

Design of Secured Wireless Real Time Electronic Voting Machine

Subhadeep Chakraborty¹, Sandip Karmakar², Rima jana³, Subhradeep Dey⁴

Lecturer, Technique Polytechnic Institute, Hooghly, West Bengal, India¹

Project Fellow, Technique Polytechnic Institute, Hooghly, West Bengal, India^{2,3,4}

Abstract: Electronic Voting Machine or EVM is generally used to count the poll result at the time of vote. In EVM generally a counting part is available where the counting are done and the count value is stored in the memory. In this paper, the design of the Wireless EVM has been proposed where the counting will be done in a remote section to avoid the fault or error caused by the several problems such as wrong button press, wrong counting, theft caused by the Stationary EVM. The data will be transferred from the EVM machine through a transmitter and this signal will be caught up by the receiver of the Counting module. The count will be shown at the display side as per preference that is the real time display can be turned off during the poll time. In this device, the voter cannot press the poll button of their preference twice as the device will be deactivated after single press. That is why the design proposed in this paper is of reduced error and works efficiently.

Keywords: Wireless Data Acquisition, RF Module, Microcontroller, Security, Signal encoding and decoding, Wireless Count, Real time system.

I. INTRODUCTION

Electronic Voting Machine is generally used for the counting the poll result and store the result in the memory provided into it[1][2][3][5][8]. Generally the economically or officially used EVM is the on-board system that is the insertion of poll and counting of those polls takes place within a same device and the result is also stored in the EVM[1][4][5][6]. This type of EVM is somehow costly as because all the mechanism is incorporated in a single device[4][6][7][9][10]. If any part of the device become faulty, the entire device become useless. Again if the device is stolen, all the poll value entered by the voters will be lost and if any voter press two button at a time, the count become useless. To avoid these type of errors, a highly secured and efficient EVM mechanism is shown in this paper where count is done in remote section[15][19][20][21][24]. The another advantage of this design is that it can detect the priority of the pressing of the button that is if any voter presses two button at a time, the first value will be entertained the later is rejected by using the priority encoder[7][11][12][13][14][15].

In this Real Time EVM, at the poll side, no controller or processor is used that is the device, used for giving the poll, is not programmable and it obviously signifies that there is no meaning of theft or misuse of the device as no data is stored in it[12][14][15][17][18]. This EVM is also monitored by the poll officer or some other pulse that is generated from the officer section. On the other hand, at the counting section, the data received from the poll section, is being counted and displayed in real time mode. The section officer at the count section can also make the display off at the poll period to increase the secrecy of the poll and hence smooth conduction of the poll process. To make the display “ON” or “OFF”, a keyboard is also connected or interfaced with the display section with the microcontroller.

At the time of poll, the result is received through the wireless receiver and via decoder the data is stored within the microcontroller memory which is actually shown on the display module.

II. PREVIOUS WORK

There were many works and progresses are taken place regarding to the Electronics Voting Machine and the Authentication System[1][2][9][12][13][22][24]. Electronics Voting Machine, if constructed with some controller environment, becomes an Embedded System. Akash Konnur, Archana Nandibewoor and Nita Kakhandaki have proposed a system for Electronics Voting Machine and its solution for computation[1]. Vaibhav Bhatia and Rahul Gupta have placed a proposal for the Electronics Voting Machine with GSM interface[2]. The construction of Electronics Voting Machine by means of FPGA is proposed by Timardeepkaurarreja, Jasleenkaurbassi and Damanjeetkaur[3]. Moreover the technology also developed for the implementation of the Electronics Voting Machine by Telephone technology[4].

The Electronic Voting Machine technology is also developed with the Public Key Cryptography by Hayam K. Al-Anie, Mohammad A. Alia and Adnan A. Hnaif[6]. For enhancement of security system, the authentication system is incorporated with the Electronics Voting Machine. The Biometric verification and authentication process have been introduced in it for several times. One of the widely used biometric security is the Fingerprint Verification and authentication system.[9][10][11][12][13][23]. There also other biometric authentication process incorporated in Electronic Voting Machine[11][12][13][21]. This paper is written by taking the idea of the authenticated voting machine and by

incorporating the secured wireless technology to make it more perfect and efficient and theft proof.

III. PROPOSED DESIGN

In the proposed design, there are mainly two sections, one is the polling section another is the counting section. The objective of the design is to place vote from the polling section and the data will go to the counting section for display and storage of the result. To transfer the data from the polling section to counting section, an wireless technology will be used. At the voting section, a wireless transmitter is used through which the data from the voting machine will be transferred. At the counting section, a wireless receiver is installed through which the data from the polling section is received. The design for the entire mechanism is shown below.

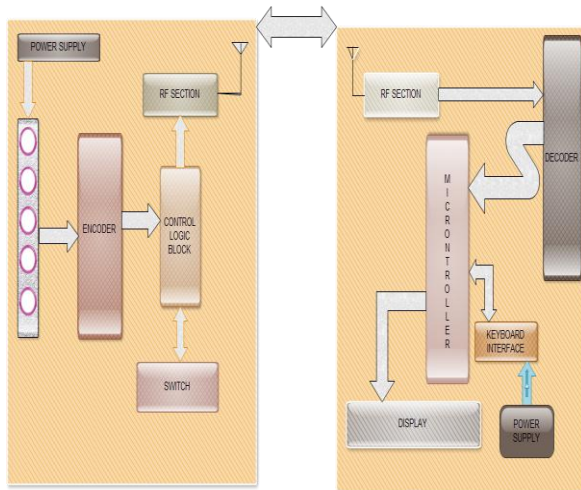


Fig.1 Real Time Electronic Voting Machine

The transmitter and the receiver are paired with wireless connection. When the receiver receives the signal, it goes to the microcontroller. At the polling section, there are some buttons are available for entering the preference of poll like Team A. Team B etc. In Microcontroller, it is decided by the code that is already burnt into the microcontroller, that the signal comes from which button as each and every button has its separate frequency. After determination, the logic goes to the Memory section and display section. In the display section, the count will be shown for separate result. The sections for the receiver side are described below. In this design there are four buttons are available at the polling section or in EVM.

IV. SECTIONAL PROPOSED DESIGN AND OPERATION

In this proposed design, several sections are there each of which is with different importance. In conventional EVM, any voter can vote twice though security guard is there but there is a provision of this. But in our design it can be eliminated as there the incorporated security to maintain that one voter can only place a single vote and if after that if the voter wishes to make another vote, it will never possible. The operation of different sections are discussed below.

A. Poll Section

In Poll section that is in EVM section, there are some buttons are available to enter the vote. Each button

signifies different candidates. In the push button array, at the back end a control pulse line is connected which may or may not be automatically controls the push button array. The proposed design is shown in Fig.2.

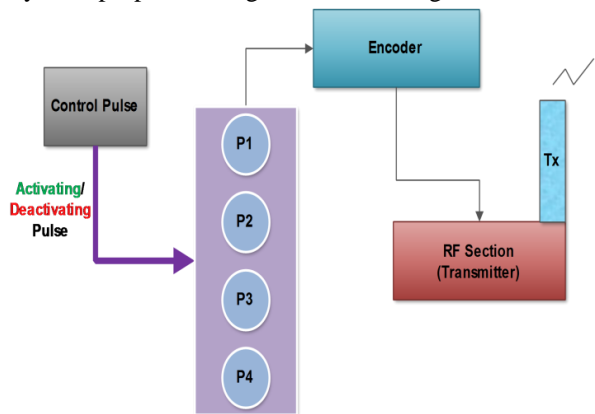


Fig.2 Poll Section

When a voter comes for entering vote, he/she will press the button for their desirable candidates. When the vote is entered, the control pulse will deactivate the EVM for certain time period which will be equal of the transaction time between two consecutive voters. When the second one comes for the vote, the EVM will again be activated. Thus no one voter can give two votes at a time.

On the other hand, If any voter press two buttons at a time, then the Priority encoder connected with this section will handle the problem. The operation of the Priority Encoder is to detect the time difference between two pulse and accepts the prior pulse rather by rejecting the later one. So, in no way, two votes can be given with this EVM.

After successful detection of the vote pulse, it goes to the RF section. In the RF section, the digital pulse is converted into analog pulse and is transmitter through Transmitter.

B. Counting Section

In the counting section, the receiver is there which is actually paired with the transmitter of the Poll Section. When the receiver receives a pulse coming from the transmitter, it converts the analog pulse into digital pulse and send it to the decoder. Decoder actually decodes the incoming pulse and send the decoded pulse to the Microcontroller. Microcontroller receives the coded data and detects that the pulse is according to which candidate and thereby increments the value of that Candidate value by one just to signify **Candidate#n** have received a vote.

The counting is done using the memory of the microcontroller itself and no further memory will have to be interfaced. When the iteration of the candidate value is completed, the result is shown in the display section. The design for the Counting section is shown in Fig.3

In this design, when a poll comes from the poll section, after calculation, it will be displayed. If there is a restriction for display, it can also be controller by the keyboard interfaced with the Microcontroller to make the display OFF and until it will be activated, it never shows any poll value on the screen.

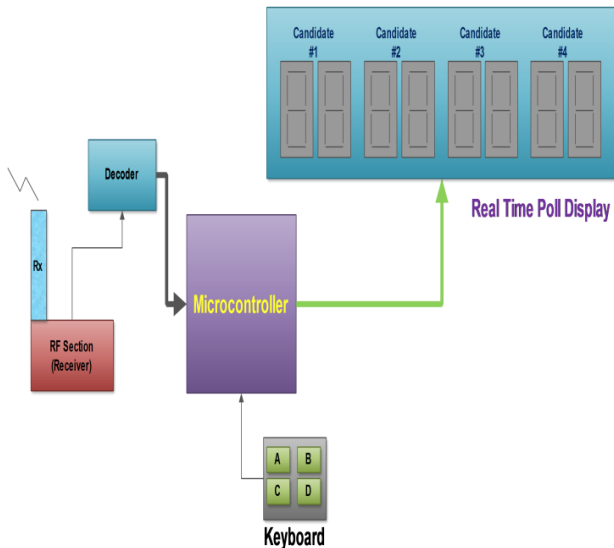


Fig.3 Counting Section

The display module is shown below in Fig. 4.

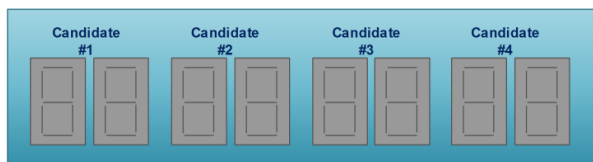


Fig.4 Display Module

As the poll value for a candidate can be shown on the display module at the time of poll synchronously, this type of display is named as “Real Time Display” and the entire design is as “Real Time Voting Machine”.

V. COMPONENT REQUIRED

The components required to build up the system are discussed below with their properties.

A. Push Button

The push button is required to enter the vote. It is interfaced at the poll section. When a push button is pressed, the signal is passed to the Encoder and after that it will be transmitted.



Fig. 5 Push Button

B. Priority Encoder

Priority Encoder can be used for different purposes. In our design, Priority Encoder is used to check the prior input value of the polling at the polling section.

If at a time two or multiple switches are pressed, Priority Encoder selects the right button which is pressed at the first time depending upon the pressing time. Actually Priority Encoder is incorporated as to eliminated the problem which is caused by multiple button pressing.

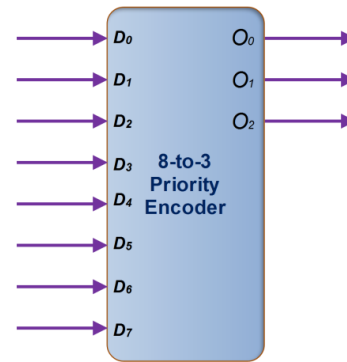


Fig.6 Priority Encoder

C. Decoder

The 3-to-8 Decoder is interfaced at the Counting section in back end with the RF module. When a new pulse is coming from the RF module, it decode the pulse and generates an unique pulse for each candidate value. The output of the decoder will go to the Microcontroller.

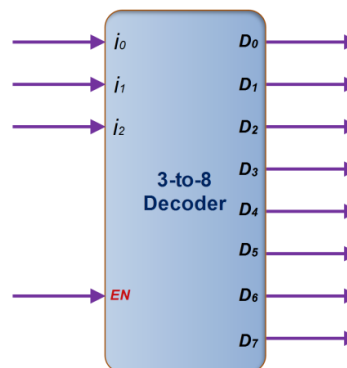


Fig.7 3-to-8 Decoder

D. RF Module

RF module is connected in both the Poll section and Counting section as paired Transmitter and Receiver. At the Poll section, RF module converts the incoming pulse from Encoder to the analog signal and transmit it to the Receiver side at the Counting section. At the Counting section, Receiver receives the signal and converts it to the digital pulse and sends it to the Decoder.

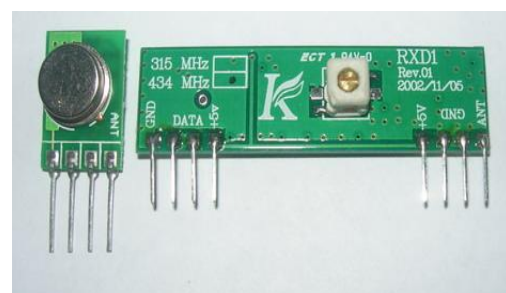


Fig.8 RF Module

E. Keypad

The 2x2 Keypad is connected with the Microcontroller at the Counting section to control the activation and deactivation of the display. The activation button will be pressed when the counting side requires to show the poll result in real time and the deactivation button will be pressed when the display is required to be turned off.



Fig.9 2x2 Keypad

F. Display

At the counting section, the display module is interfaced that is constructed with Seven Segment Display. The display module is connected with the Microcontroller from where the data comes from and data is displayed on the module. Each and every time the poll result is shown on the display module. The element of the display module that is the Seven Segment Display is shown below.

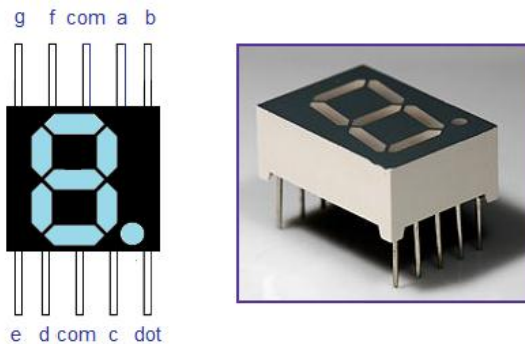


Fig.10 Seven Segment Display

G. Microcontroller

The entire system at the counting section is controlled by Microcontroller. For storage of the poll result, we have used the internal memory of the Microcontroller. The count inside the Microcontroller goes to the display module. Microcontroller used for using the internal memory and also it is capable of storing the result inside its memory whether the power will be OFF.



Fig.11 Microcontroller

VI. ALGORITHMS

Two different algorithms are used for receiving the poll and other for counting and displaying the result. The algorithms are described below.

A. Algorithm for receiving Poll

The algorithm for receiving the poll from the voters is shown below:

In this section, voters will press the push the button for giving their votes. The correct pressing will be checked by the correction section.

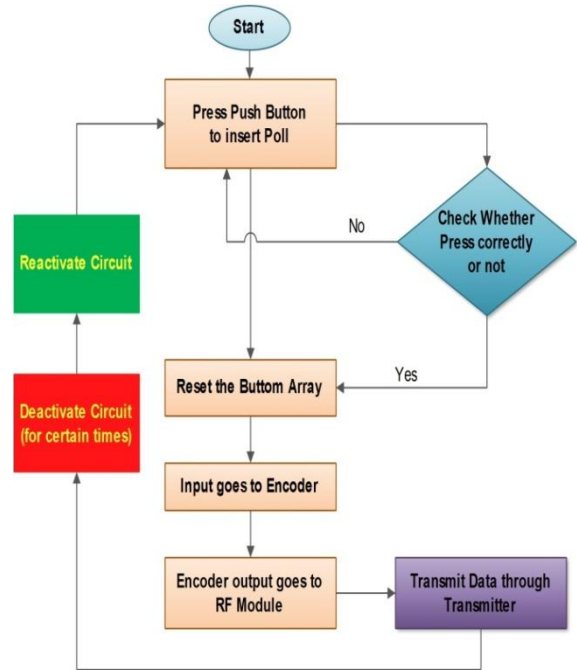


Fig.12 Algorithm for Receiving Poll

If the voter want to press the button twice, it will not be possible as the circuit will be disabled after once he/she has pressed the desired button. After certain amount of time, when the second voter will come, the circuit will again enabled. So, in that case the violation of twice voting will be eliminated. Once the button is pressed, the signal goes to the Encoder section through where the final pulse reaches to the RF Module. RF Module will send the pulse to the another section. It is worth nothing to be mentioned that each button produces different frequency.

B. Algorithm for Display and Storing Section

The algorithm for the display and storing section is shown below:

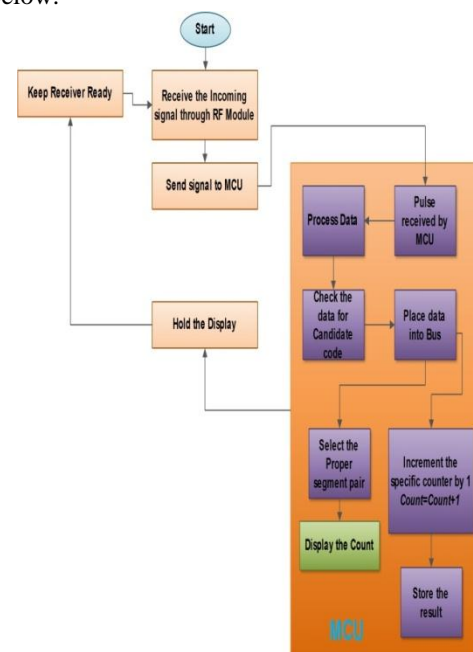


Fig.4 Counting Section

In this section, the receiving module receives the pulse coming from the transmitter. The pulse then goes to the MCU section where the rest routing will be performed. After the MCU receives the pulse, will send the pulse to the checking section for the determination of candidate code. For example, if Candidate#1 gets a vote then the corresponding counter will be incremented by 1 and this data is placed into the bus of the MCU. The data then goes to the EPROM and being stored by it and the same pulse will also goes to the display section and display the count value on the 7-Segment Display. The MCU section also controls the display section to hold the data as well as the receiving module to get next data or pulse that is coming from the transmitter.

VII. PSEUDO CODES

The required pseudo codes for this two sections are given below.

A. Pseudo code for Poll Section

The pseudo code or the mechanism and steps for the EVM or Poll section is given below:

Start_T:

Waiting for Push button to be ready;

If

Push Button is Ready;

Voter gives the vote;

Check for correct pressing:

If

Pressed incorrectly;

Press again;

Else

Reset the Button Array;

Send the pulse to Encoder;

Encode the Data;

Data goes to RF;

Deactivate the Button Array;

Delay();

Incoming Logic;

Reactivate Button Array;

Else

Make Push Button ready;

Goto Start_T;

B. Pseudo codes for Counting Section

The pseudo code or the mechanism and steps for the Counting Section Section is given below:

Start_R:

Get RF Receiver Ready;

Receive pulse from Transmitter;

Send pulse to MCU(P_n);

Get MCU Ready;

Process the Data;

Data goes to LUT;

Check for the Candidate Value(i);

For $n=1$ to 4

$i=i+1$;

Form $P_n(i)$;

Loop End;

Place $P_n(i)$ bus;

Activate EPROM;

$P_n(i)$ goes to EPROM;

Data Stored;

Send $P_n(i)$ to Display;

Select Proper Segment;

Hold the Display until Next Data;

Goto Start_R;

VIII. SECURITIES OF THE SYSTEM

The proposed system have an enhanced security provided at the EVM end provided either by Polling Officer or by automatic system. By this security no voter can vote twice. This does not require any type of Biometric security or face detection security.

A simple circuit to be designed to provide the enhanced security without use of any costly device. This system can be referred as the locking system that is provided by the digital circuit without any coding. That is why this system is reliable and hazard free and with minimal cost but much more effective than any previous design.

IX. APPLICATION AND FUTURE SCOPE

The proposed design can be applied for various field either indoor system or outdoor system by varying the Modulation technique or to vary the RF module thus by changing the range of frequency in between Transmitter and Receiver section.

The Security of the system will an unique one which is free from any type coded control rather the implementation of digital switching and for this reason the cost of the system is much more lower but the efficiency will be much more as the RF Modules are perfectly matched and the Microcontroller is used for only Display and Storing purposes. So, the risk of theft will me minimized. Our next paper will reflect the variation and modification of the newly proposed design with the incorporation of the Security system.

X. CONCLUSION

The system proposed in this paper is now under research for the betterment in future interpretation. The most important parts of the system are the remote counting and the frontline security.

This two feature makes the system perfect with minimum possibility of theft and moreover the cost will very low as no costly components are used for the construction of the system. The further implementation of the security system will be shown in the next manuscript.

ACKNOWLEDGEMENT

The idea of the system are taken from several research articles which shows the innovative topics on the Electronic Voting Machine. Though this type of instrument or Voting Machine is not actually used for counting pole till now, it can be helpful for counting and displaying the poll in Real Time Mode with lesser lose in integrity and efficiency.

REFERENCES

- [1] Akash Konnur, Archana Nandibewoor, Nita Kakhandaki, "Preferential Electronic Voting Machine - An Embedded Computing Solution", International Journal of Emerging Technology and Advanced Engineering, Volume 3, Issue 3, March 2013, pp758-763.
- [2] Vaibhav Bhatia and Rahul Gupta, "Design of a GSM Based Electronic Voting Machine with Voter Tracking", BIJIT - BVICAM's International Journal of Information Technology, January - June, 2015; Vol. 7 No. 1; ISSN 0973 – 5658
- [3] Timardeepkaurarjeja, Jasleenkaurbassi, Damanjeetkaur, "Implementation of Electronic Voting Machine Through FPGA", International Journal of Soft Computing and Artificial Intelligence, ISSN: 2321-404X, Volume-2, Issue-1, May-2014.
- [4] Md. Murshadul Hoque, "A Simplified Electronic Voting Machine System", International Journal of Advanced Science and Technology Vol.62, (2014), pp.97-102 <http://dx.doi.org/10.14257/ijast.2014.62.07>.
- [4] Sahil Gupta and Naveen Goel, "Telephone Based Voting Machine", International Journal of Emerging Trends in Electrical and Electronics (IJETEE – ISSN: 2320-9569) Vol. 5, Issue. 1, July-2013, pp 76-78
- [5] Diponkar Paul and Sobuj Kumar Ray, "A Preview on Microcontroller Based Electronic Voting Machine", International Journal of Information and Electronics Engineering, Vol. 3, No. 2, March 2013, DOI: 10.7763/IJIEE.2013.V3.295
- [6] Hayam K. Al-Anie, Mohammad A. Alia and Adnan A. Hnaif, "E-Voting Protocol Based on Public-Key Cryptography", International Journal of Network Security & Its Applications (IJNSA), Vol.3, No.4, July 2011, DOI: 10.5121/ijnsa.2011.3408 87
- [7] Mourine Achieng and Ephias Ruhode, "The Adoption and Challenges of Electronic Voting Technologies within The South African Context", International Journal of Managing Information Technology (IJMIT) Vol.5, No.4, November 2013, DOI : 10.5121/ijmit.2013.5401
- [8] Abdalla Al-Ameen and Samani Talab, "The Technical Feasibility and Security of E-Voting", The International Arab Journal of Information Technology, Vol. 10, No. 4, July 2013, pp 397-404
- [9] Syed Razwanul Haque, Miah Md. Asaduzzaman, Prasanta Bhattacharjee, Akhlak Uzzaman Ashik, Robi Kormokar, "Finger Print Enabled Electronic Voting Machine with Enhanced Security", International Journal of Engineering and Technology Volume 5 No. 6, June, 2015, ISSN: 2049-3444, pp 368-374.
- [10] Sanjay Kumar, Manpreet Singh, "Design a Secure Electronic Voting System Using Fingerprint Technique". IJCSI International Journal of Computer Science Issues, Vol. 10, Issue 4, No 1, July 2013 ISSN (Print): 1694-0814 | ISSN (Online): 1694-0784.
- [11] M. Khan, "Fingerprint biometric-based self-authentication and deniable authentication schemes for the electronic world." IETE Technical Review, vol.26 (3), pp. 191, 2009.
- [12] R. Udupa, G. Garg and P. Sharma, "fast and accurate fingerprint verification", International Conference on Audio and Video-Based Biometric Person Authentication, pp. 192-197, 2001.
- [13] k. Memon, D. Kumar and S. Usman, "Next Generation A secure E-Voting System based On Biometric Fingerprint Method", International Conference on information and Intelligent Computing (IPCSIT), pp.26-32, 2011
- [14] Mr. Soumen Ghosh, "Development of Microcontroller Based Electronic Voting Machine(EVM)", IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE) e-ISSN: 2278-1676, p-ISSN: 2320-3331, Volume 9, Issue 2 Ver. VII (Mar – Apr. 2014), PP 01-03
- [15] Mahdi Alhaji Musa, Farouk Muhammad Aliyu, "Design of Electronic Voting Systems for Reducing Election Process", International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-2, Issue-1, March 2013, PP 183-186
- [16] Qadah, G.Z., Taha, R., "Electronic voting systems: requirements, design, and implementation" Comput. Stand. Interf. 29(3), 376–386 (2007).
- [17] A. M. Keller, A. Dechert, K. Auerbach, D. Mertz, A. Pearl, and J. L. Hall, "A PC-based Open-Source Voting Machine with an Accessible Voter-Verifiable Paper Ballot," Proceedings of the USENIX Annual Technical Conference, U.S.A., 2005, p.52.
- [18] Brown, J.S., Duguid, P.: Borderline Issues, "Social and material aspects of design", Human-computer interaction. Lawrence Erlbaum Associates, Inc 9(1):3–36 (1994).
- [19] Yao, Y., Murphy, L. , "Remote electronic voting systems: an exploration of voters perceptions and intention to use", Eur. J. Inf. Syst. 16(2), 106–120 (2007).
- [20] B.FarhathAnjum1 M.Deepa2 Mrs.C.N.Kalaivani, "Advanced Microcontroller Based Bio-Metric Authentication Voting Machine", IOSR Journal of Engineering (IOSRJEN), ISSN (e): 2250-3021, ISSN (p): 2278-8719, Vol. 04, Issue 05 (May. 2014), VOL-1PP 29-40
- [21] Alaguvel.R , Gnanavel.G and Jagadhambal.K , "Biometrics using Electronic Voting System With Embedded Security", International Journal Of Advanced Research In Computer Engineering And Technology(IJARCET)Vol 2, Issues 3, March 2013
- [22] Andreu Riera and Paul Brown, "Bringing Confidence to Electronic Voting", ISSN 1479-439X, ©Academic Conferences Ltd, Electronic Journal of e-Government Volume 1 Issue 1, 2003 (pp14-21)
- [23] D. Ashok Kumar and T. Ummal Sariba Begum, "A Novel design of Electronic Voting System Using Fingerprint", International Journal of Innovative Technology & Creative Engineering (ISSN:2045-8711) VOL.1 No.1 January 2011
- [24] S.V.Prasath, R.Mekala, "A Literature Survey on Micro-Controller Based Smart Electronic Voting Machine System", International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE) Volume 3, Issue 12, December 2014

BIOGRAPHIES



Subhadeep Chakraborty, born in 1986, is presently Lecturer in Technique Polytechnic Institute with 5 years of teaching experience. He received the B.Tech degree from Saroj Mohan Institute of Technology, WBUT, India and M.Tech degree from Kalyani Govt. Engineering College, WBUT, India in Electronics and Communication Engineering in 2008 and 2010 respectively. His primary research interest includes Digital Signal Processing, Embedded System and Microprocessor, cloud computing, virtualization of Network and Swarm and Robotics.



Sandip Karmakar, presently a student perusing Diploma Degree from Technique Polytechnic Institute in Electronics and Telecommunication Engineering in 3rd Year. His primary interests are Digital Electronics, Signal processing , Embedded System and Microcontroller.



Rima Jana, presently a student perusing Diploma Degree from Technique Polytechnic Institute in Electronics and Telecommunication Engineering in 3rd Year. Her primary interests are Digital Electronics, Signal processing and Embedded System.



Subhradeep Dey, presently a student perusing Diploma Degree from Technique Polytechnic Institute in Electronics and Telecommunication Engineering in 3rd Year. His primary interests are Digital Electronics, Embedded System and Microcontroller.