

Enhanced Computer Based Examination System with Fingerprint Authentication

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ABSTRACT

Examination is the assessment method or technique through which someone that had earlier been subjected to teachings or tutelages within a speculated time interval is being tested with related questions and tasks after which he/she is graded based on his/her performance to be either qualified for a certificate, promoted to the next phase or to be re-tutored on the same subject matter. Hence, there are two (2) ways or methods for conducting this examination. First, is the traditional (manual) way, where exams are being written and graded with writing materials (paper and pen) by the examiners, and the second is the e-examination method, where computers are being used to conduct examination for both writing and grading which is more reliable, and timeous. This method is often referred to as Computer Based Exam (CBE). This project research is aimed at bridging the security gaps in the course of using computers when conducting examination often referred to as “examination malpractice”, where unauthorized candidate impersonates, by taking the exam on behalf of the original candidate in CBT examination centers. Bridging this gap is achieved by developing CBT exam web application and incorporating fingerprint authentication into the log-in interface of each examinee because of the unique nature of fingerprints in every man.

Keywords: Computer based Exam, Authentication, web application

I. INTRODUCTION

The process of promoting, grading and awarding certificates for people that partake in a particular problem solving task or assignment within a time frame brought about the idea of conducting examination to people concerned in order to establish criteria between the classes and grades to be awarded to individual participants base on their performance in course of finding solution to a problem or when faced with some test. It was

established in order to properly evaluate the knowledge and ability of an individual on a specific domain of study and presenting awards or grades to them base on their examined ability accordingly.(Babatunde, 2010)

Examination can simply be defined as the technique or method used in every studying institutions or centers (i.e. academics, vocations, organizations, etc.) where students that had earlier been subjected to various teachings, trainings or skills in a defined domain of study or interest within a particular speculated period of time are being tested, assessed and then graded based on the students’ performance for promotion to the next level or class. Therefore an examination is simply the measure at which acquired knowledge of a person is being tested with series of related questions, tasks and challenges that needs to be resolved within a time frame.

The utilization of computer systems in place of traditional (manual) or paper mode, which was pigeonholed by significant examination question leakages, candidate impersonations, teacher demands for pleasure, and bribery by supervisors and invigilators of examinations, is the current information technology (IT) method of examining students/learners (Akanbi, 2012).

Universities and other tertiary institutions like Federal Polytechnic, Ilaro are enrolling and conducting electronic examination for their students through the internet and other electronic and networking gadgets specifically for entrance examinations into their institution. In fact, not only the educational sector conducts examination for their students/learners, employers also conduct aptitude test for their job seekers through electronic means (CBT). Through the use of biometrics interfaced by client applications and closed-circuit television, the widespread adoption of Information and Communication Technology (ICT) by academic institutions could play vibrant roles in improving and modernizing teaching as well as mitigating or completely eradicating the potential

cases of examination malpractice (CCTV) (Fayomi et al., 2015).

The Joint Admission Matriculation Board (JAMB), the West Africa Examination Council (WAEC), the National Examination Council (NECO), the National Board for Technical Education (NABTEB), the National Teacher Institute (NTI), and others all enroll their students through electronic means. Recently, nearly all Nigerian tertiary institutions have embraced electronic examination for post-Unified Tertiary and Matriculation exams (Post-UTME).

II. RELATED WORKS

It is the act through which a learner under the tutelage of an instructor is being tested to properly evaluate his/her academic improvement, to review, compare and measure the effectiveness or the degree of his/her acquired knowledge. A test's primary objective is to determine if a student has completed an assignment or educational goal within the allotted time. The results of such a test can help the instructors identify issues with their designed instructional method(s) and better understand the learners' strengths and weaknesses in a particular subject and at a particular time. In order to improve the instructor's teaching/training performance, tests can also be utilized to further change the instructional environment or method based on the analytical output (Chen, et al ,2015).

The two current methods for conducting exams are as follows: (i) computer-based tests, which are an electronic examination (e-exam) that allows test participation; and (ii) traditional/manual methods of using paper and pencil/ biro tests, which include the printing and provision of test items, the grading of students' test sheets, and the analysis of learner's feedback for each test item. The process of such e-exam is primarily automated, which implies that examination administration, grading, and reviewing are of little efforts as they are automatically done by computers. Customarily, such e-exam is in form of multiple-choice test questions where exam candidates are presented with several related answers to a question, often referred to as options and ranges from option A to E or as the case may be.

Ayo, et. al. (2011) defines e-examination as a system that includes how exams are conducted through the internet or intranet, as appropriate. The Joint Admissions Matriculation Board (JAMB), a government educational organization in Nigeria, is mandated by law or decree to conduct entrance examinations into all Nigerian higher educational institutions. They suggested a model for e-Examination in Nigeria in which all applicants are

subjected to an online entrance examination in order to curtail the irregularities. Covenant University (C.U.) served as the development, design, and testing site for the suggested concept. CU is one of the private universities which belongs to the Winner's Chapel Ministry in Nigeria. Their findings demonstrated that the system has the ability to do away with issues like impersonation and other forms of examination misconduct that are related to traditional (manual) techniques of examination. In furtherance to developing and implementing means through which computers may be utilized to conduct examination (e-exam), Akinsanmi et al, (2010) envisioned a web-based e-learning system that could patiently and humbly present and assess mathematics exercises. The system must therefore have the ability to input and output mathematical formulas, generate graphs dynamically, and generate random expressions and numbers to use in testing test takers. Also, Clarke, 2012, provides an implemented Generic Software of many e-exam package types; this e-exam package is targeted towards Hearing Impaired (HI) people. Therefore, it is important that the exam questions in this produced package be translated into HI languages that the candidate can easily understand, like as sign language and finger spelling. The idea behind this universal software is to give blank templates to the teacher or instructor, who will then develop and formulate his or her intended e-exam for the relevant subject and area of interest, such as mathematics, languages, or science, and the anticipated set of exam types in the context of multiple-choice question oriented exams, matching between words or images, filling in blank spaces, and other similar types of exams.

III. METHODOLOGY

This section discusses the techniques and various block diagrams used for this project design as well as their co-interaction. It further discusses the procedures, design specifications and tools used in the achievable of this proposed work.

This proposed online examination system uses a PHP web-based code/language using visual studio code program and fingerprint identification aspect for examinees' authentication during log in, before granting/denying access to the examination questions. The system detects a person during identification by comparing his or her fingerprint biometrics with each entry in the database, granting access when there is a match and prohibiting access when there is not. In a broader sense, biometric identification is divided into the following two clearly defined stages:

- i. Enrollment and
- ii. Authentication

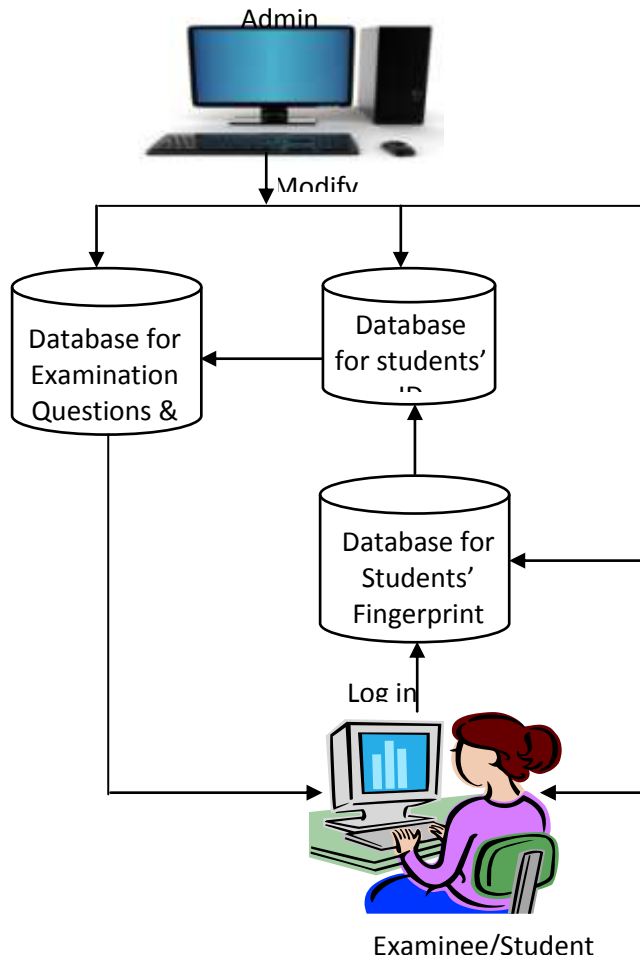


Figure 1.1: Database and User Interaction

IV. DESIGN ANALYSIS

The notion behind this proposed online examination system with fingerprint authentication is that an interactive website based online examination platform or environment was first developed using PHP language and MySQL for the backend (Database) and Javascript for the Frontend where we have the admin with the

capability of modifying examinees' information, while a fingerprint scanner or device, named Mantra Fingerprint Scanner 100 (MFS100) was used to interface the log in platform of that online examination web code which act as the gateman between the student accessing his/her data and examination area.

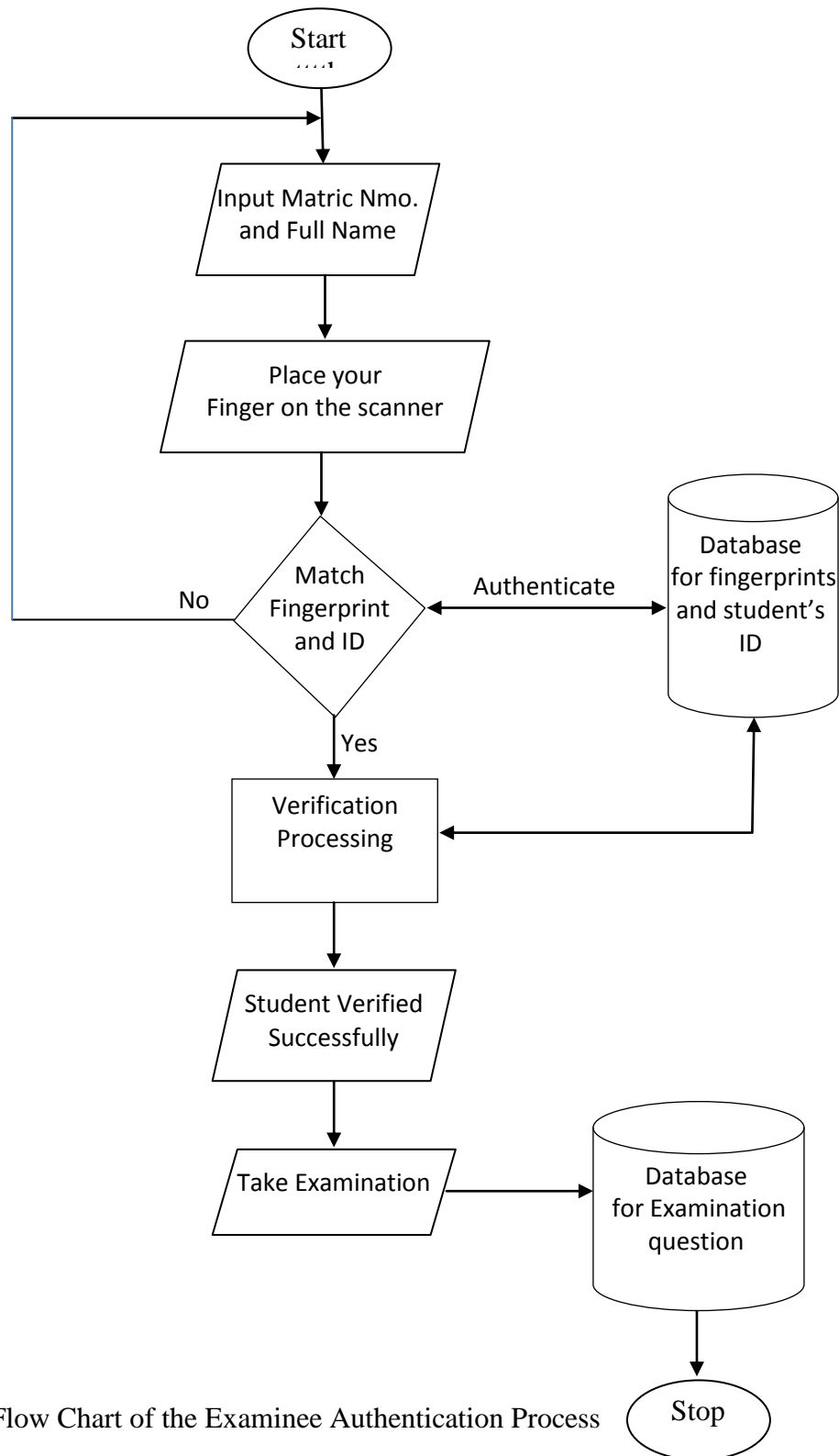


Figure 1.2: Flow Chart of the Examinee Authentication Process

4.1 WEB DEVELOPMENT EDITOR

Web development editor is an application software program designed specifically to write, run, modify and to represents web scripts and codes

A specialized program for developing software is called a text editor. An integrated development environment (IDE) or a standalone program can both contain source code editors (IDE). By distinguishing the elements and procedures, they make creating and reading the source code simpler so that programmers may more readily examine their code. Large programs would

be more difficult to review later using a conventional text editor. Examples of code editors are; notepad, sublime text, Microsoft Visual Studio, Visual Studio Code, Bluefish, Atom, Brackets, etc.

In this system, Visual Studio Code was used to write and for editing the written web code appropriately. It is standalone code editor with capability of various advanced extensions which makes code writing more easily and can also run on lower or light computer systems. An example of the Visual Studio Code environment is as shown below;

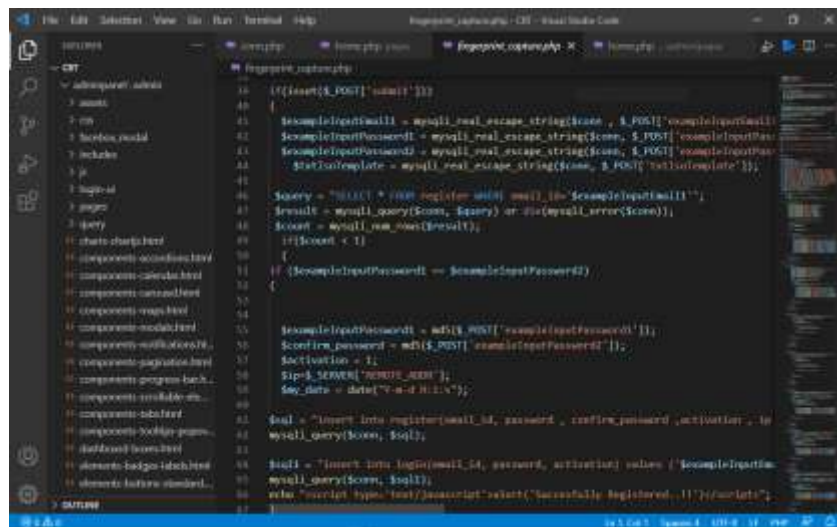


Figure 1.3: Visual Studio Code Environment

4.2 Laptop Computer System

The Laptop Computer System used in this design is the main hardware electronic device on which all operations are performed accordingly proper communication taken place between the users of the designed proposed system. In order to operate the system efficiently, some basic specifications of the system are taken into consideration for users' comfortability. These specifications include the;

- Processor Speed is measured in Giga Hertz. The processor speed of a computer system determines the operation, processing and execution speed at which instructions are handled by the computer system. The chosen system is 2GHz speed.
- RAM size is measured in Giga Byte. It determines the capacity of instruction and data under execution that can the memory can hold and accessible for the processor during execution of a particular instruction. The chosen RAM size is 16GBRAM

- Display Screen Size is measured in inches. It determines how the user can see what he/she is actually processing on or working on. The chosen display size is 15inches (15") and
- Processor generation used is core i3. This determines the features or a characteristic that's embedded into the processor for handling executions.

V. RESULTS AND DISCUSSION

The Online Examination system with fingerprint authentication was designed using software and hardware components which includes; Visual Studio Code version 1.62.0, XAMPP Control Panel Version 3.3.0., PHP Web Language, Javascript Web Language, HTML5 Web Language, and MFS100 respectively.

VI. PRESENTATION OF RESULTS

Examinees' fingerprints were captured using a fingerprint sensor/scanner (MFS100), which has two stages that includes enrollment stage and authentication stage as earlier expatiated.

Examinees/students and their fingerprints were entered into the system's database during the enrolment stage. The examinee's fingerprint and other bio-data are taken upon enrolment, and the distinctive qualities of the fingerprint are retrieved and saved in a database as a template for the topic alongside the student's identity. Biographical information about students is recorded, including matriculation number, last name, other names, sex,

level, and phone number. The stage of authentication was used to confirm the identification of the people who wanted to access the system for analysis. The individual who needs to be verified presents identification and places a finger on the fingerprint scanner. The biometric template is extracted from the improved and thinned fingerprint pictures during the feature extraction stage of image processing.

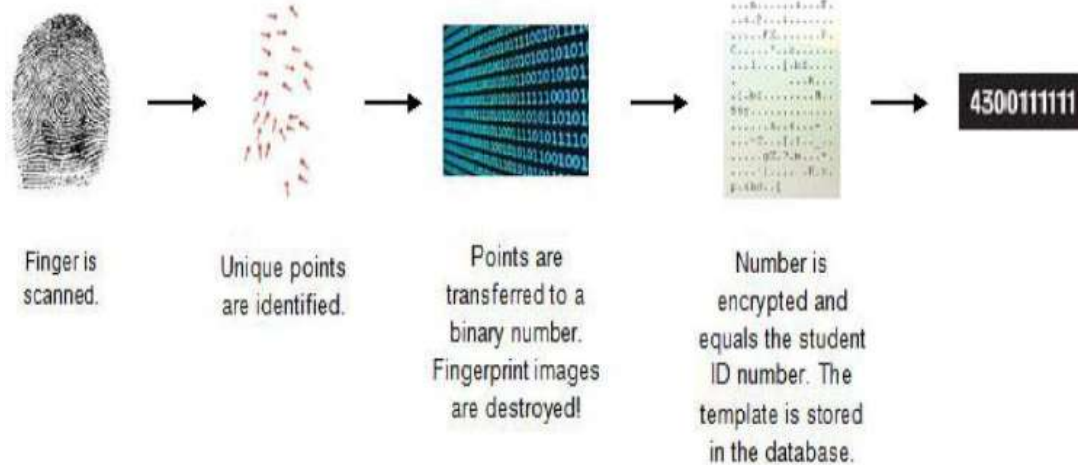


Figure 1.4: Encryption stages of captured fingerprint image

VII. CONCLUSION

Biometric techniques remain the most secure and safe means of authenticating, since tokens can be stolen and presented by another person. Passwords and username can be shared, but as for biometric, the exam candidate has to appear in person to be authenticated. An extended display of better secure identity and personal verification solutions is also becoming based on biometric technology. The need for more secure identification and personal verification technologies is becoming more obvious as the level of security is compromised. Therefore, it can be concluded that the existing methods of conducting examination for student in use was purely manual which is more time-wasting, laborious and insecure.

VIII. RECOMMENDATIONS

Since the developed system is faster, more accurate and secured, academic institutions can easily adopt it in lieu of the manual approach which is most costly. Also, the fingerprint biometric phase of this research may be integrated into staff accounts too, where individual staffs access their academic accounts with their fingerprint without compromise of unauthorised persons which may endanger their job.

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