Automatic Biometric Student Attendance System: A Case Study Christian Service University College

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ABSTRACT
In many tertiary institutions in Ghana such as Christian Service University the attendance of students is very important factor since it forms part of the students’ assessment and evaluation. It has therefore become imperative that proper measures should be put in place to ensure that no student signs for another. It has been observed that at Christian Service University College lecturers sometimes give the attendance book to students to sign without actually supervising them to see whether the right student is signing or making sure that no student signs for another. Moreover, if a lecturer wants to supervise the signing of the attendance book to make sure that the right student is signing and no student signs for a friend then the lecturer may end up by wasting a significant amount of the lecture period on the signing supervision. Furthermore, in the larger classes lecturers sometimes use their own ideology and principles to award the attendance marks (5%) that counts towards continuous assessment for students because they find counting each individual student’s attendance laborious, boring and even error prone. This means that the 5% marks obtained by students from attendance sometimes does not give a true picture about the student and therefore proper measures should be implemented to eradicate some of these irregularities in students attendance at Christian Service University College and all other institutions in which the attendance forms part of the assessment and evaluation. In view of this a fingerprint attendance system is proposed to Christian Service University College to record students’ attendance to help them improve the continuous assessment. The introduction of this proposed system for students’ attendance at Christian Service University College is expected to create room for full participation of all the eligible students, eliminate multiple signing and also increase the confidence of students in the assessment process.

Keywords— biometric, registration, fingerprint, Attendance, Assessment

Introduction
At Christian Service University College students’ attendance is a very important factor because it constitutes 5% of students’ assessment and evaluation. Since the attendance of students form part of students evaluation it has become very important for the stakeholders to find proper measures to minimize some of the irregularities in students’ attendance in order to improve students’ assessment and evaluation at Christian Service University College. The current approach in which attendance of students are taking manually is very inconvenient and also error prone. To address the issue this study proposes a fingerprint automatic attendance system which automates the whole process of taking attendance and calculation of the 5% marks of the student assessment process for Christian Service University College.

In this proposed system a student fingerprint would be taken at the entrance of each lecture for each course. The fingerprint device connected to the proposed system would be placed at the entrance of each lecture for the students to take their fingerprint. After taking the attendance records of each student for each course for the whole semester the proposed system will automatically calculate the 5% marks of the assessment for each student. It should be observed that since the proposed system uses biometric traits of each student the problem of a student signing for another would be prevented and also errors that normally occur by lecturers in calculating the attendance marks would be eradicated or minimized.

Problems With Existing System
In spite of the importance attached to the attendance records of students at Christian Service University College, it is rather surprising that no empirical research has actually been conducted at the institution from the perspective of how the attendance of students are monitored and evaluated. It was identified from observation and an interview that the existing system being used by the university college exhibits the following problems:
1. Students sign the attendance for another.
2. Laborious and troublesome work on the side of the lecturer in calculating the 5% mark for the students.
3. It also wastes a lot of time.
4. Some lecturers use their own ideology and principle to award the 5% mark without actually calculating the mark.

**How Biometric System Works**

Biometric comes from two Greek words bios meaning life and metron meaning measure. Biometrics is therefore be defined as measurable physiological and/or behavioural characteristics that can be utilized to verify the identity of an individual, and includes finger print verification, hand geometry, retinal scanning, iris scanning, face recognition and signature verification (Anil, 1999; Ashbourn, 1999; Henry, 1900; Le & Bui, 2009; Maltoni, 2005).

Allan (2002) indicated that though all biometric systems differ in technology the concepts behind are the same and the process can be summarised as follows:
1. An individual needs to provide a sample (recording of the physiological properties or behavioural properties)
2. The biometric sample is then processed to extract unique identity features to create a verification template which can be used as individual password.
3. The verification template is compared against the enrolment template which created from multiple traits from the individuals during the enrolment.
4. No individual templates are ever the same. A decision is therefore taken by the system.

Figure 1 gives the schematic diagram representation of a basic biometric system (Allan, 2002).

![Diagram of Biometric System](image-url)
Allan (2002) indicates that all biometric systems work in the same manner and principle. However he cautions that it is important to remember that the ease of enrolment and quality of the template are critical success factors of every biometric system.

**Measure Of Accuracy**

Prabhakar, Maltoni, Maio, and Jain (2003) suggested two ways of measuring the accuracy of a Biometric System:

1. **FMR (False Match or Acceptance Rate)**
The lower a biometric system having FMR value, the better the security of the biometric system. The FMR is a situation whereby the biometric system mistakenly takes two or more individual traits to be the same. In this case two or more registered students would be seen by the biometric system as authorised persons and thereby accept the individuals, allowing for multiple signing.

2. **FNMR (False non-match or rejection rate)**
The lower a biometric system having a lower FNMR value the better the security of the biometric system. The FNMR is a situation whereby the biometric system mistakenly takes two biometric traits from the same individual to be from different individuals. In this case a registered student would be seen by the biometric system as unauthorised person and thereby reject the individual.

**Biometric Methodologies**

Allan (2002) categorized biometric system methodologies into two main forms. This means that in implementing a particular biometric system there is the need to look at the methodology that will give the users more convenient way of accessing the system. The two methodologies are namely physiological biometrics and behavioural biometrics.

**Physiological Biometrics**

These methodologies are also called Physical Biometrics. These methodologies are based data derived from the measurement of traits from individuals. Examples of these methodologies include Fingerprint, Hand Geometry, Retinal Scanning, Iris Scanning, Face Recognition.

**Behavioural Biometrics**

These methodologies are based on data derived when individuals perform an action. Examples of these methodologies include Voice Recognition and Signature Verification.

**Fingerprint Features**

Each individual in this world has his/her own fingerprint with the permanent uniqueness. A fingerprint is made up of ridges and furrows, which shows good similarities like parallelism and average width. However research has shown that fingerprint verification and identification can be achieved with the help of minutiae (Bir & Xuejun, 2004; Marana & Jain, 2005; Stosz & Alyea, 1994). The minutiae of a fingerprint describe some abnormal points on the ridges of the fingerprint. Figure 2 gives the basic features of a fingerprint.

The verification of a fingerprint is normally termed as termination of minutiae. There are two ways that can be used in the termination of minutiae, immediate ending of ridges or a point where ridge ends abruptly called ending or termination, and the point on the ridge from which other branch drives or a point from where ridge splits into two or more branches is known as bifurcation as shown in Figure 3.

**Figure 3: Termination of minutiae**
Proposed System Architecture
The proposed automatic attendance system offers an alternative way of verifying and calculating the attendance of students. Some research work has been done in the area of system architecture for electronic voting (Enokela & Osuagwu, 2010). The researchers proposed the automatic attendance system architecture shown in Figure 4.

In this system every student’s biometric traits are first captured during the admission of each applicant. These biometric data is then stored in a database. In student lecture identification, the system recognizes an individual by comparing his/her biometrics with every record in the database. During each lecture, the biometrics trait of each student is captured again and then compared with already existed biometric traits of the student by using a matching algorithm. Figure 5 gives the flowchart of the proposed automatic biometric attendance system.
Conclusion
The study was carried out to propose an automatic biometric student for Christian service University College. The current system used by the University College has some drawbacks such as
1. Students signing the attendance for another.
2. Laborious and troublesome work on the side of the lecturer in calculating the 5% mark for the students.
3. It also wastes a lot of time.
4. Some lecturers use their own ideology and principle to award the 5% mark without actually calculating the mark.

The implementation of this proposed system for students’ attendance at Christian Service University College is expected to create room for full participation of all the eligible students, eliminate multiple signing, create an avenue for accuracy in the preparation of attendance which constitutes 5% of student’s marks, and thereby increase the confidence of students in the assessment process.

References

