

Development of Wireless Electronic Voting Machine as an Effective Enhancement of Voting System Security

**D. S. Kumbhar

Department of Electronic Science
Modern College, Ganshkhind, Pune
Maharashtra, India
deep.s.kumbhar@gmail.com

F. H. Kurne Inamdar

Department of Electronic Science
Abeda Inamdar Sr. College, Pune,
Maharashtra, India
faizahmedkurne@gmail.com

*H. C. Chaudhari

³Department of Physics, J.E.S. College,
Jalna, Maharashtra, India
hcchaudhari@rediffmail.com

Abstract— Voting system mechanism for election in India has gone through multiple changes. Last two decades, the Election Commission of India is using Electronic Voting Machine (EVM) for recording, storing and counting of votes. This paper presents, a highly secured and voters-friendly Wireless Electronic Voting Machine based on microcontroller and Zigbee Technology. The designed wireless EVM consists of two units, viz. Ballot unit and Control unit. Both the units are connected wirelessly through secured Zigbee protocol and able to communicate within 200 meter range. The voting information details will be transmitted from Ballot unit to the Control unit through secured Zigbee communication and securely stored at the Control unit. This wireless EVM has vote confirmation facility for the voter which increases the transparency in voting system. It can store up to sixty five thousand votes and polling result of each candidate can be viewed within a minute. It is battery operated, voter- friendly, secured wireless, cost effective and portable.

Keywords- Arduino Uno, Electronic Voting Machine, EEPROM, Voter-friendly, VVPAT, Zigbee

I. INTRODUCTION

India is the one of the largest democratic country in the world. There are more than 800 million people eligible to vote as per Election Commission of India [1] [8]. In India all earlier election, either it's state elections or central elections a voter used ballot paper to cast vote by putting the stamp next to favorite candidate name. Then voter folding the ballot paper in a prescribe manner and putting it in the ballot box. This is a long, time-consuming process and prone to errors. Over the years, there was a pronounced increase in the volume of work: millions of ballot papers had to be printed and millions of ballot boxes had to be manufactured, transported, and kept in storage; and a great amount of time was taken up by the conduct of elections. To overcome these difficulties, the Election Commission of India is using Electronic Voting Machine (EVM) instead of paper ballot for recording, storing and counting of votes since year 2000 [4][5][6]. The improvement in the EVM machine designing and development with the greatest care is continuously going on which plays critical role in determining results of an election, since for last two decades. The Election Commission has plan to used the voter-verifiable paper audit trail (VVPAT) facility with EVM in coming Loksabha election in the year 2019 [7]. Still some political parties have raised the technical questions about the present EVM viz. hacking and total vote count goes to the particular candidate in the present EVM. In this paper, the designed wireless EVM provides the solution for the questions raise by political parties by adding a new feature vote confirmation with candidate name (VCCN).

II. LITERATURE SURVEY

The existing EVM used by the Election Commission consists of two units, i. Control Unit, ii. Ballot unit. Maximum four ballot units can be connected to a control unit and each ballot unit has 16 candidates [1] [2]. These units are kept apart from each other and are connected by a five-meter cable as

shown in Fig. 1. Only the Polling Officer has access to control unit while the Ballot unit placed inside the voting booth is for voter.[3]

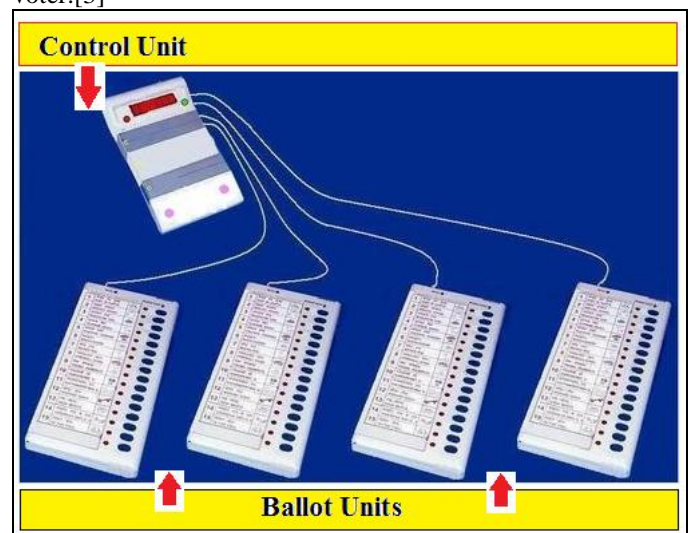


Figure 1. Existing Electronic Voting Machine

However, the existing EVM has limitations. Few of them are enlisted below.

1. The maximum candidate's allotted per control unit is up to 64 only.
2. Each control can record up to 3840 votes only.
3. Vote recoding time in control unit is 1 minute for 5 voters.
4. The complexity is increases when more than one Ballot units are to be connected to control unit by cable.

In the earlier election, some political parties raised the questions about transparency in voting machine. Therefore, Election Commission newly added the voter verifiable paper audit trail (VVPAT) facility along with existing EVM for voter as shown in Fig.2 [7].



Figure 2. Electronic Voting Machine with VVPT

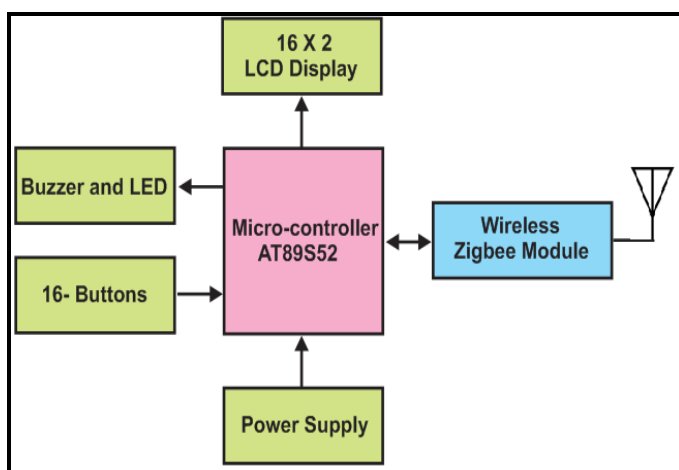
EVM with VVPAT facility has resolved queries about vote transparency but new problems were also introduced. Apart from above mentioned limitation in existing EVM, it has following disadvantages.

1. VVPT along with printer increases the size and weight.
2. Increased complexity in hardware setup and connectivity.
3. Issues such as handling, storing and dumping of voter verifiable paper are created.
4. Question on right of confidential vote has arisen due to verifiable paper.

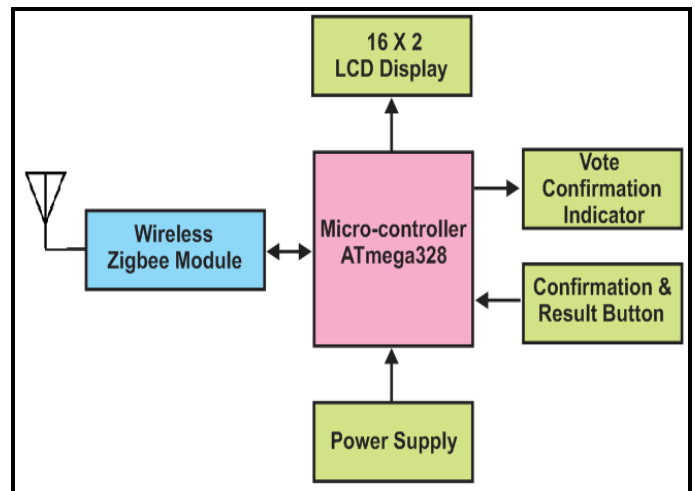
This paper present wireless electronic voting machine with vote confirmation with candidate name (VCCN) to overcome above mentioned limitations and problems .

III. BLOCK DIAGRAM OF WIRELESS ELECTRONIC VOTING MACHINE

The designed wireless EVM consists of two units namely, Ballot Unit and Control Unit. Both the units are connected through wireless Zigbee network as shown in Figure 3.



a) Ballot Unit



b) Control Unit

Figure 3. Block diagram of for Wireless Electronic Voting Machine: (a) Ballot Unit and (b) Control Unit

A) Ballot Unit

Each ballot unit is designed using AT89S52 microcontroller based system. It consists of 16x2 LCD display section, candidate name list with their party symbol, voting button section with Buzzer and LED indication, and trans-receiver ZigBee section.

- 1) **LCD display section:** It is 16 x 2 line LCD display used to display candidate name and total vote count. It displays name of candidate for whom the voter has pressed button. It is verification of vote given to choice of candidate by voter after pressing a vote button. The candidate name will be displayed OFF from the LCD display only after voter confirmation. Then it will display the total vote count which is increment by one.
- 2) **Voting button section:** The voter can cast a vote by pressing 'vote button' next to candidate's name. After pressing vote button, Light Emitting Diode (LED) glows next to that candidate's name.
- 3) **Audiovisual section:** It consists of buzzer and Light Emitting Diode (LED).When voter button is pressed, buzzer and LED both are activated simultaneously. They will remain ON until the confirm/reject button is pressed from the Control Unit. After that, the Ballot Unit is ready for next voting.
- 4) **Zigbee Trans-receiver section:** It consists of a Zigbee Device. It is used to setup secured wireless communication between Control Unit and Ballot Unit.

B) Control Unit

It is an Arduino Uno ATmega328 based system along with Zigbee device. It consists of LCD display section, vote confirmation, rejection and final result button section and trans-receiver section.

- 1) **LCD display section:** It is 16x 2 line LCD display used for dual purpose. It is use to display total

number of votes and it also displays candidate name with no of votes counted.

- 2) **Confirmation and Rejection Button:** If ‘Confirmation button’ is pressed on Control unit, then vote is recorded for that particular candidate. After that, no further vote by the same voter will be recorded. This way the EVMs ensure the principle of ‘one man, one vote’. If the voter is not agree with candidate name displayed on LCD of Ballot unit then presiding officer will press ‘Reject Button’ so that voter can revote.
- 3) **Result Button:** This button is used for the votes recorded therein shall be counted. When this Result button is pressed, the total number of votes recorded for each candidate at the polling station shall be displayed automatically in the Display Panels of the control unit. The result can be produce within fraction of seconds.
- 4) **Zigbee Trans-receiver section:** This section consists of Zigbee Device. It is used to setup secured wireless communication between Control Unit and Ballot Unit.

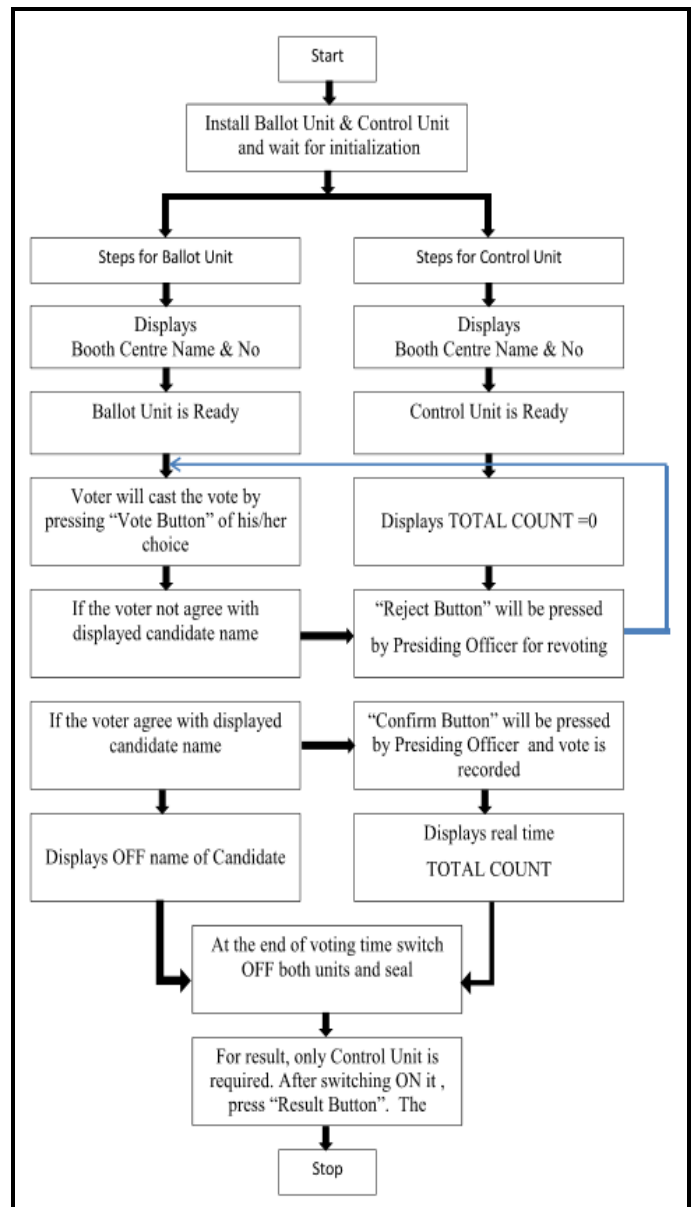
IV. PROTOTYPE AND FUNCTIONAL FLOW CHART



(a) Ballot Unit



(b) Control Unit



(c) Functional flow chart

Figure 4. (a). Ballot Unit, (b) Control Unit & (c) Functional flow chart
 The prototype wireless EVM is programmed in C/C++ languages using Keil uVision3 and open source Arduino (IDE) software. For secured wireless communication between Ballot Unit and Control Unit, XCTU software tool is used to set-up and configure Zigbee RF modules. The prototype of EVM and Functional flow chart is shown in Figure 4.

V. RESULT

The designed wireless EVM can record up to 65000 votes into control unit. There is provision for 16 candidates in a single balloting unit. Multiple ballot units can be used if the numbers of candidates are more than 16. The ballot unit and control unit are connected to each other with wireless Zigbee technology. After pressing voting button, the candidate name is displayed on LCD display of ballot unit and after confirmation from control unit the name will be displayed OFF from the display. The voter can change his/her choice of

the candidate before the confirmation by pressing button next to the candidate name. After the confirmation, the voter can't change his vote by press any button. The total number voter is displayed on control units' LCD display continuously.

VI. CONCLUSION

In this wireless EVM system, Zigbee RF modules are used to achieve a secured voting. It overcomes the draw backs of existing voting machine with new additional features viz. candidate name and vote confirmation facility for the voter (VCCN), reselection of candidate before confirmation and polling result can be viewed with a minute. It is battery operated, voter- friendly, cost effective and portable so that it can be use to conduct various elections anywhere in the country.

ACKNOWLEDGMENT

Authors would like to anticipate and thank the Mr. Ramkant Bhujbal Director, Future Chip Technologies, Pune for technical assistant and Dr. Varsha Bapat, Modern College for sponsoring the project.

REFERENCES

- [1] Election Commission of India , “Annual Report,2016” , Published in 2017 by the Election Commission of India.
- [2] M. Sudhakar, B.Divya Soundarya Sai,” Biometric System Based Electronic Voting Machine Using Arm9 Microcontroller”, IOSR Journal of Electronics and Communication Engineering (IOSR-JECE) e-ISSN: 2278-2834,p- ISSN: 2278-8735.Volume 10, Issue 1, Ver. II (Jan - Feb. 2015), pp 57-65.
- [3] Vishesh Shrivastava & Girish Tere , “An Analysis of Electronic Voting Machine for its Effectiveness”, International Journal of Computing Experiments (IJCE) Vol No. 1, Issue No. 1 (August 2016), pp 8-12.
- [4] Mr. Soumen Ghosh ,“Development of Microcontroller Based Electronic Voting Machine(EVM)”, IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE), Volume 9, Issue 2 Ver. VII (Mar – Apr. 2014), pp 01-03.
- [5] Dhinesh Kumar and others, “Embedded System based Voting Machine System using Wireless Technology”, International Journal Of Innovative Research In Electrical, Electronics, Instrumentation And Control Engineering, Vol. 4, Issue 2, February 2016,pp 127-130.
- [6] Jagriti Kumari and others, “ELECTRONIC VOTING MACHINE USING ZIGBEE” International Journal of Research in Engineering and Technology, Volume: 03 Special Issue: 07 | May-2014,pp 11-16.
- [7] Electronic Voting Machines in India: A Status Paper,Report by Election of India.
- [8] https://en.wikipedia.org/wiki/Electronic_voting_in_India.