalid voter it has been designed to raises an alarm.

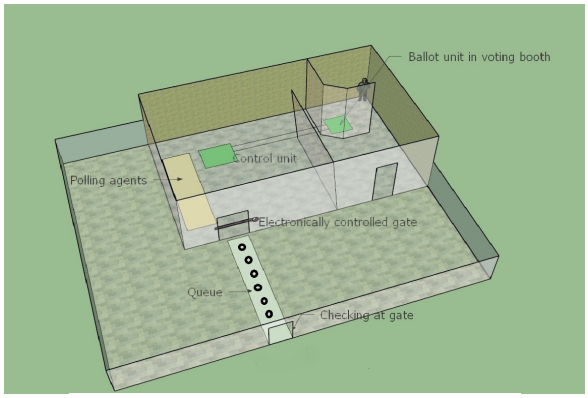

Fig. 5: Schematic view of the voting premise

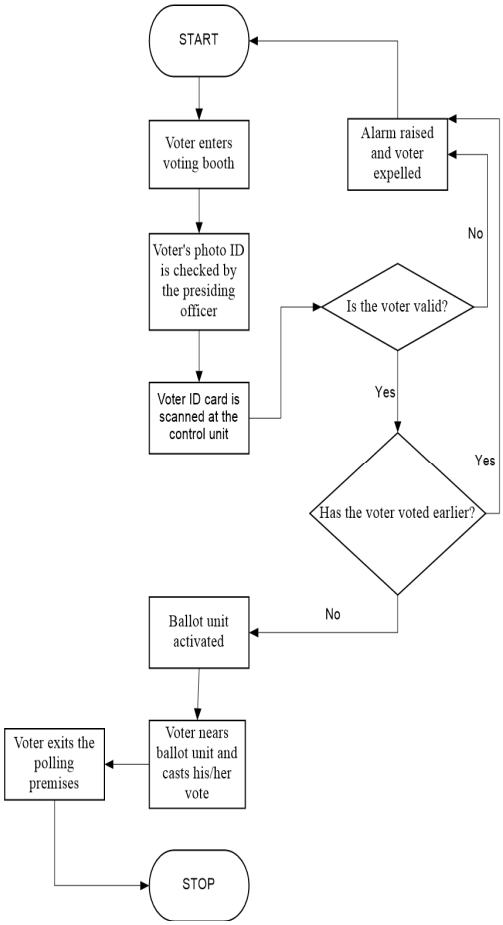

Fig. 6: Flowchart for stage III

V. ADVANTAGES

a) The presiding officer will have much less control over the voting process. So manipulating the voting process by **PRESSURIZING** the presiding officer is less probable.
b) The overall voting process much smoother, faster and automated.
c) Ballot stuffing can be prevented to a large extent since the proposed system will only register a vote if it finds a valid voter ID card.
d) It can also prevent a voter from casting his/her vote more than once, as the system is designed to register only a single vote from a particular voter.
e) The EVM has inbuilt alarm systems to raise different kinds of alarms related to different kinds of frauds.

REFERENCES:

[1] "BASIC Stamp Syntax and Reference Manual", Version–2.2, ISBN: 192898232-8, Page No (5-488)

[2] "RFID Card Reader Documentation", Version-2.3, Page No (1-11)

[3] "Radio-frequency identification", http://en.wikipedia.org/wiki/Radio-frequency_identification

[4] Hari K. Prasad, J. Alex Halderman, Rop Gonggrijp, Scott Wolchok et al., "Security Analysis of India's Electronic Voting Machines", Proc. 17th ACM Conference on Computer and Communications Security, Page No (1-21), Oct 2010.

[5] "Electoral fraud", http://en.wikipedia.org/wiki/Electoral_fraud

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