*International Journal of Emerging Trends & Technology in Computer Science (IJETTCS)*
**Web Site: www.ijettcs.org Email: editor@ijettcs.org, editorijettcs@gmail.com**
**Volume 3, Issue 4, July-August 2014** **ISSN 2278-6856**

# E-Voting System Using GSM Mobile SMS

**Haval MohammedSidqi**
Master in Computer Science, Sulaimani Polytechnic University
Qirga St., Sulaimani, Kurdistan Region of Iraq

## Abstract
***Electronic voting systems have the potential to improve traditional voting procedures by providing added convenience and flexibility to the voter. Numerous electronic voting schemes have been proposed in the past, but most of them have failed to provide voter authentication in an efficient and transparent way. On the other hand, GSM (Global System for Mobile communications) is the most widely used mobile networking standard. There are more than one billion GSM users worldwide that represent a large user potential, not just for mobile telephony, but also for other mobile applications that exploit the mature GSM infrastructure. In this paper, an electronic voting scheme using GSM mobile technology is presented. By integrating an electronic voting scheme with the GSM infrastructure, we are able to exploit existing GSM authentication mechanisms and provide enhanced voter authentication and mobility while maintaining voter privacy. In this paper, SMS has been used to send message which contain only code or identification of candidate , on the other hand used mobile to receive message and it is connected to a server to collect messages.***

**KEYWORDS**Electronic voting, Fault-Tolerance, Robustness, Mobile SMS

## 1. INTRODUCTION
The voting process in today's context is behind its time in respect of the usage of modern ICT as seen by experience. The voting process begins with persons manually going to an election office showing proof address and then a national identification card (Id) will be issued for getting the authentication during the actual process of voting at the polling both/station. With this, a voters' list will be generated for each constituency. Each voter will then have to go to a polling station where they believe that their names are made available and if so after authentication with their Id, they will cast their vote by placing a mark against the political party symbol of their choice. In some cases, on the voter's right thumb/index finger, an indelible ink mark is made to show that this person has already voted and so the voter cannot vote again. After the voting schedule is complete, booth officials will then take the ballot boxes to a centralized place, then declare the voting results by manually counting the votes polled, and tally the counts. In some cases, there may be some need for a recount of ballot papers polled also due to discrepancies. These processes are often lengthy, tedious, inaccurate, and risky and in some cases the final count may get skewed and end up in court cases also. This manual process leaves scope for errors to creep in, political dishonesty and political fraud, which is seen through the voicing of their feelings by people in the media in many countries using these systems. In countries that are better developed like in India, electronic voting (e-voting) is made possible and this technique encapsulates both electronic means of casting of votes and also counting of votes [1]. This process cleared up lots of problems and barriers faced by the paper based voting process explained above. But problems of long lingering lines of voters on the day of voting to cast their votes still persist and consequently not enough persons come for voting thereby neglecting their civil rights. Another reason for the lack of participation is that of security and the fear that they may be bullied into voting for someone that they don't wish to vote and cases have been reported in the media regarding political riots during the polling day. Another important reason is impersonation, voting by somebody before the actual person arrives in the polling booth for voting. These are just a few reasons why persons may be reluctant to exercise their rights to vote on the polling date. With all these problems in mind, we here propose a novel Mobile voting technique [2][3] for Jamaica at the first instance, with the hope that this Biometric based technology will erase the above issues. Our reported research focuses on the application of mobile technology with the use of short message send SMS.

### .1.1 Evaluation of Voting Equipment
In the recent years, voting equipments which were widely adopted may be divided into five types [10]:

**(1) Paper-based voting**
The voter gets a blank ballot and use a pen or a marker to indicate he want to vote for which candidate. Hand-counted ballots is a time and labor consuming process, but it is easy to manufacture paper ballots and the ballots can be retained for verifying, this type is still the most common way to vote.

**(2) Lever voting machine**
Lever machine is peculiar equipment, and each lever is assigned for a corresponding candidate. The voter pulls the lever to poll for his favorite candidate. This kind of voting machine can count up the ballots automatically. Because its interface is not user-friendly enough, giving some training to voters is necessary.

**(3) Direct recording electronic voting machine**
This type, which is abbreviated to DRE, integrates with keyboard, touchscreen, or buttons for the voter press to poll. Some of them lay in voting records and counting the votes is very quickly. But the other DRE without keep voting records are doubted about its accuracy.

**(4) Punch card**
The voter uses metallic hole-punch to punch a hole on the blank ballot. It can count votes automatically, but

if the voter's perforation is incomplete, the result is probably determined wrongfully.

**(5) Optical voting machine**

After each voter fills a circle correspond to their favorite candidate on the blank ballot, this machine selects the darkest mark on each ballot for the vote then computes the total result. This kind of machine counts up ballots rapidly. However, if the voter fills over the circle, it will lead to the error result of optical-scan.

**1.2 Effectiveness of E-voting Among Different untries**

Recent years, a considerable number of countries has adopted E-voting for their official elections. In this section, four empirical examples are enumerated as following.

**(1) America**

Government of the United States hold election collaterally in several ways, in other words, each state can choose the suitable way to hold elections independently. Because there are some debates about E-voting, such as some vote casts were not counted, or election system crashed during the Election Day. Secretary of State Kevin Shelley established an "Ad Hoc Touch Screen Task Force" to research the debates on DRE in February 2003 [1]. Shelly advanced that DRE should include voter verifiable paper audit trails (VVPAT) to solve electoral debates.

**(2) Japan**

Japan adopted E-voting for local election in 2002, such as mayor and councilor election of Niimi city in Okayama prefecture in June 23, 2002; mayor election of Hiroshima city in February 02, 2003; and mayor election of Kyoto city in February 08, 2004. Take mayor and councilor election of Niimi city for example, electoral center surveyed the voters' reliability when the election finished. There are 83% of voters considered that E-voting system is trusted. 56% of them considered that the results of E-voting and paper-based voting are the same therefore E-voting is sufficient for reliable. The reasons why voters can't trust the E-voting system are voters worried about the abuses in E-voting system, and they can not make sure their ballot are recorded correctly.

**(3) Belgium**

Election for the Federal Parliament is held in May 18, 2003. In order to assist voters in being familiar with E-voting system, electoral center held short-term training. Counting efficiency in the election with E-voting system was faster then convention. Belgium's compulsory voting system and E-voting complement each other, voters' satisfaction and attending willingness of join voting are improved obviously.

**(4) Brazil**

Brazil used E-voting in 1998. When the voter reaches the polling place, he shows his identity card for authenticating; if he is an eligible voter, he can get the ballot for E-voting. Brazil's E-voting system transmits votes to electoral center immediately, so that the count of votes can announce rapidly while the voting finished.

**1.3 Comparison of E-voting System**

Besides many vendors to develop and sell commercial electronic election machines, there are various open source E-voting systems. We cite some examples as following [4,8]:

**(1) AccuVote-TS**

AccuVote-TS's vendor is Diebold Election Systems. This system includes touchscreen, card reader, keyboard, headphone, and paper tape printer. The voter selects his favorite candidate on touchscreen, and the vote will be printed on the paper tape. Its design balances the policy, electoral procedure and technology. But all the electoral information (including identity authentication, audit, or counting of votes) are stored in Microsoft Access database without setting password so there are high risks of attack.

**(2) iVotronic**

The vendor of iVotronic is Election Systems and Software (ES&S). iVotronic provides multi-language, and uses flash memory to save voting records. Electoral workers use PEB (Personal Electronic Ballot, a device which is similar to disk) to start polling machine up. When the election is finished, the workers use PEB to access voting records in the polling machine, then delivers PEB to electoral center or transmits data from network. Because the PEB's password is only three characters, the risk of password breaking exists. This system have made mistake in the past elections, such as the number of voters is not corresponding between master server and backup server, the candidate selected on the ballot is not the voter's selection, and so forth.

**(3) eSlate 3000**

Hart InterCivic invented eSlate 3000. The voter gets a personal identity number (PIN) as four digits from electoral workers, then goes to the booth to input the PIN into polling machine to login. He can rotate selector wheel to select the candidate whom he want to poll for. Each terminal connects to the server which is named JBC (Judges Booth Controller). Counting of votes will send to JBC from every terminal by network, then save it in MBB (Mobile Ballot Box). This system doesn't encrypt voting data, so there are some risks of data security. Furthermore, the electoral functions are not protected with password, anyone, even the voter, can finish the election.

**(4) AVC Edge**

AVC Edge is a multi-language polling machine which is manufactured from Sequoia Voting Systems. This machine includes touchscreen and flash memory for saving voting recorded, and its electoral procedure is similar to a foregoing E-voting machine, Accu Vote-TS. There were some stumbles when this machine operated in the elections. For example, the E-voting system crashes when the user chose language; the counting of votes is not correct; and the ballot became blank because of the system breakdown.

**(5) SAVIOC**

SAVIOC is an open source E-voting system and all the source code and software can download from its official website [5,6]. This system is written in C language, and it can be saved in disk with FreeDOS. This system operates from disk, so hard disk is not necessary and the discarded computer is enough. This system is not connected to any networks and most of keys on the keyboard are disabled, attackers can't find the way to invade. SAVIOC's advantages are its simple disposition and low cost, but on the other hand, there are short of GUI and ease of use on SAVIOC.

## 2. System Architecture

Our implementation uses visual studio c#.net for administrator and database oracle 0g express with mobile . Furthermore, we utilize mobile for user to use SMS to send message to center . The E-voting system can divide into two parts: SIM card, each user can take from center who can vote per ration card after than can vote by sending sms and the second part it is mobile which connect to server to collect all messages from voter. The complete system is shown as Figure 1. This solution requires a GSM modem (or a mobile phone), a SIM card, a data cable that can be used to connect the GSM modem (or mobile phone) to your PC and an SMS gateway software. For long term operations it is best to use a professional GSM modem, such as a WavecomFastrack, a Siemens or a Multitech modem. For testing purposes any mobile phone will do. The SIM card needs to be placed inside the GSM modem and it will determine the phone number and the SMS cost. When you purchase your SIM card, it is worth to consider choosing a tariff package which offers favorable text message prices. There is a good chance you can find a plan that offers free or very low cast SMS messages. The data cable can be RS232 or USB. RS232 is a better choice, because it does not require you to install a driver.

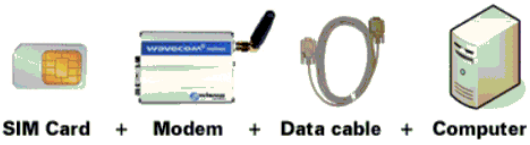


**Figure 1** System Architecture [3]

### 2.1 SMS server

is an application software which is used for receiving messages(SMS). It listens for incoming messages to arrive, processes the message if it's in a valid format. Note the processing of arrived messages depends on the application which will be discussed later. I am going to explain the following things:

Communication Port Settings

1. Receive Incoming Message
2. Read All Messages (Sent by the users)
3. Delete Messages (One or All)
4. I have used the GSMComm Library for Sending and Receiving SMS. You require a GSM modem or phone for sending an SMS.

#### 2.1.1 Communication Port Settings

CommSetting class is used for storing comm port settings

```
publicclass CommSetting
{
publicstaticint Comm_Port=0;
publicstaticInt64 Comm_BaudRate=0;
publicstaticInt64 Comm_TimeOut=0;
publicstatic GsmCommMain comm;

public CommSetting()
   {
//
// TODO:  Add constructor logic here
//
   }
}
```

Comm is an object of type GsmCommMain which is required for sending and receiving messages. We have to set theComm port, Baud rate and time out for our comm object of type GsmCommMain. Then try to open with the above settings. We can test the Comm port settings by clicking on the Test button after selecting the Comm port, baud rate and Time out. Sometimes if the comm port is unable to open, you will get a message "No phone connected". This is mainly due to Baud rate settings. Change the baud rate and check again by clicking the Test button until you get a message "Successfully connected to the phone." Before creating a GSMComm object with settings, we need to validate the port number, baud rate and Timeout. The EnterNewSettings() does validation, returns true if valid, and will invoke SetData(port,baud,timeout)for comm setting. The following block of code will try to connect. If any problem occurs "Phone not connected" message appears and you can either retry by clicking on the Retry button or else Cancel.

```
GsmCommMain comm = new GsmCommMain(port,
baudRate, timeout);
try
{
      comm.Open();
while (!comm.IsConnected())
      {
         Cursor.Current = Cursors.Default;
if(MessageBox.Show(this, "No phone connected.",
"Connection setup", MessageBoxButtons.RetryCancel,
            MessageBoxIcon.Exclamation)==
DialogResult.Cancel)
         {
            comm.Close();
return;
         }
         Cursor.Current = Cursors.WaitCursor;
      }

// Close Comm port connection (Since it's just for testing
// connection)
      comm.Close();
}
catch(Exception ex)
{
   MessageBox.Show(this, "Connection error: " + ex.Message,
"Connection setup", MessageBoxButtons.OK,
MessageBoxIcon.Warning);
return;
}

// display message if connection is a success.
MessageBox.Show(this, "Successfully connected to the
phone.",



"Connection setup", MessageBoxButtons.OK,
MessageBoxIcon.Information);
```

### 2.1.2 Receive Incoming Message

We are going to register the following events for GSMComm object comm.

1. PhoneConnected This event is invoked when you try to open the Comm port. The event handler for Phone connected iscomm_PhoneConnected which will invoke OnPhoneConnectionChange(bool connected) wit h the help of Delegate ConnectedHandler.
2. MessageReceived This event is invoked when a message arrives at the GSM phone. We will register withMessageReceivedEventHandler. When the incoming message arrives, the comm_MessageReceivedmethod will be invoked which in turn calls the Message Received() method in order to process the unread message. GSMComm object comm has a method ReadMessages which will be used for reading messages. It accepts the following parameters phone status (All, ReceivedRead, ReceivedUnread, StoredSent, andStoredUnsent) and storage type: SIM memory or Phone memory.

```
privatevoid MessageReceived()
{
   Cursor.Current = Cursors.WaitCursor;
string storage = GetMessageStorage();
   DecodedShortMessage[] messages=
CommSetting.comm.ReadMessages
            (PhoneMessageStatus.ReceivedUnread, storage);
foreach(DecodedShortMessage message in messages)
   {
      Output(string.Format("Message status = {0},
    Location = {1}/{2}",
      StatusToString(message.Status),
      message.Storage, message.Index));
      ShowMessage(message.Data);
      Output("");
   }

   Output(string.Format("{0,9} messages read.",

         messages.Length.ToString()));
   Output("");
}
```

The above code will read all unread messages from SIM memory. The method ShowMessage is used for displaying the read message. The message may be a status report, stored message sent/un sent, or a received message.

## 3.System Implementation

4-1 First step each voter must receive SIM card from center, it is useless after message where it was sent. 4-2 server calculates and counts each millisecond and send data into database.

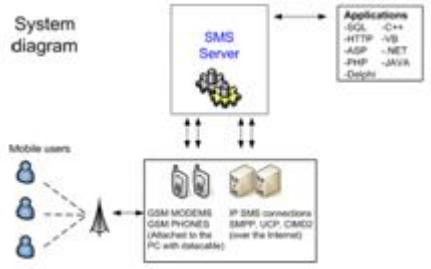


**Figure 2**System Diagram

## Conclusion

E-Voting System Using GSM Mobile SMS is an excellent program to receive SMS messages This is the best solution.The manual voting process can be very tedious, prone to electoral fraud and costly. The time that is been consumed and the resources often times runs into expensive projects. With all this, security is compromised because of the inability of all the human factors to provide efficient security needed for robust operation of the system.

## References

[1] T. M. Carbaugh, “Secretary of State Kevin Shelley Announces Directives To Ensure Voter Confidence in Electronic Systems,” California Secretary of State, 2003.

[2] D. L. Chaum, “Untraceable Electronic Mail, Return Addresses, and Digital Pseudonyms,” Communications of the ACM, Vol.24, No.2, 1981, pp.84-88.

[3] C. T. Chiou, “A Study of Election Reform in Taiwan: An Observation from e-Voting Experiences in Developed Countries,” Journal of Research, Development and Evaluation Commission, Vol. 28, No. 4, 2004, pp.25-35 (in Chinese).

[4] Compuware Corporation, “Direct Recording Electronic (DRE) Technical Security Assessment Report,” Ohio Secretary of State, 2003.

[5] C. A. Gaston, “A Better Way to Vote,” Proceedings of the 38th Annual Hawaii International Conference on System Sciences, 2005, p.117c.

[6] C. A. Gaston, SAVIOC Voting Systems, [Online], Available: http://www.savioc.com/, 2007.

[7] Institute Policy Institute, “Report of the National Workshop on Internet Voting: Issues and Research Agenda,” Proceedings of the 2000 Annual National Conference on Digital Government Research, 2000, pp.1-59.

[8] 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.

[9] T. Kohno, A. Stubblefield, A. D. Ribin, and D. S. Wallach, “Analysis of an Electronic Voting System,” IEEE Computer Society, 2004, pp.27-40.

[10] R. Mercuri, “A Better Ballot Box?” IEEE Spectrum, Vol.39, No.10, 2002, pp.46-50.

[11] C. H. Yang, Network Security: Theory and Practice, Key Hold Information Inc., Taipei, Taiwan, 2006 (in Chinese

## AUTHOR

**Haval M. SIDQI** received the B.S.degree in Math , Higher Diploma and M.S. degrees in Computer Science from Mosul and Sulaimani University in 1992, 2008 and 2011. During 1997 to present, he works as assist lecturer in ComputerScienceInstituteled by Sulaimani Polytechnic University, Kurdistan Region of Iraq.