Fingerprint attendance system for students and academic staff

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Abstract

Monitoring the participation of students and academic staff in the auditors of higher education institutions is still realized through traditional techniques which in most cases require time and human resources. Traditional techniques do not allow accurate identification of audience participant and this may be a security problem. The proposal of a system that automates this process would solve the above issues. Fingerprint techniques are widely used for accessing data on mobile devices but can also be used for monitoring issues. This thesis will propose a solution based on the use of biometric techniques through fingerprint recognition and how it can be used for enrollment of the participations in the audience.

Keywords:

Fingerprint Recognition, Attendance System, Identification, Verification.

1 Introduction

Nowadays in Albania the educational institutions use a manual system for taking attendance of students. This process is a long process and non efficient, but can be solved using an attendance management system using biometric technology.

Biometric system begins with the identification of a particular human trait to make that as a token to be used for identification and verification of an individual in a system. Fingerprints are the most popular and most commonly used biometric model. While Biometric Attendance is a software which manages the huge data related to the attendance. [Kir17]

The fingerprint attendance system solves the attendance issues by the following means: no time waste as the attendance is taken during lecture without intervention of teacher, flexibility to use schedules of college, managing the attendance is automated, no chance for fake attendance marking, evaluate level of attendance for students automatically. [Alh15]

In this paper, we propose a system that will use fingerprint reader to check attendance of students and academic staff.

2 Literature overview

There are a lot of researches that have worked on attendance systems using fingerprint and other biometric technologies for registering students and academic staff.

Research [Alh17] proposes a system for educational institutes that allows the guardians of the students to monitor and follow up on the attendance of their students via Internet.

The authors in [Eze13] use a real-time remote monitoring system interface o manage staff and students using an integrated Fingerprint Attendance System. With this system, it took only 2 seconds to verify and mark attendance per student as opposed to 15seconds for manual process.

The authors in [Rah18] proposed a system where the fingerprint scanner read fingerprints with the student information; the device scans the edge and ridge of the finger and creates a template. The system searches all the templates that are stored in the system database and matches with each saved template. Then the teacher can take attendance to each class manually or through fingerprint.

Other systems [Oye18] connect a SD card to the computer system. The SD card is connected to the computer system to enable the uploading of the, txt file to the window application. The Arduino SD Card module is a simple solution for transferring data to and from a standard SD card. When the student places their finger on the fingerprint module and the attendance is taken, the student ID number is stored in a.txt file in

the SD card. After every class, the lecturer or the administrator needs to connect the SD card to the window application in order to access the database and print the attendance list.

Different authors [Das17] have made a comparison of commonly used biometric traits according to the table below:

U- Universality (every person should possess the biometric trait); D-Distinctiveness (any two persons should be significantly different in terms of their traits or characteristics); P1-Permanence (biometric trait should perform in the same way irrespective of the matching criterion); C1-Collectability (a biometric trait is able to be measured quantitatively.); P2-Performance (measured in terms of recognition accuracy, computational time, error rates etc.); A-Acceptability (which set of users can accept to go for the biometric sensor in everyday life.); C2-Circumvention (measured in terms of how easy to bypass the biometric authentication system).

Biometric Identifier	U	D	P1	C1	P2	A	C2
Face	H	L	M	H	L	H	H
Fingerprint	M	H	H	M	H	M	M
Hand geometry	M	M	M	H	M	M	M
Hand/finger vein	M	M	M	M	M	M	L
Iris	H	H	H	M	H	L	L
Signature	L	L	L	H	L	H	H
Voice	M	L	L	M	L	H	H

Table 1

3 System Architecture

3.1 Logical Architecture

A biometric system is a recognition system that takes biometric data from individuals (through scanners or other means), outputs a set of distinct features from biometric data, known as the template biometric, compares the template with other templates and makes a decision depending on the comparison result. A biometric system generally has four main modules: a sensor module, a module for quality assurance and to retrieve the features, a module for comparing features, and a database module.

3.2 Physical Architecture

The physical architecture will consists of physical computers set up in each auditorium. Each computer is connected to a fingerprint reader device that is the device 'U ARE U 4500' as well as a physical server located in the faculty, where will be the database. The aim is to develop a desktop architecture, not a web application, for two reasons: the most important reason is security, where this information will not be found on the Internet, making it more secure against external attacks and the second reason is to avoid connecting to the Internet because it is being an application that will have to work all the time even if the students or the lectures will have problems with the internet.

3.3 Implemented Architecture

The application will use the architecture as shown in figure below.

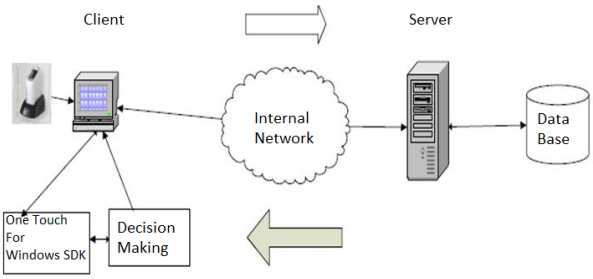

Figure 1

When the user use the biometric scanner with his finger, the application will make a comparison between this and the templates that are in server. For developing the application we will use One Touch for Windows SDK, java language and MySql Database. For sending biometric templates from application in server and vice versa we will use Diffie-Hellman and AES algorithms for encryption. We already have tested the prototype with biometric scanner U ARE U 4500, but One Touch for Windows SDK supports most of the biometric scanners.

4 Proposed System

The system offers a log in panel for students, lectures and administrator.

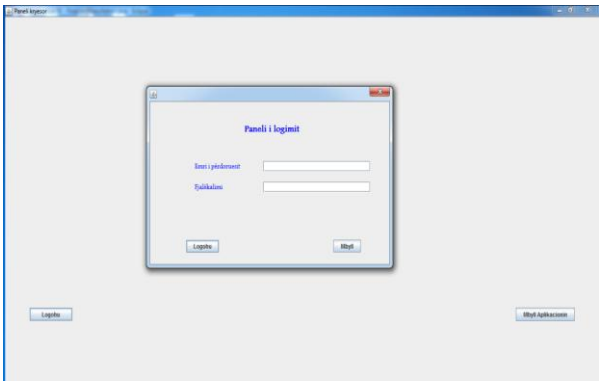

Figure 2

The students will record their attendance using fingerprint from the interface below. The administrator adds the students and their information.

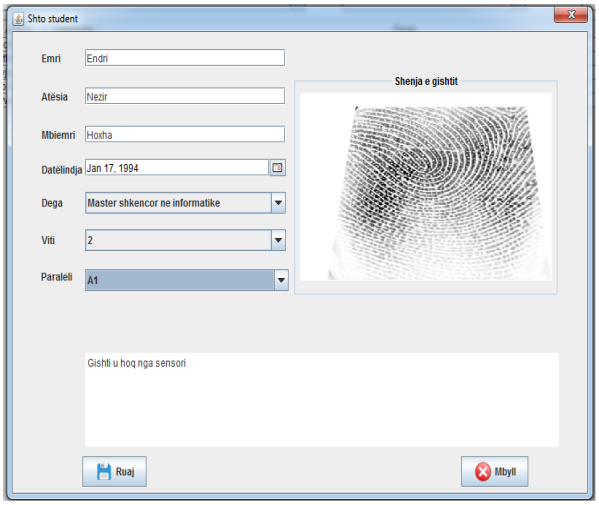

Figure 3

The system is able to compare the fingerprints with the templates from the database. For example the system is able to modify students and also it is able to detect if the same fingerprints have been stored in the database.

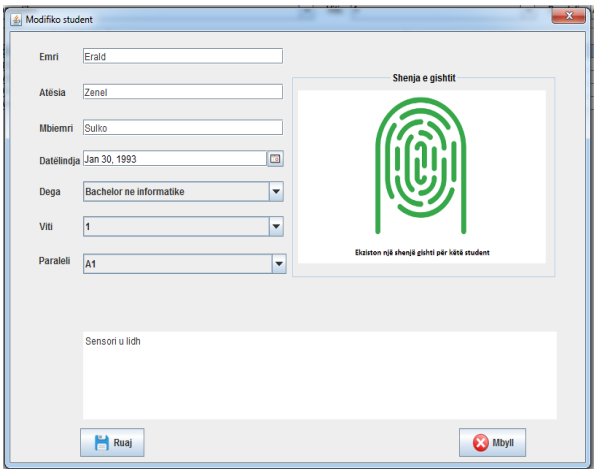

Figure 4

Also using this application can register the attendance the students and lectures in the auditorium. The interface for registering the students will give a positive answer when the student is enrolled. This result will be displayed after the control over the existence of another similar sign in the database and if the students has no previous registration in the database.

Figure 5

If the students have been enrolled the application will give a negative answer.

Figure 6

Also, the application it is able to detect if there is on fingerprint information for that students, or if the students or the lectures are not part of that course.

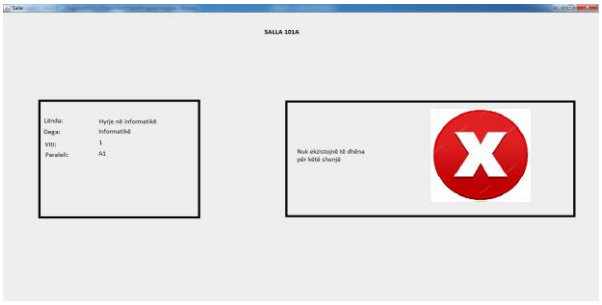

Figure 7

5 Conclusions

The aim of this work was to provide an effective way of taking attendance of students and academic staff. Biometric systems provide a very good opportunity to improve classical authentication methods. While passwords can be detected or forgotten, biometric methods provide a safe and fast way for personal identification.

In this paper we built an authentication prototype of users in a desktop application that manages a real business situation. The prototype uses JAVA-based technology and client-server architecture through the internal network of faculty.

Students and lecturers can register their presence using their fingerprints and the application it is able to compare different templates in database.

References

[Alh15] M. Alhothaily, M. Alradaey, M. Oqbah, A. El-Kustaban. Fingerprint Attendance System for Educational Institutes. Journal of Science and Technology, 20(1): 34-44, June 2015

[Das17] D. Dasgupta, R. Arunava, A. Nag. Biometric Authentication. *Advances in User Authentication, Infosys Science Foundation Series. Springer:* 77-78, 2017.

[Eze13] U. Eze, A. K. C. Joe-Uzuegbu, D.K Opara. Biometric-based Attendance System with Remote Real-time Monitoring for Tertiary Institutions in Developing Countries. *IEEE International Conference on Emerging & Sustainable Technologies for Power & ICT in a Developing Society*. November 2013

[Harr16] T. Harries, P. Eslambolchilar, R. Retttie, Ch. Stride, S. Walton, H. C. van Woerden. *BMC Public Health*, 16(1): 925, September 2016.

[Kir17] M. Kirmani. Impact of Biometric Attendance System on Secondary and Higher Secondary Educational Institutions Across J&K. *Oriental Journal of Computer Science and Technology*, 10(2): 291-297, June 2017

[Oye18] B.Oyebola, K.Olabisi, O. Adewale. Bassil. Fingerprint for Personal Identification: A Developed System for Students Attendance Information Management. *American Journal of Embedded Systems and Applications*, 6(1): 1-10, 2018.

[Rah18] S. Rahman, M.Rahman, M. Rahman. *Automated Student Attendance System using Fingerprint Recognition*. Edelweiss Applied Science and Technology, 2:90-94, January 2018.