



# **The Calibration and Voting Process of Preferential Electronic Voting Machine using Microcontroller**

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**ABSTRACT:** With the elevation in technology there is a great demand of automation of voting systems in different areas of application. The paper ballots are used for Preferential voting as it is a very knotty and composite process as a whole. This paper deals with the tuning and vote recording method of Preferential Electronic Voting machine. The machine has been devised in such a way that it is competent, compelling, convenient and foolproof for voter as well as election conducting agency.

**KEYWORDS:** calibration, PEVM, CU, BU, voting, preferences, election, microcontroller.

## **I. INTRODUCTION**

The notion of preferential election is distinct from assembly election. Preferential voting was used for the Legislative Assembly (Lower House) of the Victorian parliament in UK. According to this system, voters number candidates on the ballot paper in a rank order of choice. On each ballot paper, voters choose the candidate they most want to elect and write 1 in the box next to their name. They write 2 next to their second choice, 3 to their third choice and so on. The system is such that it enables to choose a candidate that can build an absolute majority of support in the electorate rather than the simple majority of first past the post voting<sup>[3]</sup>. The complete process of preferential voting makes use of paper ballot and still counting of votes is done manually in many countries. There are many clauses in counting method that makes the task very complex. This paper deals with the tuning and vote recording method of Preferential Electronic Voting machine.

## **II. APPROACH**

The architecture of PEVM is based on preferential voting governing the rules of voting process stated in statutes of Marathwada Act 1974. The machine is constructed using ATMEGA32 from AVR series microcontroller which is a powerful 8-bit microcontroller with RISC (Reduced Instruction Set Computing, high performance and low power consumption. The details of which can be read from the datasheet. An interesting feature is that it has 32k bytes of In-System-Self Programmable (ISSP) flash memory- endurance- 10,000 write/erase cycle and it operates on 4.5v to 5.5v. Data retention is up to 20 years at 85<sup>0</sup> C and up to 100 years at 25<sup>0</sup> C. There are two hardware units and a software unit. The PEVM is going to be used in typical preferential voting system. A suitable flowchart is developed showing the process of tuning the machine before election. The program is written embedded C language that has been tested using AVR Studio compiler to make the code error free. And for loading the microcontroller chip with the executable program, the HEX file is generated and burned to the microcontroller chip with the help of AVR-burner.

## **III. CALIBRATION OF PEVM**

The flow chart of calibrating the preferential electronic voting machine before voting session begins and recording of votes is shown in figure 1. In order to calibrate the machine one has to first connect the control unit to the computer running the control software through serial port. The software provides an option for 'Machine preparation for new election'. It provides a graphical user interface through which user has to give information like number of contesting candidate, to be elected candidates and the names of those candidates. Once 'SEND' button clicked the required information gets loaded into the machines memory. Simultaneously the messages can be seen on the LCD display of

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the control unit. If anything went wrong then one has to simply press the ‘Reset’ switch on the control unit and restart the software. After data has been correctly loaded into control unit, it is required to load same information into ballot unit. This can be done by connecting control and ballot unit together.

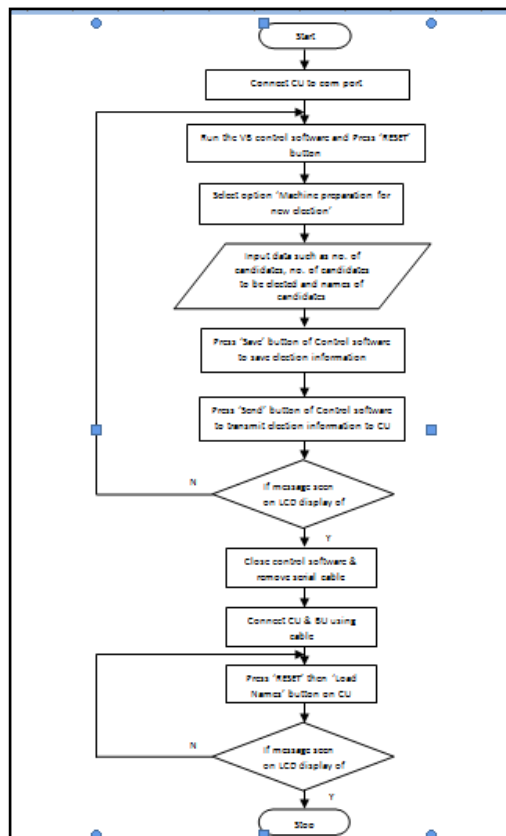


Fig.1

## IV. VOTE RECORDING PROCESS

When the power is supplied, the PEVM performs necessary initializations and is ready for the voting process. The control unit act as the master for ballot unit that is ballot unit waits for the instructions from control unit. Then as instructed, the ballot unit carries out the operations such as display the names of the candidate. Once the candidate name is displayed on the LCD display the voter can cast the vote. After all the candidates have been assigned the preference, one has to press the DONE switch to record their vote. The vote is saved in the external memory. An interface is developed in visual basic to extract voting data from the voting machine into a computer and perform further counting. System allows only one voter to cast his vote at a time. It gives voter a full freedom to make changes in the preference order before DONE switch is triggered. System also accepts skipping of one more candidates from the list. Some of the voters are not interested in reading the names of the candidate they simply want to look for candidate number and cast their vote. This need is also fulfilled by LED display on the ballot unit. No chance of any other mark except numbers. System does not accept preference number greater than number of candidates.

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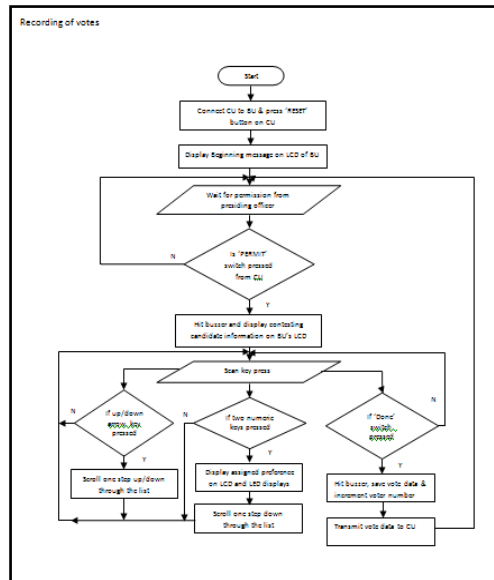


Fig. 2

## V. SNAPS OF WORKING MODEL

### 1. Calibrating Control Unit:

Before beginning the actual voting session, the Preferential Electronic Voting Machine (PEVM) needs to be initialized with the data such as the names of the contesting candidates, number of contesting candidates, number of candidates to be elected. The calibration is done from the control software in the computer system. The control unit is connected to the computer system having the control software through serial port as can be seen in figure 3.



Fig. 3

When the control unit has successfully established connection with the control software which is indicated by blue light, a message showing two options is displayed on the LCD screen of control unit. For calibrating one has to opt option one. Once the required information is ready, one has to click the 'SEND' button in the control software. Then the required data is sent to the control unit (CU) which is saved in EEPROM of the CU. This is shown in figure 4 & 5.

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Fig. 4



Fig. 5

## 2. Loading Names into Ballot Unit through Control Unit:

When the voting data has been loaded into control unit, it is required to load the same information into ballot unit (BU) too. For this, BU is connected to the CU RS-232 connector and 'RESET' button is pressed. Here, green LED glows indicating BU and CU connected successfully. To send the voting data to BU, one needs to press 'Load Names' button on CU. This is shown in figure 6. The simultaneous action can be seen on BU in figure 7 and 8.



Fig. 6



Fig. 7



Fig. 8

## 3. Vote Casting:

Ballot unit contains the following components

1. LCD display for displaying contesting candidates name, serial number and the preference number given by the voter.
2. LED display that displays the serial number of the candidates and its allotted preference number.
3. A numeric key panel for giving the preference number to the candidates. If the voter wants to give number 1 then he has to press key '0' and key '1'. That is '01' and so on.
4. A switch named 'DONE' to confirm the vote.

When the 'PERMIT' button is pressed on CU a buzzer hits and allows the BU to display the names of the candidates and is ready to accept the vote from voter. Figure 9 and 10 shows CU and BU ready state respectively.

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Fig. 9



Fig. 10

Figure 11 shows the state of CU after pressing 'PERMIT' switch. Figure 12 shows the state of voting process on BU. If the voter has assigned preference number to a candidate the list automatically scrolls above and cursor blinks on next line, indicating the voter to vote for this candidate now. The voter can scroll on its own by pressing down arrow or up arrow keys on key panel and the preferences can be changed.



Fig. 11



Fig. 12

Figure 13 and 14 shows the state of BU and CU after the voter has pressed the 'DONE' button on BU. This will record the vote for that voter.



Fig.13



Fig.14



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## VI. CONCLUSION AND FUTURE WORK

The snaps of the model show the correct working of the preferential electronic voting machine. The proposed research has invented a new voting machine in India that can provide an easy way of voting in preferential type of voting system. The machine is less expensive and simple to operate. To ensure the acceptance of voting result, one has to apply an appropriate counting method to interpret the votes cast and produce a voting results that reflects the true opinion of the voters. The LCD display used can be replaced by some graphical display unit in future. Although, the machine is constructed for University elections, but it can be used for other preferential voting systems.

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