High Performance Electronic Voting Machine (EVM) Implementation Using ARM Cortex M3

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Abstract— **The main building stone in a democratic country are fair elections. In India, the main objective of introducing Electronic voting machine was to reduce mishaps and frauds especially in states which are politically sensitive and are subjected to frequent re-polls due to electoral rigging and imbalance in voting system. The EVM machine currently used by our government requires updated Microcontroller like ARM Cortex M3 which has advanced features like Memory protection, Accurate Time stamping using Ultra Low power RTC, cost sensitive, efficient interrupt controller (NVIC), a RTOS timer (the SysTick). These features make the software on ARM Cortex M3 much more efficient. In this paper using ARM Cortex M3, this research work has replicated features currently available in the EVM and also included some features like RESET and final vote count display as password protected. Designed EVM system will allow a person to cast his/her vote only once, the casted vote being recorded by the ballot unit which is controlled by control unit. In the process of vote, the person casting the vote would able to watch glowing LED near the candidate party symbol. By this candidate conclude themselves that vote has been recorded. The process followed by enabling the ballot on control unit by the PRO.**

Keywords—**Electronic Voting Machine (EVM), Real time Clock (RTC), Real Time operating system (RTOS), NVIC**

I. INTRODUCTION

Election plays a vital role in India. Through election people decide the leader who is going to rule government [5]. All over the world there are different methods and techniques of voting have been adopted. This system is designed to make the voters as well as political parties who act as candidates to be satisfied after the announcement of the result after elections are held. Voting is a process in which people elect the leader among the participating candidates through elections. In previous years elections were held in the ballot paper having different symbols of each candidate respectively. Each voter has to keep stamp besides the symbol of their chosen candidate. Now a day's EVM's are used in elections. EVM abbreviated as Electronic Voting Machine, the designed system is effective and efficient than the existing system by its performance and even in terms of mechanism [5]. It has a simple user interface. It strengthens the weaker and the vulnerable sections of the society which includes illiterates, scheduled castes and tribe who were now more likely to cast their vote than before. To cast a vote just press the button beside to candidates mentioned. Few important security arrangements have been made in such a way that only polling officer can break the security system while announcing the results of election. A brief comparison of technical aspects mentioned in [1],[2],[3],[4]

Authors	Advantage	Disadvantage
Rahil Rezwan et.al [1]	System will provide the security while casting the vote. By scanning the finger of voter, i.e machine will easily identify the person and avoid fake or proxy vote.	1. As mentioned in the implementation part system need more data base to identify the each voter. The offline process taken place while casting the vote, this method implemented save the data from cloud, but large population country's cannot opt this solution due to heavy data set ,hence large memory system should require in the system. 2. After casting the vote anyone can break the system to check the count. And also every time need to update the database due to the new voters
Bhuvanapriya.R et.al [2] Prof. A.M. Jagtap et.al [3]	System will have the data base of Adhar Card which provides the security while casting the vote. By scanning the finger of voter, If identifies then only machine	1. Huge data set required to complete the voting .As mentioned by the author's considering the Adhar data set in the ballet mission is tedious process and along with Adhar including finger print again takes lot time

	will allow the voter to cast his/her vote and avoid fake or proxy vote.[2],[3]	while casting vote. 2. Not possible to implement in the remote area as mentioned in the drawback session due to the process requires message service for any changes.[2],[3] 3. Online voting systems can't be implemented due to the network compatibility.[2] 4. IOT implementation is existing platform is highly impossible and voting from any place is not safe as per the concern of secure vote.[3]
V. Kiruthika Priya [4]	By scanning the finger of voter, i.e machine will easily identify the person and avoid fake or proxy vote. Implementation of Finger scanner is impact able .	1. As mentioned in the implementation part system need more data base to identify the each voter. The offline process taken place while casting the vote, this method implemented save the data from cloud, but large population country's cannot opt this solution due to heavy data set ,hence large memory system should require in the system . 2. Anybody can access the results at the end of the casting due to the transparency objectives.

After casting the vote anyone can break the system to check the result count in [1],[2],[3],[4] and failed to give the security after the election. And also every time need to update the database due to the new voters The designed system will follow the same procedure as mention by the .Election Commission of India provided password security at the end of the vote. Once done with the election until counting officers enter the password ,the system will not show the results.

II. METHODOLOGY

In the proposed model as shown in Fig.1, when the device is ON, initially it displays the message "VOTING MACHINE"[4]. Next it enables 3 options for the presiding officer and they are (a). Allow to cast the vote: OPTION 1 (b). Reset and display all the party list and count which are password protected: OPTION 2 (c). Display the total vote count which is also a password protected: OPTION 3. If option1 selected: it allows the person to cast the vote, during vote casting buzzer sound will be generated and LED will glow indicates that vote is casted. After each vote cast presiding officer is required to enable option1 for next vote casting
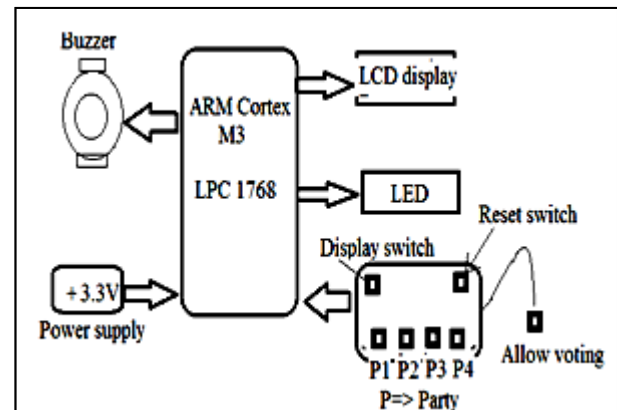

Fig.1 Proposed Model of EVM.

If option 2 is selected, i.e., Reset mode: which is usually done at the beginning to confirm all the parties vote count are zero. Count will be displayed through the LCD. If option 3 selected ie., Display mode: which is usually done at the last to obtain the vote count of all the parties. Count will be displayed through the LCD.
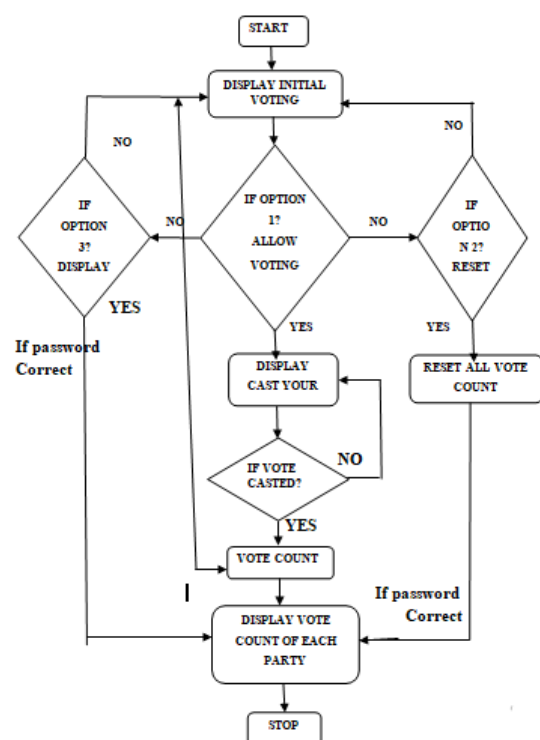

Fig 2. Flowchart

Algorithm 1 For Security for identifying the password PIN

Pseudo code

        *Procedure to check password
                *Constants (Initialization)
        Step 1: Allow any character to create authontocation
        Step 2: Store the length (L).
        Step 3: Variables
                        Count=0;
                        Allow Maxtry is 3
        Step 4: Begin
        Read the Character from user
        * Check the length of the character & match with L.
                IF entered character length match
                        Then ExitLoop
                        EndIf
                        Add 1 to the Count
        Step 5: ExitLoop
        IF entered length of PIN match with length
                        Count=0;
        Step 6: * Check the character entered by user &
        compare with actual PIN
                IF entered character match
                        Then Exitend
                        EndIf
                        Add 1 to the Count
                        IF Count reach Maxtry then
        Step 7: Exitend.

Password protected device will allow any character to create a strong password, Additional key (password) will be with DC or Election Commissioner, If in case of errors or due to failure because of multiple try .

III.   HARDWARE AND SOFTWARE DETAILS

Designed system will be the solution interns of high system performance and speed issues. It mainly because of the processor used in the prosed system. ARM cortex M3 will give the better performance than the other systems because of the architecture, which has better Debugging section and also it can achieve any application because of its simple programmability nature like the design system.

Table 1. Specifications

ARM Cortex M3	LPC-1768
LCD	16 x 2 display
Carrier Box	8.5x7inch
RPS	+3.3V
Piezo buzzer	-

A Ballot Unit is used in the design system which can caters upto 16 candidates. The control unit is being controlled by the Presiding Officer of the respective block and the Balloting Unit is used by the voter for casting their valuable votes. The software used to develop the design system is keil uvisio4 with supporting LPC1768 file of supporting 32 bit Thumb2 instruction. There are 5 Ports and 10 PINSEL available in Cortex M3 Processor.

Table 2. Device connection Specification

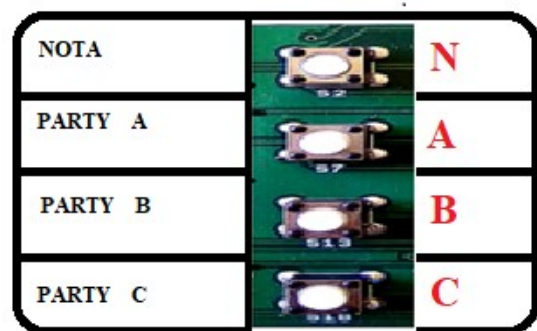| Used Device and Device Specification	Port lines	Port
LCD_Data Lines	P2.0 - P2.7	P2
LCD EN	P0.27	P0
LCD RS	P0.28	P0
BUZZER	P3.25	P3
LED	P0.4-P0.11	P0
KEYS	P1.14-P1.21	P1

Fig. 3. Ballot unit

The control unit is digital circuitry contained within the processor that coordinates the sequences of data movements into, out of, and between the processor's and with other sub units.
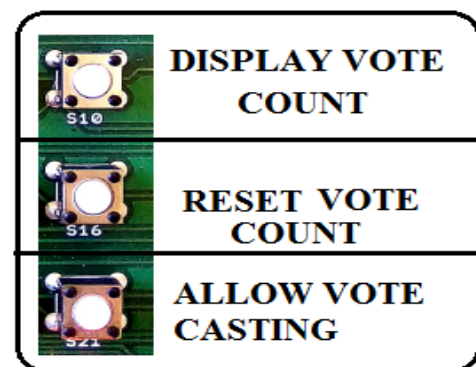

Fig. 4. Control Unit

IV.   RESULT

A Electronic voting Machine with fully password protected feature is built here. The EVM allows the voter to cast the vote and avoids any fraud or mishap that might happen. ARM Cortex M3 of STM2F101RE 32 bit has CPU speed of 72MHZ and flash memory of 1MB .The designed system has stuffiest flash memory to store the casted vote (Max 1500 votes per boot). The LCD display shows the final count of the voting

result only providing the suitable password by the Counting Officers or Election Commission Officers.

In the following figure PA=Party A, PB=Party B, PC=Party C.

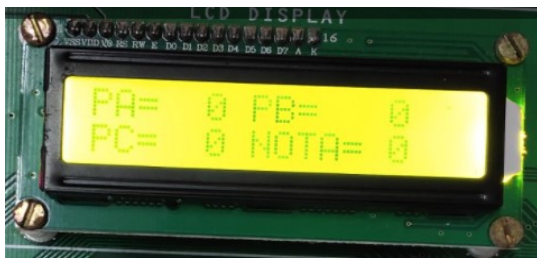Fig. 5. The Initial Display when the EVM is ON

Fig. 6. When Reset option is selected which is password protected

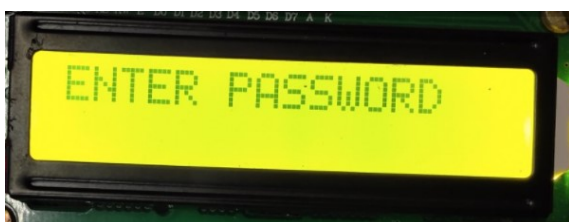Fig. 7. when presiding Officer allows to cast the vote

Fig. 8. When Display option is selected, which is password protected
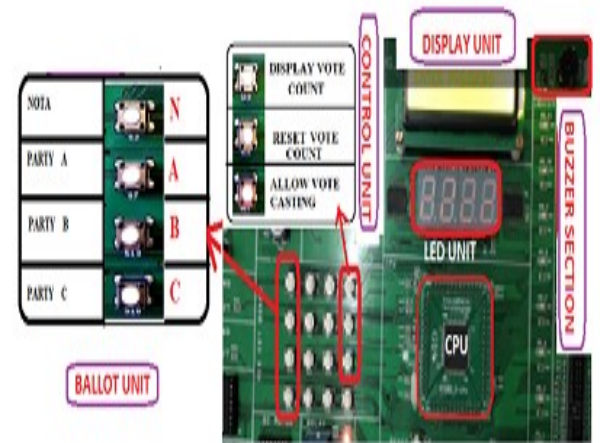

Fig. 9. Final Count

Fig.10. Hardware Working Model

The peripheral complement Fig 10 shows the LPC-1768 includes up to 1 MB of flash memory[11][12], up to 64 kB of data memory, and which supports Ethernet MAC, USB Device/Host/OTG interface, DMA controller of 8 channels, 4 UARTs, 2 CAN channels, 2 SSP controllers, SPI interface, 3 I2C-bus interfaces, 2-input plus 2-output I2S-bus interface, 8-channel 12-bit ADC, 10-bit DAC, motor control PWM, Quadrature Encoder interface, four general purpose timers, 6-output general purpose PWM, ultra-low power Real-Time Clock (RTC) with separate battery supply, and up to 70 general purpose I/O pins. LPC 1768 consist of Memory Protection Unit MPU with running speed 100MHz.

V. CONCLUSION

Using ARM Cortex M3, the features currently available in the EVM are replicated and also included some features like RESET and final vote count display are password protected. Designed EVM software allows a candidate/Person to cast their vote only once. Apart from the digital Security, manual security is also included by marking ink on the fingers. Once the selected candidate button is pressed by the voter the red light will glow near the selected candidate name and the symbol of the candidate thereby ensuring that the next voter can draw in since the previous voter's vote is properly taken into the consideration.

ACKNOWLEDGMENT

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