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SECURING LECTURE HALL KEY SYSTEM USING RFID TECHNOLOGY

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A CASE STUDY OF KOFORIDUA TECHNICAL UNIVERSITY, GHANA

Abstract— *Radio Frequency Identification (RFID) is a device that identifies any object attach to it. With the help of RFID technology, students or lecturers eligibility for keys to lecture halls or offices can be validated.*
Most of the smart cards are read by smart card readers or Radio Frequency Identification (RFID) Readers. These readers read the information on the card to perform its designated function.
The use of smart cards has become a pivotal point of interest and development pattern to most organizations and institutions because of its efficiency in making tasks to be performed faster without waste of time in terms of staff and students checking in and checking out at work. Most organizations in Ghana use these smart cards technologies to check-in and check-out their staffs.

Keywords— *RFID, RFID tags, Key System*

I. INTRODUCTION

RFID is a wireless device which automatically identify any object attach to it through tag which stores the information [1]. It can be used to track objects, people or animals using tags that respond to radio waves.

The Radio Frequency Identification is a system which consists of a label or tag and a reader. The RFID label has a transceiver (transmitter and receiver) implanted. The RFID module on the label comprises microchip which stores and processes data and an antenna which receives and transmits signal. The label encompasses a precise sequential code for the exact entity.

Two-way radio transmitter-receiver called a reader emits a signal to the label using an antenna whenever the data embedded on a label is to be read. The label responds with the data in its memory bank and the reader transmits the results to the RFID computer as shown in figure 1 below [2].

Information technology professional stated that high tech non-contact card offers institutes the capability to provide much protection and greater experience for staff and students on campuses [3].

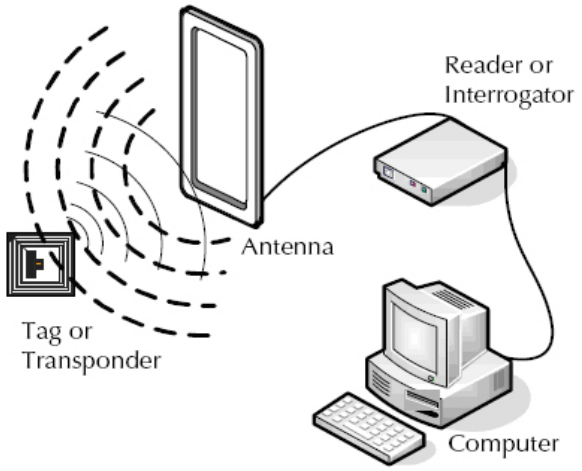

Figure 1: RFID System

1.1 Problem statement

There is frequent access to lecture hall and office keys at the security posts by unauthorized persons and these keys are not returned.

1.2 Objectives

1. To prevent unauthorize access to lecture hall and office keys
2. To send notification through email on misplaced ID card to the authentic owner
3. To electronically collect and store students data whenever key is collected at the security post

1.3 Importance of the study

The system will help to collect and store students data whenever they collect lecture or office key for use. It will help to trace any missing key to the real student who collected the key at security post. Students who are not eligible to collect lecture hall or office key will be denied access.

II. LITERATURE REVIEW

Different literatures were studied and properly reviewed to discover issues associated with them and bridge such gaps.

University of Ghana introduced the use of multi-purpose customized card called UG-Cruz Card to assist their students and lecturers in performing their activities. The card acts as a proof of identity for students and eases admittance to libraries and gain access to other services [4]. It was discovered that the UG-Cruz card does not provide functionality of automatically checking-in students when signing in for keys to their various departments, faculties and classrooms for the purpose of lectures, seminars, among others. This was a major challenge of the smart card.

University of Cape Coast also implements the use of smart card to perform their basic operations. Just as the UG-Cruz card works for University of Ghana, the smartcard for the university of cape coast works in the manner but does not allow students to automatically check in whenever key is to be collected at security post. This was another challenge associated with the smart card.

A web based automated system call securing lecture hall key system using RFID technology will be designed and developed to bridge these identified gaps.

III. METHODOLOGY

In this study, qualitative approach will be used and the research instrument will be interview because it generates more insightful responses [5].

3.1 Agile Model

The Agile model will be adopted to develop the system. It is a set of principles for software development in which requirements and solutions evolve through collaboration between self-organizing and cross-functional teams [6]. The model has the followings benefits namely:

- It promotes adaptive planning
- It allows early delivery
- It permits continuous improvement of the system

3.2 Phases of Agile Model

Below figure represents the different phases in agile model

Figure 2: Agile mode diagram showing all the phases involve in software development

3.3 Use Case Diagram

The use case stated below demonstrate relationship between users and the system

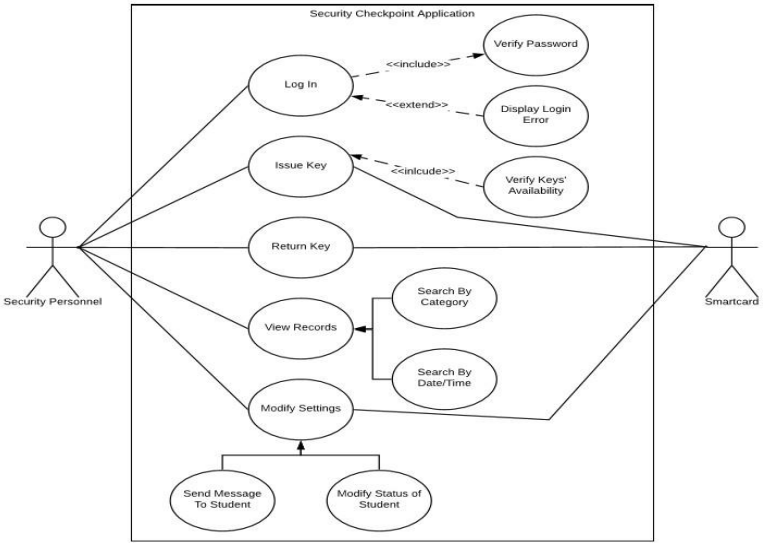

Figure 3: Use case diagram

3.4 Database Tables

Name of Key	Time Taken	Time Returned
str (value)	strftime (value)	strftime (value)

Table 1: the table shows data types declarations for fields names used to store issued keys

Name of Key	Time Taken	Time Returned
str (value)	strftime (value)	strftime (value

Table 2: the table displays data types declaration for field names used to store returned keys

Students ID Number	Student Name	Student Programme	Student Eligibility

str (value)	strftime (value)	strftime (value)	img (value)

Table 3: the table shows data types declarations for field names used to students details

3.5 Software Development Tools

The system will be developed using the below programming tools:

- Python
- PyQt
- Qt Designer
- PyCharm

3.5 Functional Requirements of the system

The followings are the system functional requirements to be implemented namely:

- Issuing key to student
- Collecting key from student
- Displaying eligibility of student
- Sending email notifications to student who misplaced ID card
- Permitting or denying student access to lecture hall key

3.6 Non-Functional Requirements of the system

- Automatic Searching for key
- Authenticating users before issuing key

Verifying users login credentials before gaining access to the system

IV. RESULTS

4.1 Main Connector Source codes

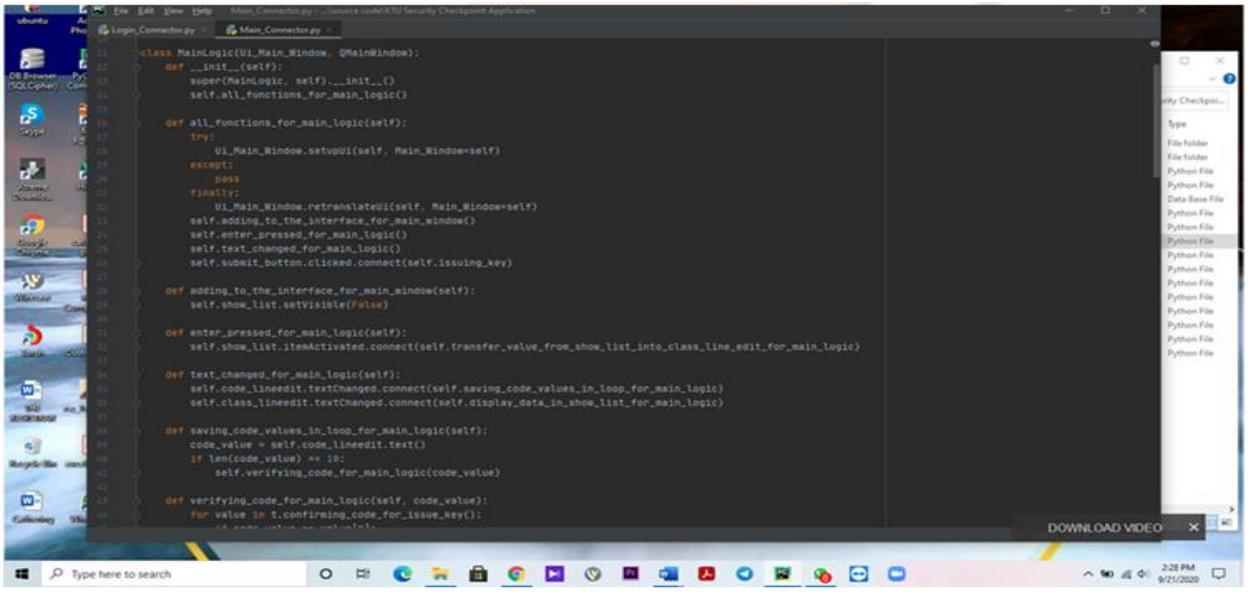

Figure 4: showing the main connector source codes of the system

4.2 Records Source Codes

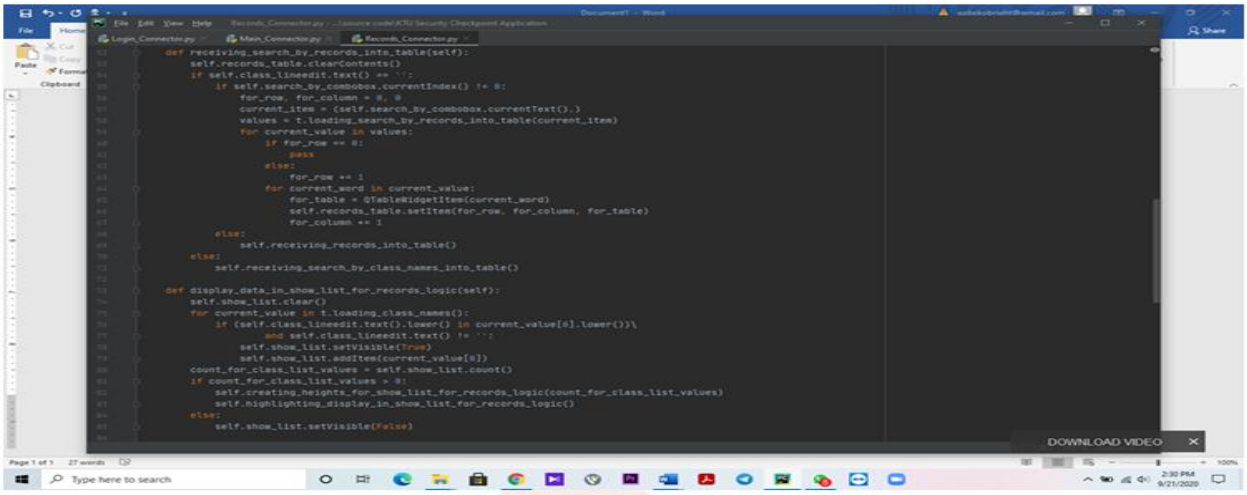

Figure 5: showing the students records source codes

4.3 Return Key Source Codes

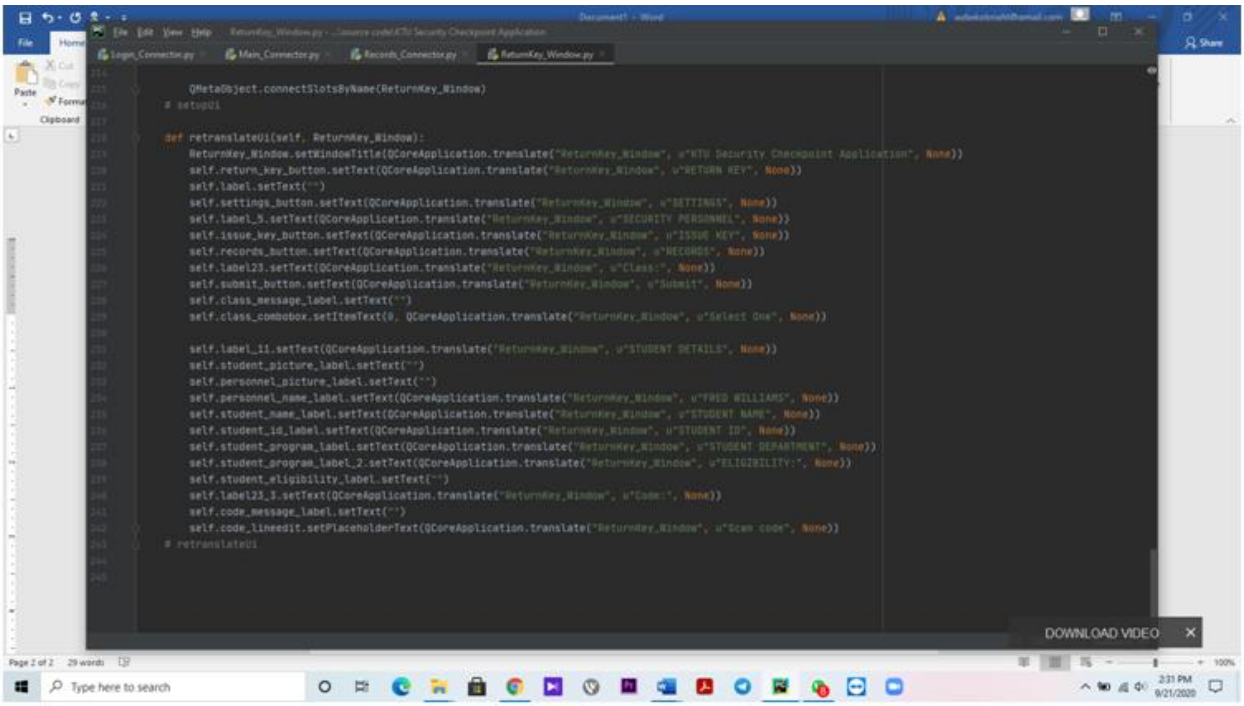

Figure 6: displaying key source codes

4.4 System Testing

After developing the system, different tests were performed to ascertain the usability, adaptability, reliability and maintainability of the system. The tests include unit testing, integration testing, system testing, white box testing, black box testing and usability testing. All the tests conducted on the system proved successful.

4.5 System Interfaces

4.5.1 User login interface

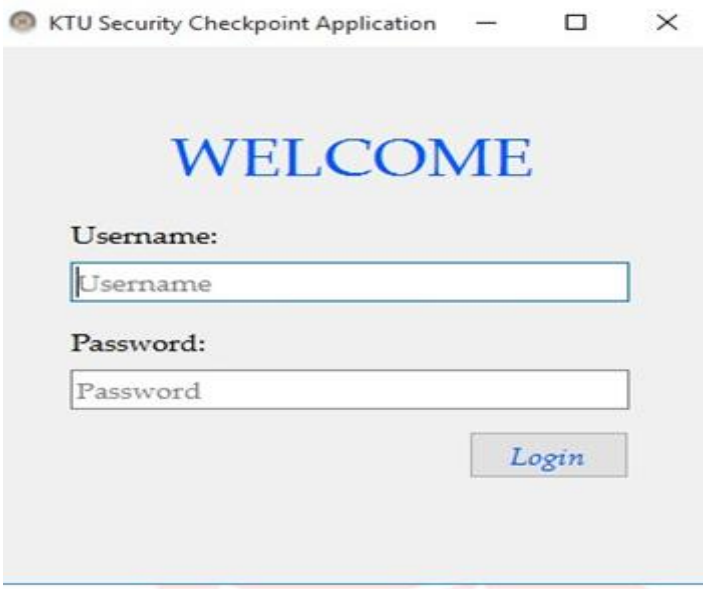

Figure 7: it displays the interface where user can provide their login credentials before accessing the system

4.5.2 Issuing key interface

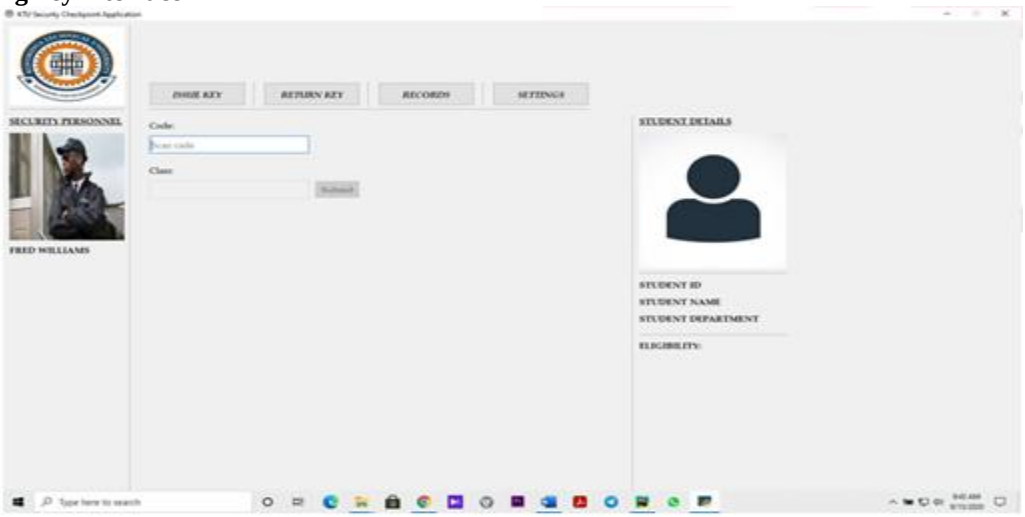

Figure 8: it displays the form where key can be issued to authorize student

4.5.3 Managing settings interface

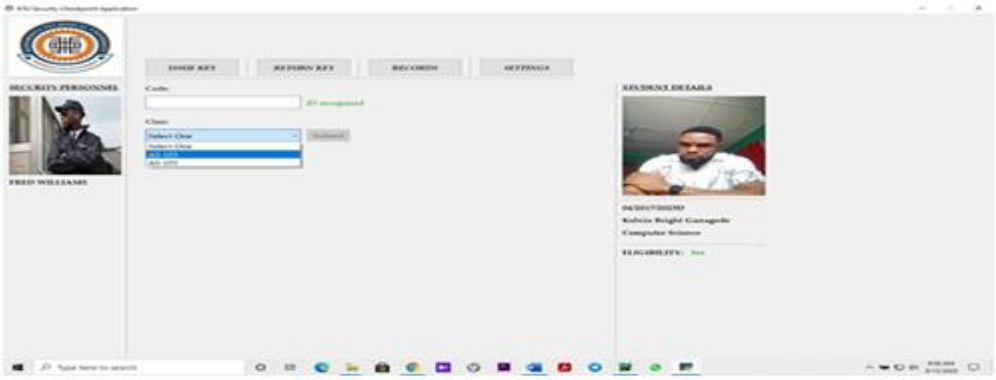

Figure 9: it shows the interface for managing settings

4.5.4 View records interface

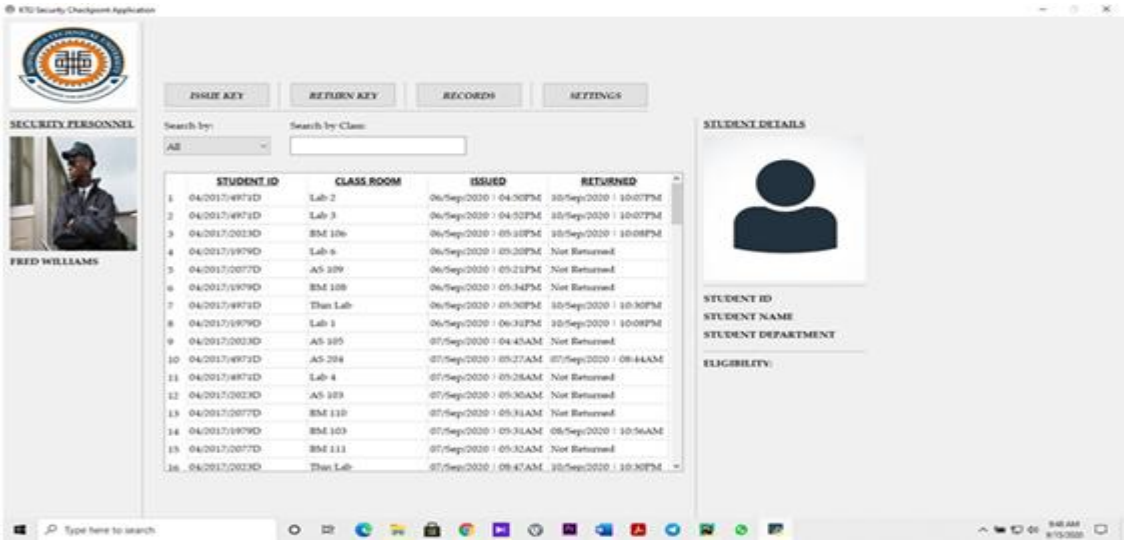

Figure 10: it displays interface that allows students records to be viewed

V. CONCLUSION

With the above demonstrated results, we have effectively developed securing lecture hall key system using RFID technology that prevents unauthorize access to lecture hall and office keys, sends notification messages through email about misplaced ID card to the authentic owner and electronically collects and stores students data whenever key is collected at the security post.

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