



Design and Implementation of Biometric Voting System for Tertiary Institutions in Nigeria

Longe O. L.^a, Ayofe T.A^b., Akporherhe O. A^a.

^aDepartment of Computer Science Federal Polytechnic, Ede Osun State, Nigeria

^bDepartment of Computer Engineering Federal Polytechnic, Ede Osun State, Nigeria

E mail-longelawrence@gmail.com

Abstract - This paper deals with design and implementation of biometric voting system for tertiary institutions in Nigeria (A case study of WAPOG Polytechnic). The system was designed and developed using Microsoft Visual Basic Integrated Development Environment (IDE), and Visual dBASE Management System was used for its database support. This system employs automated methods of identifying or authenticating the identity of a living person based on fingerprints. The fingerprint distinctiveness, ease of acquisition, and high matching accuracy has made it suitable for biometric applications. The interaction style used was menu, and the menu items were grouped to reflect their functions. Agile and user-centered design methodologies were adopted. The implementation of this system shows that the integrity of campus electoral process can be enhanced greatly with biometric voting software applications. The objectives of user convenience and higher efficiency of biometric method has made it a good voting application for tertiary institutions. Campus voting system can be greatly improved based on the current biometric technologies.

Keywords: *biometric voting software, Biometric technologies, Microsoft Visual Basic, Visual dBASE Management System*

1.0 Introduction

Voting theory began formally in the 18th century and many proposals for voting systems have been made ever since. Voting is a method by which electorates make decisions or express opinions often following discussions, debates or election campaigns. Biometric technologies employ automated methods of identifying or authenticating the identity of a living person based on physiological or behavioural characteristics (Oluwatosin, 2015). Automated fingerprint identification is one of the most reliable biometric technologies (Thang, 2008). The thumbs impression of every individual is unique, and so they help in maximizing the accuracy of the application (Alaguvel et al., 2013). Election allows the populace to choose their representative and express their preference on how they will be governed. The integrity of the election process is fundamental to the integrity of democracy itself and the people elected. The electoral or voting system must be sufficiently robust to withstand the variety of fraudulent behaviours and must be sufficiently transparent and comprehensive enough so that voters and candidates can accept the results of the election (Eduardo et al., 2010). Biometric voting system employs thumbs impression for the purpose of voters' identification and authentication. Therefore, the application will trap down all illegal and duplicate votes, and the election results will be credible.

2.0 Motivation for the study

The issue of election in our campuses of higher learning should be of interest to all. The politics on Campus is becoming very important to national development in terms of acceptance and adoption of credible voting systems because the students are the leaders of tomorrow in any nation. Good governance and right culture to political development can be enhanced by accurate and credible voting systems. The integrity of the electoral process is fundamental to the integrity of democracy itself; therefore, the integrity of democracy must be sustained right from the campus politics by the adoption of good voting

systems. Most of the elections that are conducted in our higher institutions today used manual systems. This paper-based system is not only limited in its capabilities, but also introduces both illegal and duplicate votes. There has been a greater need for software designers and programmers to develop current and next-generation biometric applications.

3.0 Aim and objectives

The purpose of this study is to develop a Biometric Voting Application for tertiary institutions in Nigeria. The objectives of the study include:

- (a) To develop a flexible and interactive Biometric Voting Software that enables the conduct of free and fair election on campuses of higher learning in Nigeria.
- (b) To develop a simple easy-to-use Biometric Voting Application which an individual with little or no idea of software application can interact with a great deal of comprehension.

4.0 Literature Review

4.1 Electronics technologies

There have been several studies on using electronics technologies to improve elections (Peter et al., 2017). Elections allow the populace to choose their representative and express their preference on how they will be governed. Naturally, the integrity of the electoral process is fundamental to the integrity of democracy itself (Aishwarya and Prashant, 2015). In the context of western democracies, electronic voting has become a very popular topic of discussion in academic and technical circles. Voting is a method by which electorates make decisions or express opinions often following discussions, debates or election campaigns. Electronics voting is a term encompassing several different types of voting, embracing both electronic means of casting votes and electronic means of counting votes (Chikodiri, 2015).

4.2 Biometric technologies

Biometric technologies are defined as “automated methods of identifying a living person based on psychological or behavioral characteristics” (Rudd, 2011). Automated methods can be broken down into mechanisms used to scan, process, and comparing units or interfaces with a variety of application systems. Identification refers to when characteristics are selected from a group of stored images; this produces a list of possible or likely matches (Jain, 2010). Fingerprints have been used for personal identification for many decades. Automatic fingerprint identification is one of the most reliable biometric technologies (Firas and Seifedine, 2012). This is because of the well known fingerprint distinctiveness, persistence, ease of acquisition and high matching accuracy rates. Fingerprints are unique to each individual and they do not change over time (Ankita et al., 2013). Even identical twins do not carry identical fingerprints. Scientific research in the areas such as biology, anatomy and histology has supported these findings. Because biometric identifiers cannot be easily misplaced, forged or shared, they are considered more reliable for person recognition than traditional token or knowledge based methods (Alaguvel et al., 2013).

The objectives of biometric recognition are users’ convenience, better security, and higher efficiency. The tremendous success of fingerprint based recognition technology in law enforcement applications, decreasing cost of fingerprint sensing devices, increasing availability of inexpensive computing power, and growing identity fraud/theft have ushered in an era of fingerprint based person recognition applications in commercial, civilian and financial domains (Eduardo et al., 2010). There are some previous work which uses fingerprints for the purpose of voters’ identification and authentication. Humans have used body characteristics such as face, voice, and gait for thousands of years to recognize each other (Oluwatosin, 2015).

4.3 Fingerprint Scanner

The finger print Scanner consists of the following parts:

- (a) Printer print sensor: this is used to scan the thumb impression. The data obtained from this is analog in nature. This is transferred to the A/D converter for further processing.
- (b) A/D converter: This is used to convert the analog data from the sensor into digital data and transfer it to the processor.
- (c) Flash ROM: This is for the storage of the data temporarily in the DSP processor. This will work until the data is transferred to the main memory of the host.
- (d) DSP Chip: This is used to receive the data and process it. This is connected to the USB port for further transfer of the data.
- (e) USB PORT: The sole purpose of the USB port is to establish a communication link between the DSP processor and the memory (database)

5.0 Methodology

The design methodology used is “Agile”, which is Feature Driven Development (FDD). FDD consists of 5 clearly defined processes. The processes are: (a) build an overall model, (b) build a features list, (c) plan by features, (d) design by features, (e) build by features. The processes (that make up FDD) are structured around defining every element of a project as a feature, then designing and building each feature in an iterative manner (Gerard, 2015). It means design, coding, and testing in an iterative manner until the whole system emerges.

5.1 Data Collection Techniques

The methods adopted in getting all needed information are as follows

- (a) Reading through voting documents
- (b) Personal interview with the campus electorate personnel
- (c) Information is also gathered from the internet , from various web site
- (d) Text book on voting

6.0 Results and Discussion

The major components of this design are input design, output design, process design, screen design, Database design, Data design, and program design. The databases were created using Visual dBASE database management system. The User Interface and other programming modules within the application were written using Microsoft Visual Basic integrated development environment (IDE).

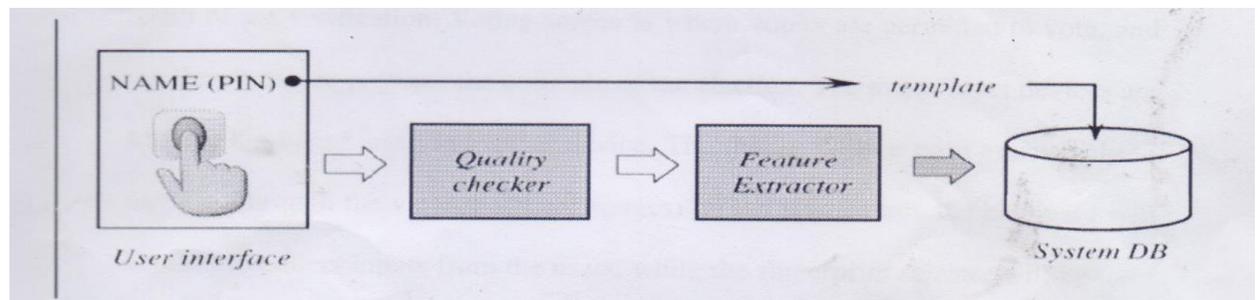


Fig.1: The Model of Registration

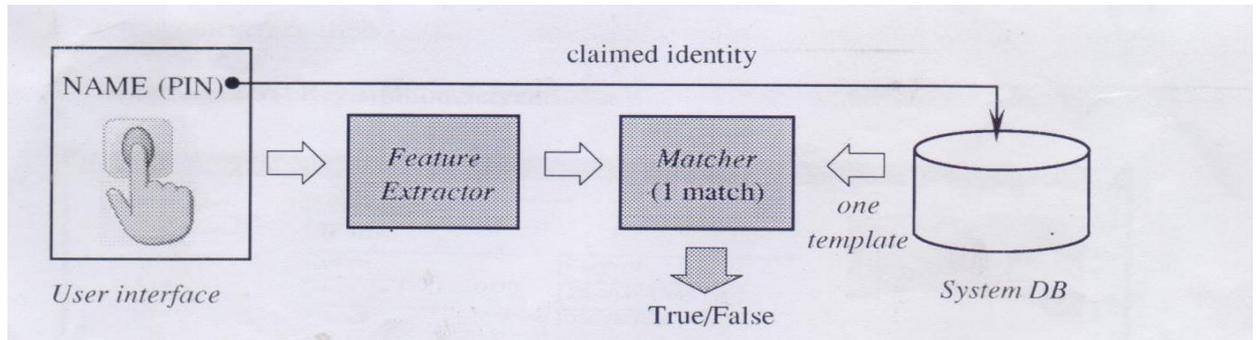


Fig.2: The model of Verification

Biometric Voting System will integrate with the fingerprint technology and it consists of different menus. The Voters' Registration Screen is meant to collect and store details of voters. Such details include pictures, fingerprints, and other necessary data. The Candidate Registration Screen allows the contestants to register the post they are willing to contest for and it should appear during the voting exercise. Verification Screen allows fingerprint of each of the voters to be verified from the existing ones in the database. The eligibility to vote is granted or denied based on the result of the verification. Voting Screen is where voters are permitted to vote, and the Result Screen presents the outcome of the election. The major input devices for this application are mouse, keyboard, and fingerprint device. The mouse will be used extensively to navigate through the various screens (pages) on the application, the keyboard will be used to collect input from the users, while the finger print scanner will be used to collect the voters' and contestants' fingerprints. The figure 3 and 4 show program screen shots:

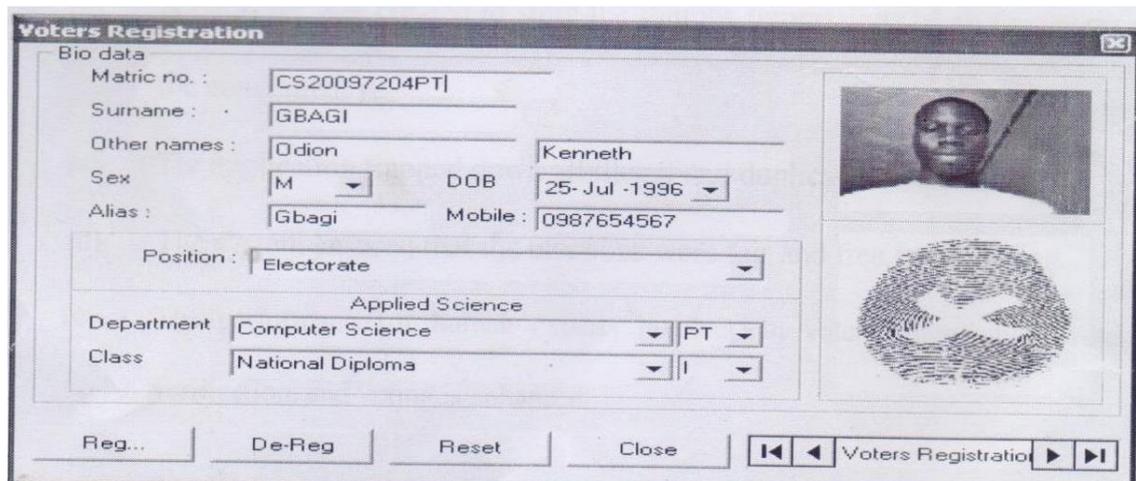


Fig.3: Screen shot of the Voters registration screen

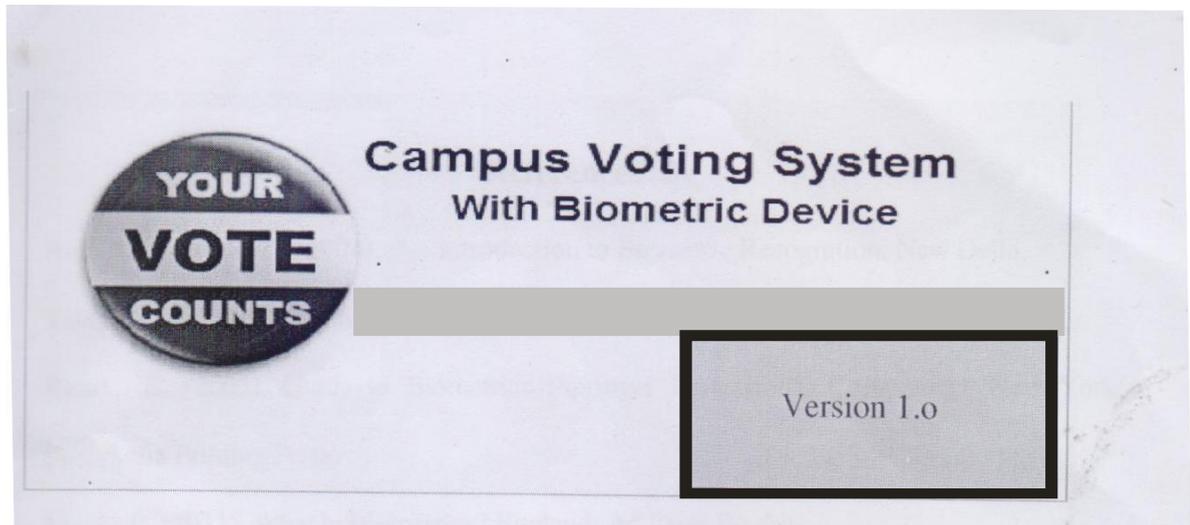


Fig 4: Screen shot of the introductory

7.0 Conclusion and Recommendations

The study has examined the design and implementation of Biometric Voting System for Tertiary Institutions in Nigeria. . The objectives of users' convenience and higher efficiency of biometric method has made it a good voting application for tertiary institutions. In a challenging economy, democracy is a vehicle for economic development and it requires a credible voting method such as biometric voting system to achieve its objectives. Good governance will bring good economy recovery in a challenging economy.

Tertiary institutions in Nigeria should adopt biometric voting system for their elections. Campus voting system has to be improved based on the current technologies for effective democratic processes at all levels in Nigeria. To achieve highly credible electoral process, the following recommendations are made:

- (a) The management of each institution should create Electoral Management Unit (EMU) to manage and maintain the software
- (b) The federal government should assist in funding and maintenance of the Nigeria tertiary institutions in order to enhanced the application of ICT products at all levels.
- (c) Funds and resources could be attracted from wealthy individuals, corporate organizations and international organizations for the purpose of improving the ICT compliance of tertiary institutions in Nigeria.

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