A new information system for Lebanese E-voting

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Abstract: In this paper, we describe a new information system of electronic voting (i.e. E-voting) in Lebanon. The frontal of this application is constituted of convivial, efficient and easy-to-use graphical user interface containing different languages suitable for all kinds voters. The system was developed taking in account by novice end-user and will have a high level security. This system was developed using the Microsoft Visual Basic language.

GVI, The Graphical Voter Interface, is a GUI (Graphical User Interface) for voting, suitable for use in private or public elections. Although it could be adapted for online voting, it is currently intended only for conventional "precinct" voting. Three parties use the system: Voters, Chief of election center and main Administrator. This system will be presented to the ministry of interior affairs for approbation and if necessary for modification.

Key Words: Administration, Database, E-voting, Lebanese election.

1 Introduction

In this paper, we describe a new information system of electronic voting in Lebanon (i.e. E-voting). E-voting is the process that permits the citizens to vote online with a simple computer rather the traditional voting. The frontal of this application is constituted of convivial, efficient and easy-to-use graphical user interface containing different languages suitable for all kinds of clients (i.e. voters). Processed data are saved in a relational database. This secured system should replace the traditional system therefore simplify the task for both voters and the election-administrators. In addition to this, the results will be revealed much sooner and more accurate.

We will first assess the impact of existing technology and ballots designs on a variety of factors: the ability of voters to cast their ballots accurately and efficiency, voter ease in casting complete ballots (if so desired), voter comfort using different technology and ballots interface, voter confidence that their ballot will be accurately and confidentially recorded, and the level of voter turnout (Bederson & al., 2003).

Nowadays, E-voting is still unpopular and therefore rarely used in exception of some countries that are starting to adopt it for all its advantages. The United state of America (USA) is on top of these countries with many states having such systems. In Santa Clara, there is a system of e-voting that was established in 1998 (Paielli & al., 1998). However, this system suffers from complexity therefore making voting a log process. Santa Clara’s system consists many steps, from the authentication to selecting the candidates by typing on a touch-screen his name (the name of candidates) letter by letter. The open voting consitium of California which exposed to the public inspection can make it vulnerable to hackers (Buck, 2004).

Therefore the chief points in such system, is the ease-to-use in addition to security and that provide a unique interface that has no links, which prohibit voters from tampering with the systems. The voting procedure must be very simple, of course, because most voters will have little or no time for training (Rubin, 2001).

With the system that we are proposing which consists of selecting the candidates easily from a presented list. The system was developed taking in account by novice end-user and will have a high level security. This system consists of a relational database that controls all features and data needed in the e-voting process.

To develop this system we used the Microsoft Visual Basic language. It is an adapted environment, a convivial and a productive, that permits to quickly develop the professional application of very high level.
In our opinion, electronic voting has the potential to not only modernize electoral processes but also to improve the interaction between citizens and their governments through e-participation platforms based on information and communication technologies (ICT).

However, to take full advantage of the benefits and promises of electronic voting advanced security measures must be deployed to compensate for the inherent lack of transparency and to increase confidence in the new system by both voters and election authorities. (Jorba & al., 2002).

In this paper, we present our E-voting system in Lebanon, which characterize to have a high level of security. In section 2, we start by presenting the aim of our system that is providing electronic machinery for two types of election held in Lebanon. In section 3, we describe the architecture of our E-voting system including the database, three parties use the system: Voters, Chief of Precinct and main Administrator, and security. Finally, section 4 includes our conclusion about E-voting system at all.

2 Problematic

The voting procedure must be very simple, because most voters will have little or no time for training. The aim of this system is to provide electronic machinery for two types of elections held in Lebanon.

First, the legislative election which is held nowadays in traditional ways requiring lot of paper preparation, time and many other logistics such as TV, cameras, microphones for counting votes, the list of voters has to be prepared since two or three weeks or more and the distribution of the heads of precincts would be done before a while. However, the e-voting system presents many improvements from facilitating the process, reducing counting time and using less logistics.

Lebanon is a parliamentary republic in which the President is by tradition a Maronite Christian, the Prime Minister a Sunni Muslim, and the Speaker of the Chamber of Deputies a Shiite Muslim. The Parliament consists of 128 deputies, equally divided between Christian and Muslim representatives.

The legislative election is held region by region and the winning candidates are distributed on all sects depending on the proportion of the sect in each region. Lebanon is a parliamentary democratic republic, divided in 8 regions. The ‘Majlis al-Nuwab’ (Assembly of Representatives) has 128 members, elected for a term of five years by the religious communities [Maronites (34), Sunnites (27), Shiites (27), Greek Orthodox (14), Greek Catholics (8); Druzes (8), Armenian Orthodox (5), Alauites (2); Armenian Catholics (1); Protestants (1), Christian Minorities (1)].

On the same side, the municipal election suffers from the same disadvantages of the legislative election. This election is held village-by-village and city-by-city, and the voters choose only candidates from their city or village.
3. Application Architecture

3.1 The database

The figure 1 shows the relational data Model of our system database. This model satisfies all the points invoked in the problematic section. The role of each table is described as follow:

**Region**: contains all the regions that exist in Lebanon.

**District (department)**: contains all districts that exist in Lebanon.

**Village/city**: contains all the villages/cities that exist in Lebanon. Each city was joined to their district.

**Neighborhood**: contains all the neighborhoods that exist in Lebanon. Each neighborhood was joined to their city.

**Election center**: contains all the election centers that exist in Lebanon. Each election center was joined to their neighborhood.

**Voter**: contains all the details of voter such identity, password, etc…

**Religion**: contains all the official religions that exist in Lebanon.

**Candidate**: contains all the candidates.

**Type of election**: contains all types of elections, legislative, municipal.

**Election process**: contains the process of election.

**Election cycle**: contains the year and type of election.

**Seat**: contains the entire seats that exist in selected place.

**Nominating**: contains all nominates and their number of votes.

**Precinct**: contains all precincts that exist in Lebanon. This table was joined to the seat table through the **Details of precinct** table to indicate seats number and type.

The relational database of this application controls all features and data needed in the e-voting process such as confidence of voter that the system itself doesn’t know what they vote. Three parties use the system: Voters, Chief of election center and main Administrator.

3.2 The Software

The objective of this dedicated application is to computerize the voter process through a convivial, efficient and easy-to-use graphical voter interface. This software has been developed with Microsoft visual basic language. We will describe the main functionalities of this system.

3.2.1 The Voters

The voter has a simple task of voting consisted of two steps: Authentication and selecting the candidates.

The authentication process consists of confessing his ID with the database already prepared. This authentication prohibits anyone from voting more than once. (Figure 2).

![Figure 2. User Authentication interface.](image1)

![Figure 3. Process of Selecting from candidates list.](image2)
finished by clicking yes or the voter can go back to choose again. Then the system will be ready for another process of voting.

3.2.2 The chief of election center

![Language Setting](image)

**Figure 4. Language selection.**

The chief of Precinct has a role specifying the language used in the process depending in the village language and he can also change the language during the election as needed. (Figure 4)

![Election Setting](image)

**Figure 5. Election settings (open and close the election).**

The chief of election center can open the process of the election by clicking on the “open” button, in the same time the “close and result button were disabled by the system. (Figure 5)

The chief of election center also sets the end of the election according to an order coming from the interior ministry or previous time deals with it. And before send the result, the chief of election center have to close the election then takes in charge the sending of the result to the ministry of interior affairs. Later, the chief of precinct deliver the memory cards or cdrom along with a printout of the results. (Figure 6)

3.2.3 The main administrator

![Election Settings](image)

**Figure 7. Process of Selecting from the main interface.**

(Selecting the region, then the department in the region, then the city in the department, then the neighborhood and finally the election center, and the final result of election).

The main administrator can receive the sub-result from each election center, and also check which election center still not send result yet. He is the one who declare officially the final result by receiving it from all election centers and also...
checking it with the printout coming with each chief of election center. (Figure 8)

![Image of Final Results of election]

**Figure 8. Final Results of election.**

This system will be presented to the ministry of interior affairs for approbation and if necessary for modification.

### 3.3 The Security

GVI, The Graphical Voter Interface, is a GUI (Graphical User Interface) for voting, suitable for use in private or public elections. Although it could be adapted for online voting, it is currently intended only for conventional "precinct" voting.

For security reasons, GVI does not require that the voter have access to a keyboard. It can handle write-ins and multi-language elections, and it can automate voting along party lines. It can also be used for Approval Voting, which allows voters to select more than one candidate. The voters vote by using a new touch screen which is distributed in all voting booth of each precinct. Most important, touch-screen systems can reduce several common mistakes voters. Touch screens provide immediate feedback on voter choices, helping to ensure that you don't vote for too many candidates in a race, forget to vote on an issue, or enter an unintended vote because you misreading. (Boutin, 2004)

E-voting terminals can be more convenient than paper systems as well. Officials don't need to supply paper ballots in different languages--voters select the language as a menu option. Results can be transmitted to election headquarters in seconds, and recounts are a snap since each vote is unambiguously stored in memory.

The booth machines operate independently, or connect only to a local election judge's workstation. They lack the hardware to connect to the net. To report results, the chief of precinct dials by using a special interface to the server located at election headquarters and transfers that precinct's tallies over an encrypted modem-to-modem connection. Later, the chief of precinct deliver the memory cards along with a printout of the results. Therefore, at the headquarters, the results will be collected by the main system, which provide a quicker final result.

### 4. Conclusion

In this paper, we have described an e-voting system that is supposed to be more efficient than the traditional voting process. The frontal of this system is constituted of a convivial, efficient and easy-to-use to use graphical user interface. Data are saved in a relational database. With this system, all tasks are achieved more easily and more quickly while meeting the key points (convivial, efficient and easy-to-use to use) for a successful election process. This work contributes efficiently to reinforcement of the e-voting.

### 5. References