

Development of a Verification System for Rusticated and Expelled Nigerian University Students Using Fingerprint Authentication

V. I. Yemi-Peters and O. S. Obaniyi,
Department of Mathematical Sciences,
Kogi State University, Anyigba, Nigeria.

Email: adeife74@gmail.com; joobaniyijuwon@gmail.com

ABSTRACT

In Nigerian universities, the rate of students' expulsion/rustication has greatly increased over the years due to the acts of students' misconduct in respective universities, and fingerprint being a popular biometric characteristic, provides a unique authentication of human identity. This paper presents a model for implementing students' expulsion/rustication verification in the Nigerian universities using a unique authentication, i.e. fingerprint, to validate the identities of students who were formerly engaged in misconducts. The work also developed a software application that can be used to keep, manage and search as a reference, students who have been previously involved in misconducts and expelled from a particular institution among the Nigerian universities. Tools like Flowchart, Use Case, Entity Relationship Diagram and a model algorithm were used to illustrate the solution model, and also a biometric system equation was formulated to explain the identification process of the model. One of the major findings of this study was the absence of a unique authentication system method for the verification of new intakes for previous misconducts in the existing system of the Nigerian universities. This paper recommends the adoption of the developed model to the National Universities Commission (NUC) to be implemented in the Nigerian universities as advancement to the existing system, to curb and minimize the rate of misconducts among students in the University System. C#.net was used as the development language and Microsoft SQL Server R2 2008 was used as the Backend Database engine.

Keywords: Rustication, Expulsion, Nigerian Universities, Biometrics.

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1. INTRODUCTION

To create a better and a conducive academic environment, there are rules and regulations to be followed and strictly adhered to. These rules and regulations can be termed as the standards of the academic setting. The standards may include the required dressing mode, examination conducts, the relationship of the student with other

students, the relationship of students with their lecturers, stand against cult activities, violence or student unrest and so on. According to Tuzzolo and Hewitt (2006) expulsion refers to the removal/banning of a student from a school system or university for an extensive period of time due to a student persistently violating that institution's rules, or for a single offense of appropriate severity in extreme cases while rustication can be defined as the suspension of

a student from a university as a punishment. To understand the difference and similarities better, Kumar (2011) explained that when you rusticate someone, you suspend the individual; the suspension is usually temporary. On the other hand, expulsion suggests that the student is being forced to leave the educational institution permanently. Expel comes from the Latin 'ex' meaning 'out' and 'pellere' meaning 'to drive'. Therefore, when you expel someone, you force or drive him out. The nature of the academic environment in which students are found can have a great influence on the academic performance of these students. When students go against or break the rules and regulations of the institutions, there is a need for appropriate action to be taken to forestall other students from doing the same act. Awe (2001) stressed that this is one of the reasons why the measures of Rustication and Expulsion are being used as corrective tools in universities, colleges and other platforms of education. This work, therefore, is aimed at bringing to bear an understanding of these concepts. The work will also try to develop a software solution model that can be used to keep, manage and search as a reference, students that have been previously involved in misconducts.

1.1 Statement of Problem

Universities offer the certificate of good character and learning to any individual who graduates from the school. It is expected that, for a student to be admitted into any university, he or she should be screened to help verify the student's past records, in order to prevent continuous misbehavior of students with a record of malpractice involvement. This research work seeks to develop a system that can help in managing such situation.

1.2 Objectives of the study

The objectives of this study are listed below:

- i. To develop a model for students' expulsion/rustication verification using biometric authentication that will be used in universities to verify if a student has been previously rusticated or expelled.

To develop a model for implementing a reliable system that will serve as a great advancement to the manual expulsion/rustication screening exercise done by Nigerian universities

2. RELATED WORK

A number of related works exist in the literature on the application of students' expulsion/rustication verification and biometric authentication. In a proposed system of

student verification system titled "Automated Student Rustication/Expulsion Screening Verifier: A case study of Nigerian Universities". Etudaiye (2015) tried to solve the problem of Nigerian universities not verifying students with expulsion/rustication previous academic records by proposing a web-based screening exercise software. The system verifies students Rustication/Expulsion record through the use of the students' name and passport. The proposed system serves as a great advancement to the manual screening exercise done by universities as it connects Nigerian universities in getting relevant information on students with rustication and expulsion past records during the screening exercise by enabling Nigerian universities in making their inquiries on reasons for a student been Expelled/Rusticated by a particular university but the system does not provide a unique authentication method of verification. Students can change their names after being expelled or rusticated from a school. Also, students can look alike facially e.g. identical twins, thereby limiting the passport authentication method. It is on these limitations observed in the authentication methods that this study is therefore being carried out by proposing a unique authentication model. Biometrics technology (fingerprint) is, therefore, a unique authentication tool that can be explored in this respect, being a behavioral characteristic of a human being that can distinguish one person from another and that theoretically can be used for identification or verification of identity.

2.1 Rustication and Expulsion

According to Bumbarger and Brooks (1999) in a special report submitted to the University of Pittsburgh and Pennsylvania State University, rustication and expulsion were viewed as rather severe punitive sanctions meant to send a clear deterrent message to both the student and parent about the seriousness of the student's misconduct. Thus rustication is known as a punitive approach to student indiscipline, implemented by schools, universities, mainly to suppress the immorality of students, where this implies the loss of one academic year, so far as he or her appearance in a board examination is concerned, the period of absence from the school will, however, depend upon the time of the year when the penalty is imposed upon the student. Wikipedia (2015) upholds that after the expiry of the period of the rustication the student will be eligible to seek admission in any institution subject to the permission accorded by the board.

Expulsion, on the other hand, refers to the removal/banning of a student from a school system or university for an extensive period amount of time due to a

student persistently violating that institutions rule, or for a single offense of appropriate severity in extreme cases as observed by Tuzzolo and Hewitt (2006). Laws and procedures regarding expulsion vary between countries. The term has been in existence in the early days of the educational system where countries around the world use different modalities and in a country like Nigeria, if a student has been expelled from two schools, then any state school is legally allowed to refuse admittance of the student, this is also valid with foreign universities. In the United States of America, it is stated that the penalty for examination malpractice at the Harvard extension is rustication as observed by Sue Weaver (2009). Indeed, Gimba (2002) in referring to the students' misconducts in the universities referred to the universities as offering "BSc" in violence and "MA" in cultism. As observed by Eneji (1996), almost every passing day, there are new stories of devilish acts perpetrated by secret cults on campuses. Basically, activities that have been identified as the cause of rustication and expulsion in Nigeria universities as listed by Patrick (1997) are:

- i. Students and examination malpractices;
- ii. Students and secret cults;
- iii. Students and violence; and
- iv. Students' unrest.

Akaranga and Ongong (2013) also supports that some of the factors which have been identified as encouraging students to engage in examination malpractice, to mention but a few, are connivance of students and lecturers, cooperation among students not to report cases of cheating, close spacing of seats in examinations.

2.2 Biometrics Authentication System

According to Salil, et al (2003) a biometric system is essentially a pattern-recognition system that recognizes a person based on a feature vector derived from a specific physiological or behavioral characteristic that the person possesses. Humans have used body characteristics such as the face, voice, gait, etc. for thousands of years to recognize each other. As observed by Zdenek, R. and Václav, M. (n.d) that the primary advantage of biometric authentication methods over other methods of user authentication is that they really do what they should i.e. they authenticate the user. These methods use real human physiological or behavioral characteristics to authenticate users.

Muneeb (2014) stated that the complete biometric system can be used as a verification system or an identification system. The verification system conducts a one-to-one comparison while identification system conducts the one-to-many comparison.

Alphonse Bertillon, chief of the criminal identification division of the police department in Paris, developed and then practiced the idea of using a number of body measurements to identify criminals in the mid-19th century. What biological measurements qualify to be biometric? Anil, et al (2004) asserts that any human physiological and/or behavioral characteristic can be used as a biometric characteristic as long as it satisfies the following requirements:

- *Universality: each person should have the characteristic;*
- *Distinctiveness: any two persons should be sufficiently different in terms of the characteristic;*
- *Permanence: the characteristic should be sufficiently invariant (with respect to the matching criterion) over a period of time;*
- *Collectability: the characteristic can be measured quantitatively.*

Joseph and Simon (2016) outlined the requirements of a biometric solution process as enrollment, the input of biographical data and storage of these identity parameters in the database. However, Caldwell (2015) asserts that fingerprint biometric is more accurate, unique, immutability and acceptable than any other biometric system.

3. METHODOLOGY

The Proposed system is aimed at developing students expulsion/rustication verification system for Nigerian Universities. Universities are expected to register on the software solution, as this will grant access to the global record of expelled/rusticated students nationwide. The account also provides Nigerian Universities with the license of verifying student expulsion/rustication records. The system will make available, a centralized database which will hold the record of rusticated/expelled students nationwide against which a prospective student can be verified for the existence of rustication/expulsion case. This will help schools to checkmate student behavior and character prior to their application for admission. Schools can, therefore, subscribe to the software services so as to add and view the affected students. To achieve this, modules with the following functionalities will be developed:

- 1) User authentication with profile submitted by the respective university for gaining access to the system.

- 2) Facilities for the admin to register, login, add rusticated/expelled students, view rusticated students, and verify students' expulsion/rustication record
- 3) A global admin user that can log in, register university, remove university, view all expelled/rusticated students, and monitor users.

3.1 The Solution Model Flowchart

Flowcharts being a tool used in analyzing, designing, documenting or managing a process or program in various fields. Below are flow charts diagrams showing the solution model of this research work such as the Main Program, Configuration, Register Biodata, Register Biometrics, View Record, Verification, Register Institution, Generate Activation Code and Admin View Record Flowcharts.

3.2 Entity Relationship Diagram

Below is an entity-relationship model, also called an entity-relationship (ER) diagram, which is a graphical representation of entities and their relationships to each other in a system shows the System Entity Relationship Diagram for this research work.

3.3 The Model Algorithm

Below is a systematic process for the registration and identification of rusticated or expelled student phases of the model.

Registration of Expelled or Rusticated Student by Institution

- Step 0: START
- Step 1: Enter Student Biodata
- Step 2: Enter Offense & Punishment
- Step 3: Capture Biometric template
- Step 4: Check if template exists
- Step 5: If existing, use existing record else submit registration to database
- Step n: STOP

Identification of Rusticated or Expelled Student

- Step 0: START
- Step 1: Capture Sample print to match against database templates
- Step 2: Match samples against templates
- Step 3: If a match is found display rustication/expulsion details else display a message of no record found.
- Step n: STOP

3.4 Biometric System Equation

A biometric system is essentially a pattern recognition system that operates by acquiring biometric data from an individual, extracting a feature set from the acquired data, and comparing this feature set against the template set in the database. Below is a biometric equation to illustrate both biometric registration and the process of identifying a student's print against registered templates.

To register a student fingerprint, let V be a set representing the database holding template V_1, V_2, \dots, V_k .

$$V = [V_1, V_2, V_3, \dots, V_k, V_{k+1}] \quad (1)$$

Where V_{k+1} is the newly captured print template. If we represent the total templates in the database as Z, then

$$Z = \sum_{i=1}^K V_i \quad (2)$$

This is now the representation of registered templates.

Now to identify a sample say R_3 against a template in Z, a Boolean variable "s" that holds a value 1 for successful match of the sample against a template in Z and 0 for unsuccessful match of the sample against a template in Z. The equation is represented as:

$$\forall R_s \in Z, \quad s=1 \quad (\text{For successful match}) \quad (3)$$

$$\text{WHERE } Z = \sum_{i=1}^K V_i$$

This implies that

$$f(s) = \begin{cases} \forall R_s \in Z, & s = 1 \\ \forall R_s \notin Z, & s = 0 \end{cases} \quad (4)$$

Where Z = All registered template in database i.e.

$$Z = \sum_{i=1}^k V_i$$

R_s = Captured sample for verification
 k = the last registered template in the database
 s = Boolean Variable for success or failure of match.

4. RESULTS

The system was tested to identify if a student has been formally expelled or rusticated. A new sample print was

captured and checked against the database templates. The first test showed that there was no record found for the student, which means the student does not have any rustication or expulsion record. A record was found upon the second test for another sample print and the system automatically generated the rustication/expulsion record. The following screenshot shows the result of the implemented model.

5. DISCUSSION OF FINDINGS

In the course of this study, the following was discovered:

1. Nigerian Universities lacked a unique authentication method for the verification of previous students' expulsion/rustication records.
2. Majorly, only students' results, citizenship, and credentials are being screened, but these do not ensure the maximum verification of students' past records.
3. The existing system does not provide any central database that can be accessed at any given time by different universities to verify if a prospective student seeking admission with them had been previously involved in any misconduct.

To minimize the difficulties of the existing system, the development of students' expulsion/rustication verification system must, therefore, be adopted as it will make available a centralized database which will hold the record of rusticated/expelled students nationwide from which a prospective student can be verified for the existence of rustication/expulsion case.

Finally, it will give Nigerian universities a good technology savvy image and make them frontiers among other nations' universities in curbing students' misconduct in the various institutions.

6. CONCLUSION AND RECOMMENDATION

As the acts of students' misconducts increase in the Nigerian universities, it is important to implement a computerized system of record keeping and easy access of getting students' past records, which will help institutions during screening exercises, in ensuring maximum verification of students' expulsion/rustication records; using a unique authentication method. For Nigerian Universities to be sure of the certificate offered and students they graduate, that is, '**certificates of good character and learning**'; a thorough verification exercise using a model such as this should be employed for every

admission process at all levels (undergraduate and postgraduate). This will prevent continuous misbehaviors and misconducts of students in our universities. Hence, this paper recommends the adoption of this model to the National Universities Commission (NUC) to be implemented in the various institutions under the supervision of the commission.

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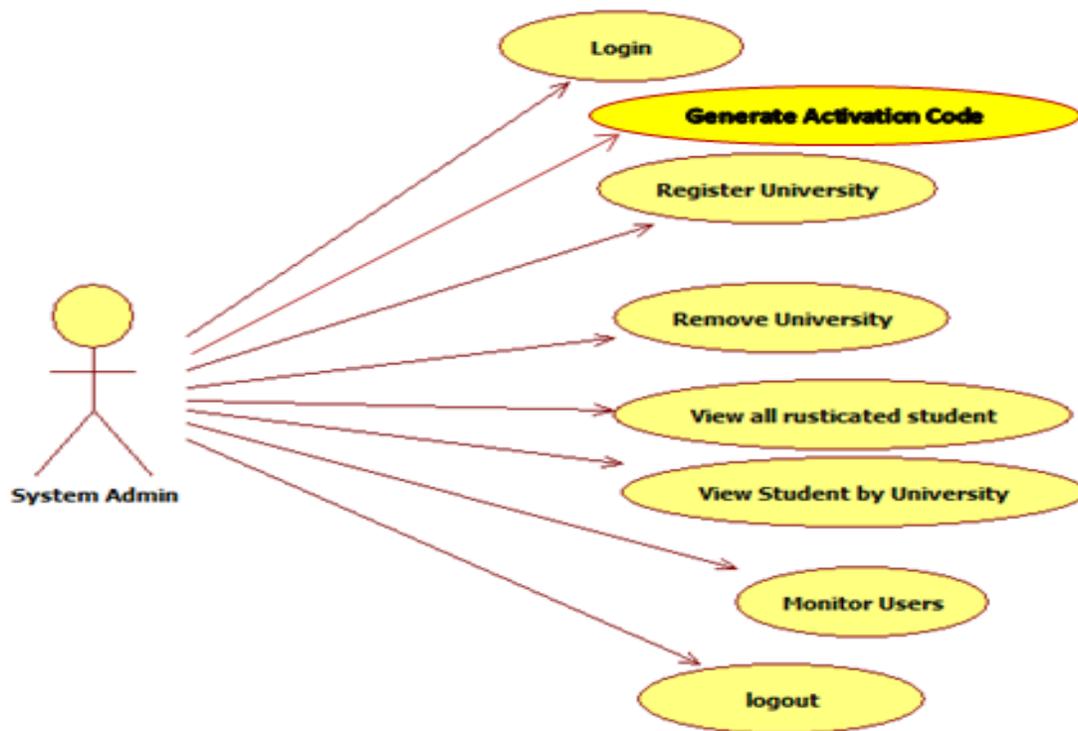


Fig.3.1: Use case diagram of System Administrator

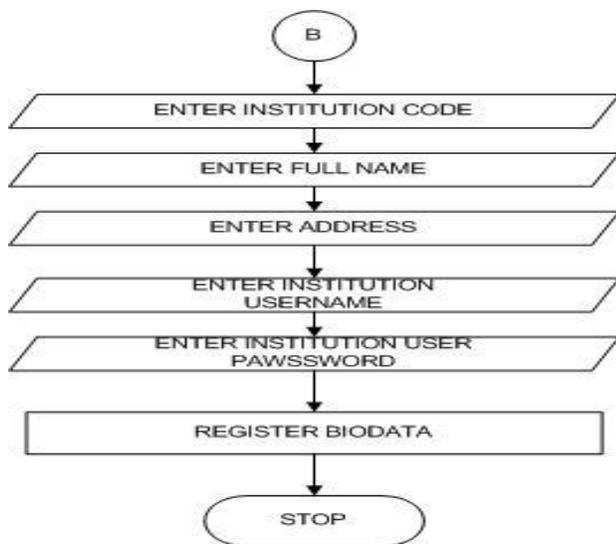


Figure 3.3: Register Institution

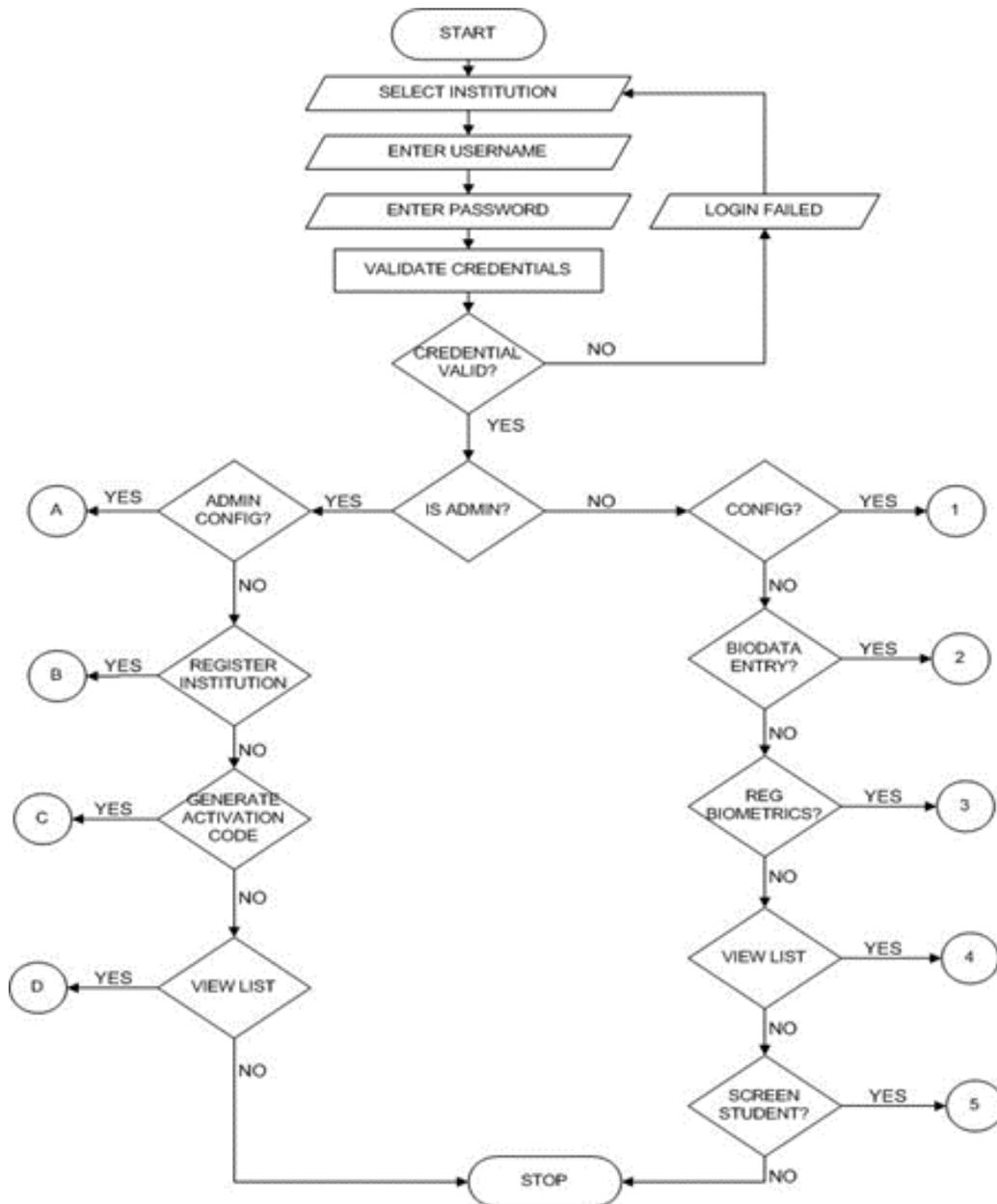


Figure 3.2: Program Main Flowchart

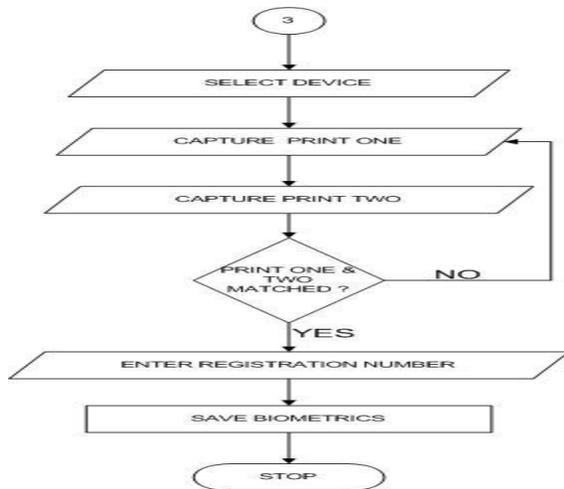


Figure 3.4: Register Biometrics

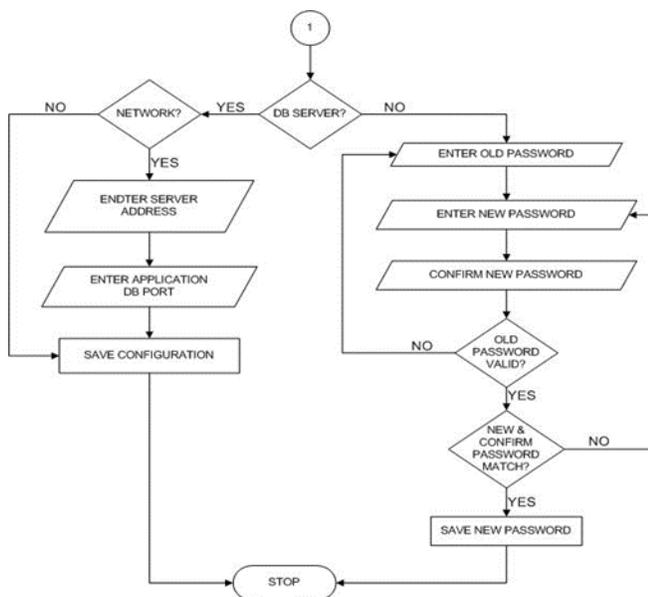


Figure 3.5: Configuration Flowchart

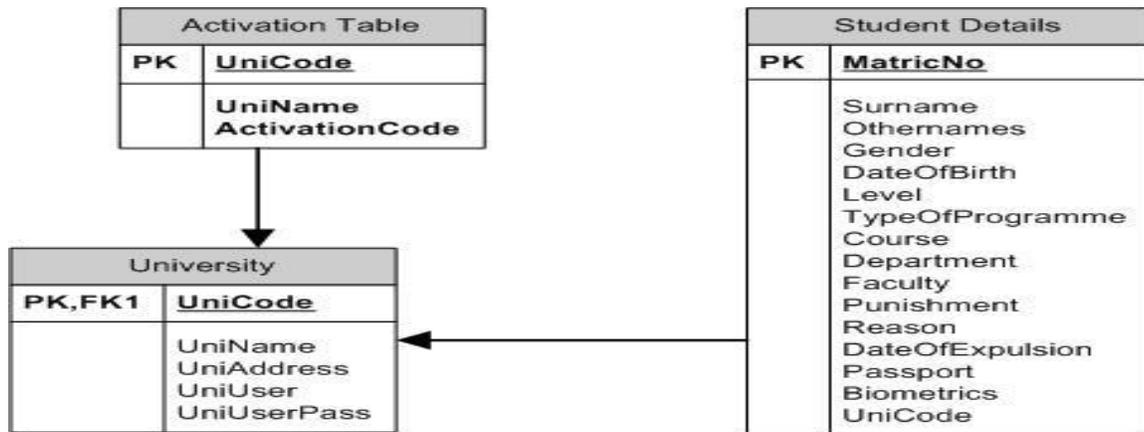


Figure 3.6: System Entity Relationship Diagram (ERD).

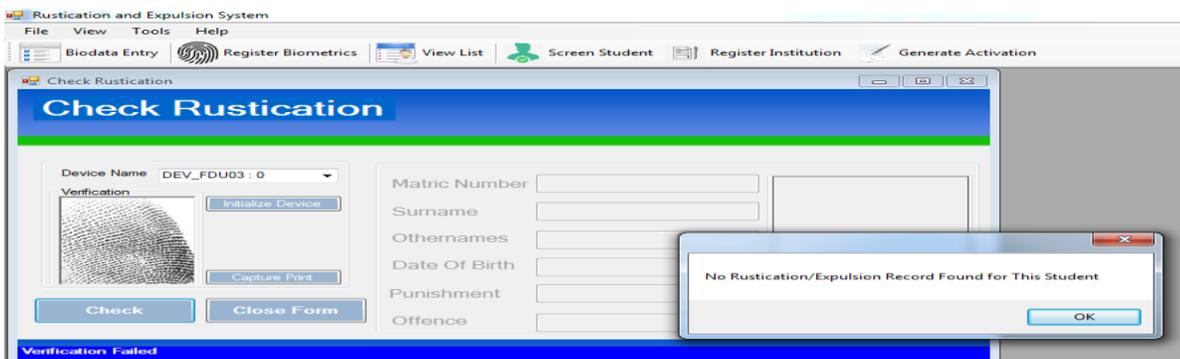


Figure 4.1: Student verification result with no record found

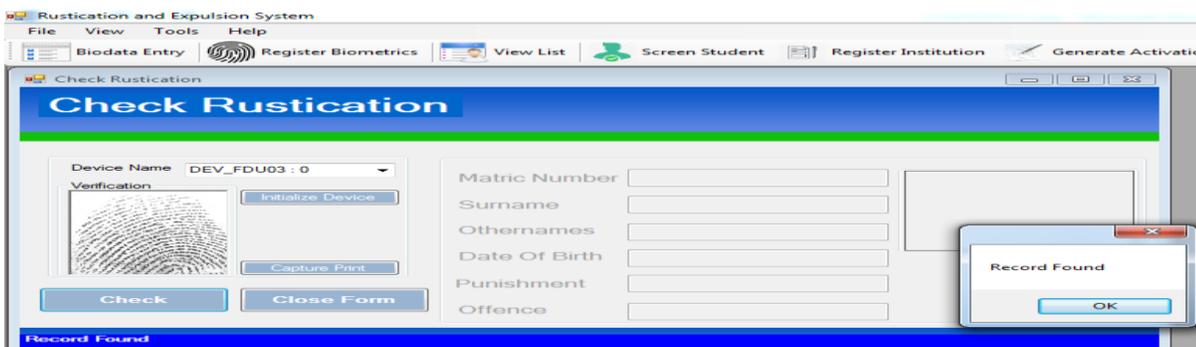


Figure 4.2: Student verification process with expulsion/rustication record found

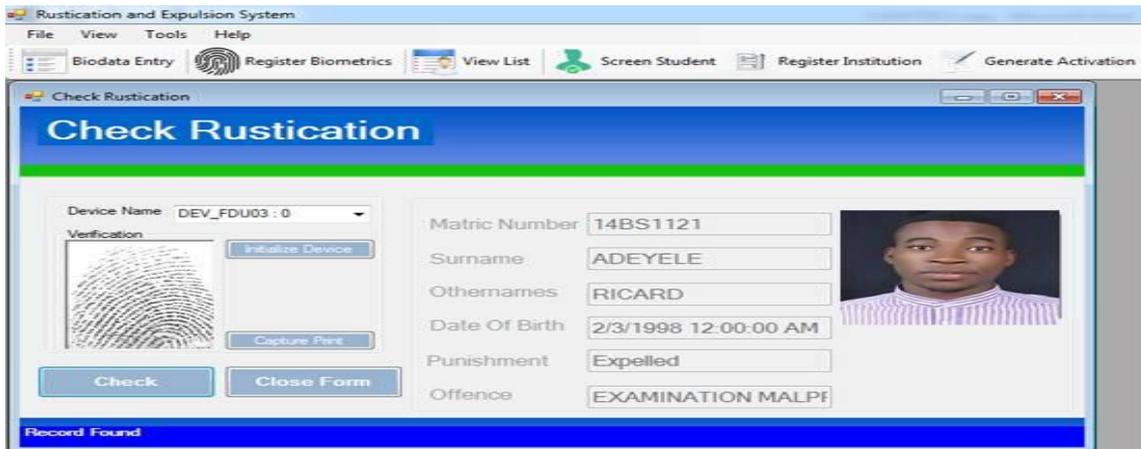


Fig 4.3: Automatic information generated for student with past record