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Fingerprint Oriented Employee Attendance System

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ABSTRACT:
Staff Attendance System is a simple windows based attendance system that was specifically developed for small and medium scale companies. This software helps to manage the workforce and track employee time and attendance in an easier way. This software application can manage the recordings, control and monitoring of staff absence and lateness. The significance of this application is to make sure that the staff member are punctual and do their jobs on time. Currently, there is no proper system to monitor the staff attendance at some companies. Some companies still use the paper based system to store the records of the employees. With the implementation of this system, paper based system will be eliminated. This research will help the Administrator to manage recordings, monitoring and tracking the attendance of the employees. It provides an accurate time management for the employees in order to sign in and sign out their attendance. In this paper, the biometrics based Staff Attendance Monitoring System was developed using Visual Basic Programming Language as front end while Microsoft Access was used as the Database to the backend users.

1. Introduction

It is expected today that an individual who wants to authenticate himself for a service must have a token and/or password for example identity card, ATM card, driving license, health card and so on. Carrying different cards and remembering passwords for different services is a significant issue for individuals and organizations. A secure and effective identity management system plays an important role in the successful deployment of an attendance management system. To make the identity management system more secure and reliable for authentication, biometrics data are integrated in the attendance management systems [1].
Biometrics technologies verify identity through characteristics such as fingerprints, faces, irises, retinal patterns, palm prints, voice, hand-written signatures, and so on. These techniques, which use physical data, are receiving attention as a personal authentication method that is more convenient than conventional methods such as a password or ID cards because it uses data taken from measurements and such data is unique to the individual and remains so throughout one's lifetime [2].
In these technologies, fingerprint becomes the most mature and popular biometrics technology used in automatic personal identification. The reason for the popularity of fingerprint verification is that fingerprints satisfy uniqueness, stability, permanency and easily taking [3]. In this paper, an attempt was made to look at the prevalence in the high level of impersonation experienced on a daily basis in both private and public sectors, the ghost worker syndrome which has become a menace across all tiers of government, employers concerns over the levels of absence in their workforce and difficulty in managing student attendance during lecture periods. Sequel to this, a fingerprint-based Attendance Management System was developed to provide a faster, more secure, and more convenient method of user verification than passwords and tokens can provide for a reliable personal identification.

2. Attendance Management

Attendance management is the act of managing attendance or presence in a work setting to minimize loss due to employee downtime. Attendance control has traditionally been approached using time clocks and timesheets, but attendance management goes beyond this to provide a working environment which maximizes and motivates employee attendance [4].
Attendance management is a major part of today's human resource systems; take organization towards better human resource practice, systems and excellence, hence regular attendance and punctuality are expected of all employees or candidates in a work setting. Unsatisfactory attendance caused by unscheduled absences and tardiness cause a disruption in work, affects productivity, and creates morale problems when workloads are shifted to other employees [5]. Moreover, in many institutions, and academic organizations, attendance is also a very important criteria which is used for various purposes. These purposes include record keeping, assessment of students, and promotion of optimal and consistent attendance in class. In developing countries, a minimum percentage of class attendance is required in most institutions and this policy has not been adhered to, because of the various challenges the present method of taking attendance presents. This traditional method involves the use of sheets of paper or books in taking student attendance. This method could easily allow for impersonation and the attendance sheet could be stolen or lost. Taking of attendance is time consuming and it is difficult to ascertain the number of students that have made

the minimum percentage and thus eligible for exam. Thus, there is a need for a system that would eliminate all of these trouble spots.

2.1. Types of Attendance Management System

Attendance Management falls into two categories namely; Conventional and Automated methods. Conventional methods include time sheet, attendance register and time clock. Time sheets are documents, electronic or otherwise that record what time was spent by the employee on what tasks. Attendance register is an official list of people who are present at an institution or organisation. Time clock which is a mechanical (or electronic) time piece used to assist in tracking the hour worked by an employee of a company.

Automated methods include Barcode system attendance system, magnetic stripe attendance system, Radio Frequency Identification (RFID) and the biometric attendance system [6].

The barcode attendance system requires that every employee is issued a badge/card in which there is a barcode. In order to check into or out of the company, the badge/card is swapped on the time clock, and the data is captured by the clock. In the magnetic stripe attendance system, data is encoded in the magnetic stripe of the employee card. When the card, is swiped through the employee time clock, the information in the card's magnetic stripe is recorded by the time clock. This system reads one card at a time and also requires contact with the reader. Radio-frequency identification (RFID) is a technology that uses radio waves to transfer data from an electronic tag, called RFID tag or label, attached to an object, through a reader for the purpose of identifying and tracking the object. The ID cards of the employees is embedded with RFID tag which is read by a reader. This RFID system is interfaced to a database through a computer. Each employee uses an RFID card and the reader records the data when the employee enters or exits. In biometric Attendance system, there is attendance software that is paired with a time clock for employees which uses biometric technology for authentication purposes. When these systems are in use, the employees can use their biometric data such as finger prints for clocking in and clocking out. This method has the great benefit that the entire process is easy as well as quick. Other advantages include elimination of the cost previously incurred in getting the employees cards.

3. System Overview

This proposed system introduces a new automatic attendance management system, which integrates fingerprint authentication into the process of attendance management for both staff and student. It is made up of two processes namely; enrolment and authentication.

During enrolment, the biometrics of the user is captured and the minutiae data are extracted and stored in a database as a template for the subject along with the user's ID. The objective of the enrolment module is to admit a user using his/her ID and fingerprints into a database after feature extraction. These features form a template that is used to determine the identity of the user, formulating the process of authentication. The enrolment process is carried out by an administrator of the attendance management system. During authentication, the biometrics of the user is captured again and the extracted features are compared with the ones already existing in the database to determine a match. After a successful match, attendance is marked against the user's id used in matching the templates. The work utilized a fingerprint reader as the input to acquire images, developed program that has fingerprint recognition and identification system as well as database to store user's information. The database comprises the fingerprint templates and other bio-data of the users together with the attendance records made by the users. Figure 1 shows the architecture of the proposed attendance management system.

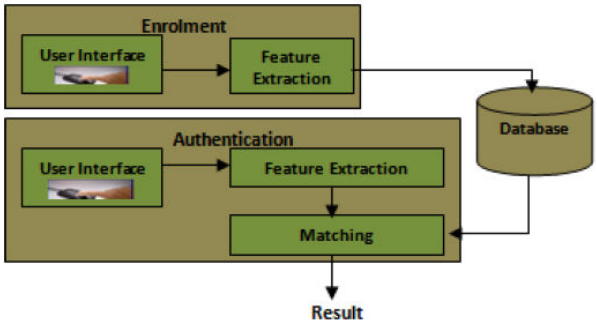

Figure 1. Architecture of the proposed fingerprint-based attendance management system

4. System Architecture

The design of the fingerprint-based attendance management system is made up of the following:

i . Enrolment module
ii . Authentication Module
iii . System database.

5.1. Enrolment Module The task of enrollment module is to enroll users and their fingerprints into the system database. During enrolment, the fingerprint and other bio-data of the user is captured and the unique features are extracted from the fingerprint image and stored in a database as a template for the subject along with the user's ID. Staff bio data to be captured includes: employee number, surname, other names, sex, position, staff type, phone number, email, department and passport photograph. Student bio data includes: matriculation number, surname, other-names, sex, department, level, studentship, phone number and passport photograph. To improve the quality of a captured image during enrolment/registration, two image samples per fingerprint used are captured for a higher degree of accuracy.

When the fingerprint images and the user name of a person to be enrolled are fed to the enrollment module, a minutiae

extraction algorithm is first applied to the fingerprint images and the minutiae patterns (features) are extracted. These features form a template that is used to determine the identity of the user, formulating the process of authentication. The enrolment process is carried out by an administrator of the attendance management system. The enrolment and registration phase is an administrative phase. The user fingerprint as well as other bio-data is stored for the first time into the database for registration. The courses, practicals, tests, lecturers and exams are also registered at this phase. All data and information required for the proper recording of attendance are enrolled in this module.

5.2. Authentication Module

The task of the authentication module is to validate the identity of the person who intends to access the system. The person to be authenticated indicates his/her identity and places his/her finger on the fingerprint scanner. The fingerprint images captured is enhanced and thinned at the image processing stage, and at feature extraction stage, the biometric template is extracted. It is then fed to a matching algorithm, which matches it against the person's biometric template stored in the system database to establish the identity. During authentication, for staff attendance, a staff supply his/her department and name, then places his/her finger over the fingerprint reader, the fingerprint recognition unit compares the fingerprint features with those stored in the database, after a successful match, the staff's employee number is sent to the database alongside the time of making such an attendance and update the status (either present/absent) of user's attendance for the day. Staff attendance is captured twice a day for both arrival and departure time.

5.3. The Database

The attendance management system database consists of tables that stores records, each of which corresponds to an authorized person that has access to the system. Each record may contain the minutiae templates of the person's fingerprint and user name of the person or other information such as pin no as an index to the template. The database design for the system implements relational data model which is a collections of tables in which data are stored. The database was implemented in Microsoft SQLServer database (Sql Server, 2005). SQLServer is fast and easy, it can store a very large record and requires little configuration.

6. LITERATURE REVIEW

6.1 Biometrics

Biometrics refers to the automatic identification of a person based on his physiological/behavioural characteristics [2]. This method of identification is preferred for various reasons; the person to be identified is required to be physically present at the point of identification. Identification based on biometric techniques obviates the need to remember a password or carry a token [13]. With the increased use of computers or vehicles of information technology, it is necessary to restrict access to sensitive or personal data. By replacing Personal Identification Number, biometric techniques can potentially prevent unauthorized access to fraudulent use of Automated Teller Machine, cellular phones, smart cards, desktop PCs, workstations, and computer networks. Personal Identification Number and passwords may be forgotten, and token based methods of identification like passports and driver's licenses may be forged, stolen, or lost. Thus, biometric systems of identification are enjoying a renewed interest. Various types of biometric systems are being used for real–time identification; the most popular are based on face recognition and fingerprint matching. However, there are other biometric systems that utilize iris and retinal scan, speech, facial thermo grams, and hand geometry. A biometric system is essentially a pattern recognition system, which makes a personal identification by determining the authenticity of a specific physiological or behavioural characteristics possessed by the user [14]. An important issue in designing a practical system is to determine how an individual is identified. Depending on the context, a biometric system can be either a verification (authentication) system or an identification system. There are two different ways to resolve a person's identity: Verification and Identification. Verification (Am I whom I claim I am?) involves confirming or denying a person's claimed identity. In Identification one has to establish a person's identity (who am I?). Each one of these approaches has its own complexities and could probably be solved best by a certain biometric system.

6.2 Fingerprint Scanner

Perhaps most of the work in biometric identification has gone into the fingerprint. For general security and computer access control application fingerprints are gaining popularity [5]. The fingerprint's stability and uniqueness is well established. Based upon a century of examination, it is estimated that the change of two people, including twins, having the same print is less than one a billion. In verifying a print, many devices on the market analyze the position of details called minutiae such as the endpoi{nts and junctions of print ridges. These devices assign locations to the minutiae using x, y, and directional variables. Some devices also count the number of ridges between minutiae to form the reference template. Several companies claim to be developing templates of fewer than 100 bytes. Other machines approach the finger as an image processing problem and applying custom very large scale integrated chips, neural networks, fuzzy logic and other technologies to the matching problem [15].

The fingerprint recognition technology was developed for some 12 years before being matched in 1983 by Identix Inc. The Identix system uses a compact terminal that

incorporates light and Charged Couple Device (CCD) image sensors to take high-resolution picture of a fingerprint. It is based on 68000 CPU with additional custom chips, but can also be configured as a peripheral for an IBM PC. It can operate as a standalone system or as part of a network [12]. To enroll, a user is assigned a personal identification number and then puts a single finger on the glass or Plexiglas plate for scanning by a CCD image sensor. The 250-KB image is digitalized and analyzed, and the result is approximately 1-KB mathematical characterization of the fingerprint. This takes about 30 seconds. Identity verifications take less than 1 second. The equipment generally gives the user three attempts for acceptance or finds rejection. With the first attempt the false rejection is around 2-3 percent and false acceptance is less than 0.0001 per cent. Each standalone unit cab stores 48 fingerprint templates which may be expanded to 846 by installing an additional memory package [11]. Fingerprints have overcome the stigma of their use in law enforcement and military applications. Finger print recognition is appropriate for many applications and is familiar idea to most people even if only from crime dramas on television. It is non-intrusive, user friendly and relatively inexpensive.

2.3 Benefits of Fingerprint

Today fingerprint devices are by far the most popular form of biometric security in use, with a variety of systems on the market intended for general and mass-market usage. Long gone are the huge bulky fingerprint scanners; now a fingerprint-scanning device can be small enough to be incorporated into a laptop for security.

6.4 Fact and Findings of Attendance System

Staff attendance software system is a software used to manage or monitor the time worked by employees for the purpose of efficiency and punctuality of the employees. These systems may be integrated with existing payroll processing software. Also, these systems track employee that come late to work and the ones that come early. These systems usually are able to give reports of all the staff records concerning signing in and out. The advantages of staff attendance monitoring system are: it can reduce the time needed to enter 'hours worked' data into payroll system and can reduce errors in enforcement of company attendance policies[6]. Staff Attendance Monitoring System is an easy way to keep track of any organization's attendance records. It also works very well as a member database. The program was developed with three main goals in mind: versatility, ease of use, and security.

Versatility:-Not every organization has the same attendance policies, so this program easily allows you to specify your organization's policies. You can also store any information you would like about each member.

Ease of Use:-This program is very intuitive. It was designed so that all of the instructions that are needed are right on the screen. The finger print scanner which will be installed beside the computer is where employees will place their thumb in order to capture their details.

Conclusion

In this paper, we have presented a fingerprint-based attendance management system. The developed system is an embedded system that is part of a fingerprint recognition/authentication system based on minutiae points. The system extract the local characteristic of a fingerprint which is minutiae points in template based. Templates are matched during both registration and verification processes. For improved quality control during the registration or verification process, a matching score was used to determine the success of the operation. The matching score was specified so that only sets of minutiae data that exceed the score will be accepted and data below the score will be rejected. Therefore, Fingerprint Recognition using Minutia Score Matching method was used for matching the minutia points before attendance is recorded. The developed system is very helpful in saving valuable time of students and lecturers, paper and generating report at required time. The system can record the clock in and clock out time of students and workers in a very convenient manner using their fingerprint to prevent impersonation and reduce level of absence. Also, it reduces most of the administrative jobs and minimizes human errors, avoids proxy punching, eliminates time-related disputes and helps to update and maintain attendance records.

References

[1] EPIC-Electronic Privacy Information Centre (2002):"National ID Cards," http://www.epic.org/privacy/id_cards/. accessed January, 2012.

[2] Kadry S. and Smaili M. (2010): Wireless Attendance Management System based on Iris Recognition. Scientific Research and Essays Vol. 5(12), pp. 1428-1435, 18 June, 2010.

[3] Khan B., Khan M. K. and Alghathbar K. S. (2010): Biometrics and identity management for homeland security applications in Saudi Arabia. African Journal of Business Management Vol. 4(15), pp. 3296-3306, 4 November, 2010.

[5] James, M., Rehg and Takeo, K. (1993). DigitEyes: Vision-Based Human Hand-Tracking. School of Computer Science Technical Report CMU- CS-93-220, Carnegie Mellon University. [6] Jonah, A. (1995). Fingerprint in Management attendance, Maxvin Pub. India. [7] Jones, J. (1999). Statistical color models with application to skin detection. In Proceedings of IEEE Conference on Computer Vision and Pattern Recognition. [8] Maltoni D., Maio D., Jain A. K., and Prabhakar S. "Handbook of Fingerprint Recognition". Springer, 2003.