EVM Case Study

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There are four major functions that EVM should do –

1. **Registration of Candidates -** The first and foremost functioning that EVM should have is that it should register candidates who are willing to contest elections. For this purpose, it should have try to satisfy following conditions –
   a.) Name of the registered candidate should be present at all times on the machine.
   b.) The button corresponding to each candidate is working all the time during elections.
   c.) There is a maximum limit on the candidates that EVM can register with itself.
   d.)No new candidate can be added between the elections.

2. **Voting by public –** The other functioning that EVM has to do is to record the votes cast by the voters at the time of elections –
   a.) Each vote is recorded and stored.
   b.) Identity of the votes remains anonymous.
   c.) Each vote is counted properly (no bias towards any candidate).
   d.)Each voter can vote only once. Nothing should happen on pressing buttons multiple times. Only first one should be counted.

3. **Counting of stored votes -** After the voting is completed, EVM needs to do the most important function, that is, count the votes –
   a.) Total vote count matches the vote count at the time of elections.
   b.) There is no bias towards any political party and all the votes are properly counted.
   c.) Result is stored properly for display after the counting is done.

4. **Display of results –** The last functioning of an EVM is to display the results. If the results are calculated properly but are not displayed, there is no point of EVM. For this –
   a.) Display the votes for each candidate properly.
   b.) Display the total number of votes cast.
   c.) Display the person getting maximum votes.

Apart from the above functions, EVM should be a standalone machine which should not be hampered by any outside source. Also, having cryptographic security for extra layer of security.

Preference Order -

I have tried to put the rules in the order of preference.

1. Vote counting should be correctly displayed.
2. Vote goes to correct person.
3. Vote counting done properly without any bias.
4. Anonymity of voters.
5. Voter can vote only once.
6. No new contestant can be added in between the elections.

Design and Solution -

1. **Similar Basic Design -**
   To solve the above problems, we can have a similar EVM as above along with some modifications.

2. **Modifications in Voter Card -**
   Each voter card contains a voter ID along with a memory chip that stores a key.

3. **Modifications in EVM and how to vote -**
   When a person goes for voting, the officer presses a button which allows the voter to vote. When the voter votes, he/she would need his/her voter ID to place at a particular place. This would generate a hash key using SHA-256 or similar algorithm and store it in the voter ID Card. Not only this, another key is stored in EVM along with voter ID appended/ included in the key. These are generated in such a way that combining these two (may be their addition or something of that sort) would tell the candidate to which was given.

4. **Verification of Votes and Anonymity maintenance -**
   If someone is suspicious that voting is not done properly and rechecking is required, a time frame can be set in which all the voters can independently scan the barcode or something of similar form and upload it on a portal which would then be fed to the EVMs to generate the vote back in case of recounting. Anonymity of voters is maintained and voters can be ensured that their vote is counted correctly.

5. **Booth Capturing Avoided -**
   This would prevent booth capturing also since Voter IDs are required to cast a vote. If someone tries to acquire a booth, it would require the voter IDs of all the residents to cast a vote which is not possible. As per the existing design, we can also have an emergency button which can be pressed to disable the EVM in such cases. This button should be under the control of presiding officer.

6. **Voting twice and Matching the total votes -**
   Not only this, there would be two independent machines for voting, one where a voter will flash his/her voter ID that would register that this person has voted. It prevents a person from voting twice and at the end of the elections, both the EVMs and this extra device display a count of voters that voted which should match.

7. **Voting Machine Damaged -**

   A person will carry with himself/herself some spare EVMs in case EVMs do not function. To have accountability that these EVMs are not tampered by the officer, key value pair ensures this thing. Since, cryptographic algorithms are difficult to break, it would make sure that the elections are fair and unbiased.

   To ensure that vote counting is done properly, we can rely on the voters key and key stored in machine for verification. Not only this, EVMs should be standalone machine which should work on small battery.