Efficient E-voting Android Based System

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Abstract— The advancement in the mobile devices, wireless and web technologies given rise to the new application that will make the voting process very easy and efficient. The E-voting promises the possibility of convenient, easy and safe way to capture and count the votes in an election. This research project provides the specification and requirements for E-Voting using an Android platform. The e-voting means the voting process in election by using electronic device. The android platform is used to develop an e-voting application. At first, an introduction about the system is presented through a general diagram. Sections II and III describe all the concepts (survey, design and implementation) that would be used in this work. Finally, the proposed e-voting system will be presented with the obtained results.

Keywords— Electronic voting, Short Message Service (SMS), Global Positioning System (GPS), Universal Mobile Telecommunications System (UMTS), Quick Response Code (QR Code).

I. INTRODUCTION

The proper execution of democratic rights has become linked to the availability and reliable functioning of advanced information and communication technology (ICT). While modern societies fully rely on ICT for business, work and leisure time activities, the use of ICT for democratic decision making is still in its infancy. In fact, the out date technological concepts for voting have been blamed in part for lost and uncounted votes and could therefore be responsible for biased political decisions making [1]. Countries all over the world are examining e-voting [2], for it has some striking advantages over traditional paper voting, including security for casting votes, accuracy of counting and analysing votes, options to conduct voting in a centralized and decentralized manner, etc. The reasons why the e-voting technology has not matured to equivalent levels as known for business and leisure time activities lies mostly in an inherent lack of trust and fear of electronic threats. While most countries are still conceptualizing or testing e-voting systems, three cantons in Switzerland have pioneered the development of e-voting to its full technological maturity.

The world is always in improvement and growth in technology, that's why we should go parallel with it, to be able as much as we can get benefit from these improvements. As illustrated in Figure (1.3), the general block diagram of the system is presented into two different ways as follows:

- Via SMS: each voter can vote by sending an SMS using any kind of mobile connection line or any kind of mobile hand set to the system through the "Mobile Switch Center". For this such type system, an android application is created in Android phone, then the system will start implementing some processes on that SMS which is sent by the voters into the server through a network. A (MySQL) database is installed on the server side to send a result back to the voter by the android system application as shown in figure (1.1).
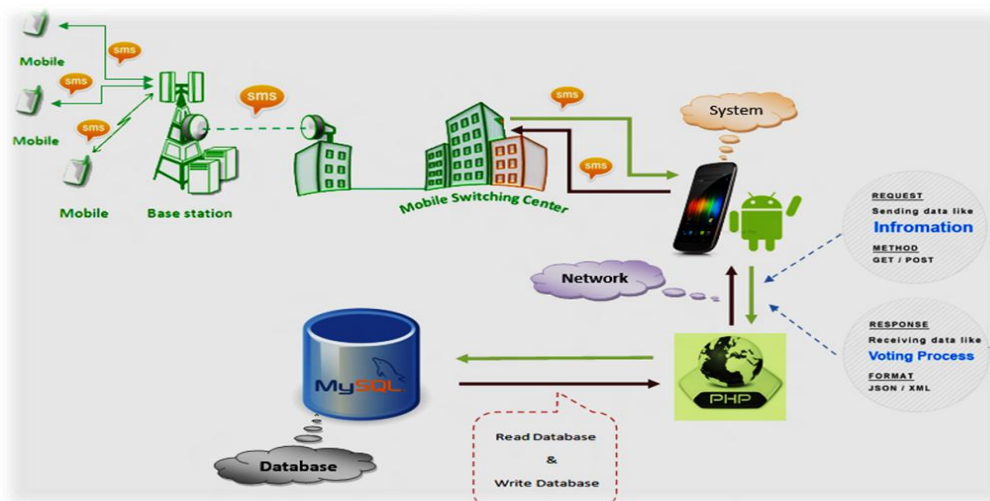

Fig (1.1) Block diagram of the SMS e-voting system

- The voter can use Internet connection through a Website which is developed throughout this work. As depicted in figure (1.2), one backend is created for the two ways connection.
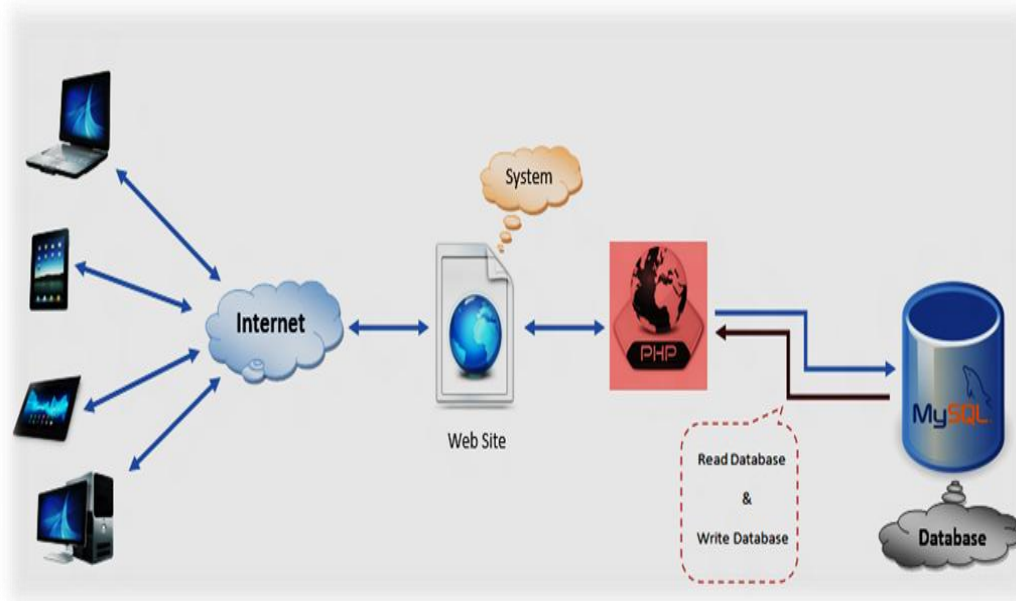

Fig (1.2) Block diagram of the Internet e-voting system

Both Android system and the Website are linked to the same (MySQL) database in order to the voter can vote through one of the two ways only one time and if he/she tries to vote again the system will deny him/her.
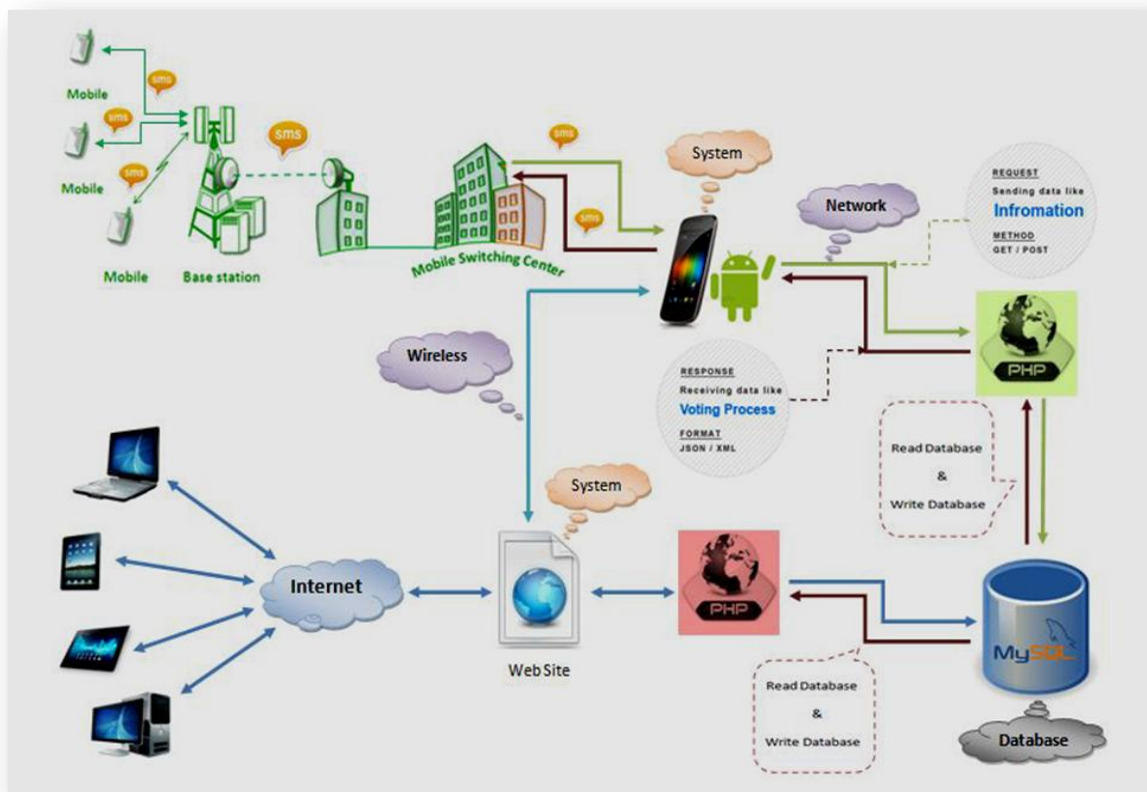

Fig (1.3) General block diagram of the e-voting system

An electronic voting system (on-line voting, internet voting) is an election system which uses electronic ballot that would allow voters to transmit their secure and secret voted ballot to election officials over the internet [3]. With the prosperity of internet over the years, inventers start to make the use of electronic voting in order to make the voting process more convenient and raise the participation of the civic. From now on, engineers have repeatedly created new technology to improve the feasibility of electronic voting system.

II. E-VOTING SYSTEM SURVEYS

Android e-Voting application on smart phone user gives user to vote, an application with an interface for consultation to a dynamic web page offers the main question to be answered (voted), and together to this page are available the buttons to send the votes: Yes, No or Maybe. Admin can see the voting results according to vote options and country from which vote was done and also can see the location of particular voter using GPS. The User can submit his opinion about given topic. System can maintain the data about the voter like Name, Country, ID number and opinion about given topic. Even though the system enables voters to poll their vote from anywhere, initially the voters should have to provide their voter id number to authenticate themselves and establish their user-ids. This constraint is imposed to ensure that only the genuine person is allowed to vote in the elections. The aim of this work is to design and implement an electronic voting application for the Android platform that will enable people to vote securely from anywhere. The application as a whole is aimed at being compatible with devices from many manufacturers and running different versions of the operating system. The application is also aimed at being localized [4].

Electronic voting refers to the use of computers or computerized voting equipment to cast ballots in an election. Sometimes, this term is used more specifically to refer to voting that takes place over the Internet. Electronic systems can be used to register voters, tally ballots, and record votes [5].

The Caltech/MIT Voting Technology Project [6] came into being in order to develop a new voting technology in order to prevent a recurrence of the problems that threatened the 2000 U. S. Presidential Elections. The report assesses the magnitude of the problems, their root causes and how technology can reduce them. They address a wide range of "What is" issues including voting procedures, voting equipment, voter registration, polling places, absentee and early voting, ballot security, cost and public finance of elections, etc. They then propose a novel "What could be" framework for voting technology (that moves away from monolithic voting structures), and propose that a process for innovation be setup. The framework is "A Modular Voting Architecture ("Frogs")" [7,8,9] in which vote generation is performed separately from vote casting, and the "Frog" forms a permanent audit trail, the importance of which cannot be over-stressed. Here, the vote generation machine can be proprietary whereas the vote casting machine must be open-source and thoroughly verified and certified for correctness and security. Finally, the report provides a set of short-term and long-term recommendations on the various issues related to voting.

In "Electronic Voting" [10], Rivest addresses some issues like the "secure platform problem" and the (im) possibility of giving a receipt to the voter. He also provides some personal opinions on a host of issues including the striking dissimilarity between e-commerce and e-voting, the dangers of adversaries performing automated, wide-scale attacks while voting from home, the need for extreme simplicity of voting equipment, the importance of audit-trails, support for disabled voters, security problems of absentee ballots, etc.

The NSF Internet Voting Report [11] addresses the feasibility of different forms of Internet voting from both the technical and social science perspectives, and defines a research agenda to pursue if Internet voting is to be viable in the future. It groups Internet voting systems into three general categories as follows:

• Poll-site Internet voting: It offers the promise of greater convenience and efficiency in that voters could cast their ballots from any poll site, and the tallying process would be both fast and certain. More importantly, since election officials would control both the voting platform and the physical environment, managing the security risks of such systems is feasible.

• Kiosk voting: Voting machines would be located away from traditional polling places, in such convenient locations as malls, libraries, or schools. The voting platforms would still be under the control of election officials, and the physical environment could be modified as needed and monitored (e.g., by election officials, volunteers, or even cameras) to address security and privacy concerns, and prevent coercion or other forms of intervention.

• Remote Internet voting: It seeks to maximize the convenience and access of the voters by enabling them to cast ballots from virtually any location that is Internet accessible. While this concept is attractive and offers significant benefits, it also poses substantial security risks and other concerns relative to civic culture. Current and near-term technologies are inadequate to address these risks.

The report presents some findings on the feasibility of each of these categories and provides research recommendations for the long-term future. It then identifies criteria for election systems. Finally, it addresses the technological issues (including voting system vulnerabilities, reliability, testing, certification and standards, specifications of source code, platform compatibility, secrecy and non-coercibility, etc.) and social science issues (such as voter participation, voter access, the election process, voter information, deliberative and representative democracy, community and character of elections, distribution of roles, legal concerns, voter registration, etc.)

The California Internet Voting Report [12] suggests a strategy of evolutionary rather than revolutionary change towards achieving the goal of providing voters with the opportunity to cast their ballots at any time from any place via the Internet. The report defines four distinct Internet voting models – Internet voting at voter's polling place, Internet voting at any polling place, Remote Internet voting from County computers or kiosks, Remote Internet voting from any Internet connection – and the corresponding technical and design requirements that must be met when implementing any of the stages. It addresses the advantages, implementation and security issues of each of the four stages. They believe that additional technical innovations are necessary before remote Internet voting can be widely implemented as a useful tool to improve participation in the elections process and that current technology however would allow for the implementation of new voting systems that would allow voters to cast a ballot over the Internet from a computer at any

one of a number of county-controlled polling places in a county. Finally, the report presents the findings and recommendations of the task force on policy issues. The Appendix A [13] of this report contains a technical analysis of the communication and security issues inherent in Internet voting, along with recommended privacy and security requirements for any Internet voting systems. It also deals with potential Internet-based voter registration systems and, briefly, with Internet petition-signing systems as well. The E-Poll (Electronic Polling System for Remote Voting Operations) project [14] investigates broadband mobile communications based on the UMTS standard for providing the E-Poll network with the required bandwidth and security. This makes it possible to use E-Poll kiosks anywhere, within a private, reliable and protected network. The voter-recognition system is based on an innovative smart card with an embedded biometric fingerprint reader, which performs voter recognition with absolute security. An ergonomic kiosk facilitates use by disabled people.

The FREE e-democracy project [15] is dedicated to creating the GNU.FREE Internet Voting system and also advocating Free Software, which is non-partisan and non-commercial in origin. [16] Presents a system for secure electronic voting which does not rely on persistent network connections between polling places and the vote-tallying server. They build the system on a disconnected (or, more accurately, an intermittently connected) environment, which behaves well in the absence of network connectivity.

III. E-VOTING SYSTEM DESIGN

Like most of the systems in the world, the security consideration is very important. We are taken into account this part through the limitation of the access using face recognition technique. When we click on a program icon , the system asks for a face to recognize ,when the system recognizes the face of the (Admin) it will gives him the approval to access the system, if the system couldn't recognize the face under any conditions for example : not clear face, too much light , the system will ask for password as an additional option. If the Admin could not access the system because of the above conditions, the system will deny him for access and the Admin will try again from the face recognition step. Also another technology that is used in this system is by using Hand Gesture Recognition in order to control all Tabs without touching the screen of the smart phone. This technique is successfully applied by using (Proximity sensor), that located in the upper layer of the android phone.

A. ***The first way for Voting(SMS Voting)*** *:* The voter can vote through the mobile regardless of the type by sending SMS to the system which are contains the following information in the example below:
1- Certification Number (N.C)
2- Form Number (N.F)
3- Candidate Number (N.P)

N.C * N.F * N.P

After the system receiving the SMS from the voters, the SMS will go to the Inbox part of the phone. Then, the system will find the SMS and save the header information. The system will separate SMS information and tokenizes them into several parts in order to work on them. The System will check those parts in order to know if they were sent in the right way that the system specified earlier, if there was an error in the information of SMS the system will send the SMS to the voter to tell him/her that the SMS contains wrong information. If the SMS did not have any errors, the information will be sent by the network to the server. The server double checks the SMS information to make sure the voter did not vote before. If the voter did not vote before, the server will accept the vote and the system sends an SMS to the voter that the vote has been accepted. After that the system will delete the SMS from the inbox for security manners (human rights, free to choose the candidate). This process was for one SMS, so the system will go back to inbox to handle another SMS in the same way than the first SMS did.

Figure (1.4) explains that the voter will receive an SMS from the system even if the process of the SMS was done in the right or wrong way. In the case that the voter does not receive any SMS from the system, that means the SMS was not sent successfully to the system and should have to try again to send the SMS to the system.
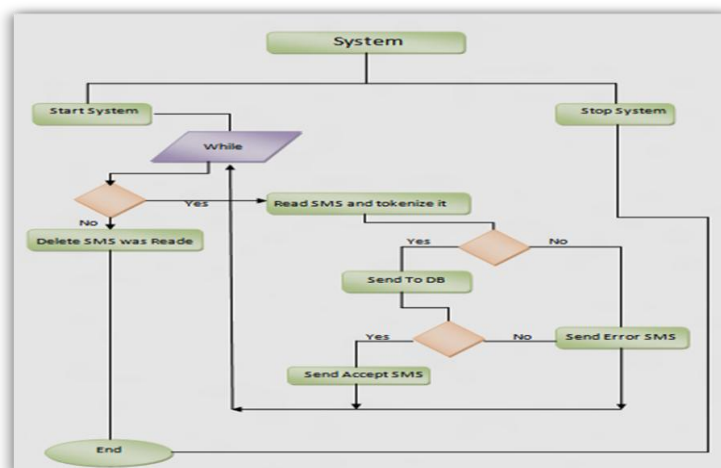
Fig (1.4) E-Voting system processes

B. *Internet Voting:* The second method is internet based voting system through the website. The website consists of a number of pages, each page has its own features and implemented in (Kurdish and English) languages. The tools that we used for design the website are:-

1) (HTML, CSS, JScript, SWF) for the front end.
2) PHP for the middleware.
3) MySQL as a backend

The two implemented voting system (SMS and Internet) are both connected to the same MySQL database. One conclude that the voter can vote through one of the two methods only one time and if he tries to vote again, the system will deny him. It also contains a special part for the admin which allows him to login into the dashboard of the website. Through this dashboard the Admin can change or add information on the website.

IV.   E-VOTING SYSTEM SECURITY LEVELS

For the security, a voice recognition technique is used because only the admin knows the correct word to choose and the admin can talk either in English or Arabic. (Google) machine translate is used as a tool for voice recognition. The recorded voice is sent to this machine through the internet, and the machine sends us back a listed text of the right words and the word that have similar syntax of the actual word. After that, the admin must choose the right word only he knows, and then the system connects to the server and get the information from the database in order to know how many votes each candidate has collected.

Other level of security that is used in this research is specified for the (database). One of the newest techniques that used is a Barcode Scanner. This technique is a specific type of (QR Code). In order to allow only specific people and authorized people to access, this part holds a specific (QR code).

V.   REAL TIME TEST RESULT

The system is tested in real time for both (SMS and Internet based method). The results show that the efficiency of the system is depending on the number of voters and the Internet bandwidth as well. Figure (1.5) presents a pie chart of the real time voting process which indicates the vote rate of each candidate.
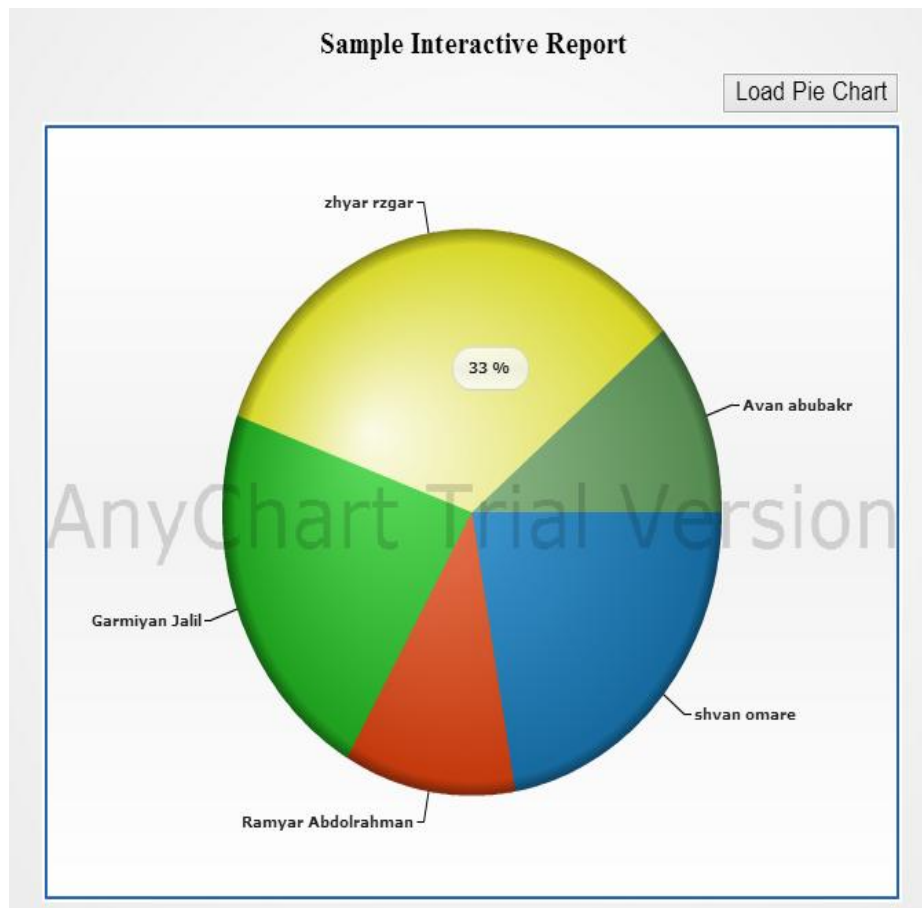

Fig (1.5) E-Voting system real time result

VI. CONCLUSION

This research paper proposed a real time e-voting system based on android phones. The system is first analysed for both SMS and Internet based voting. It then developed by implementing both techniques using android platform. The usability of this system is very high if it will be used in real life election process. It will definitely helpful for the users who wish to vote and the voting process will be made very easy by using this application.

Advantages of the proposed e-voting system: e-voting minimizes the risk of ambiguities as the voter makes his choice by touching the screen. E-voting could also minimize the need for recounts as everything is tabulated by the computer. Disadvantages of the proposed e-voting system: E-voting is not more secure as possible than the paper-ballot system. Electronic failures might occur with such a system. The e-voting system that we developed is tested with 100 peoples holding Asia cell sim card. The results show that our system is very efficient and easy to use.

VII. ACKNOWLEDGMENT

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