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AUTOMATED ATTENDANCE SYSTEM USING BIOMETRICS WITH EMBEDDED WEBSERVER

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Abstract-In this paper, the development of an Automatic College Attendance Management System (ACAMS), a biometric based comprehensive attendance management system is proposed. Complexity in managing the students' attendance during lecture hours, computing the percentage of attendance and conveying the presence/absence of students to their Parent/Guardian have become a difficult challenge and also a time consuming task. For the stated reasons, ACAMS using fingerprint biometrics is designed with an added feature of sending SMS alerts to their Parent/Guardian, for which in this system PHP and CGI scripts and the web site using Lighthttpd server for sharing a common database of SQLite have been introduced. This system takes attendance electronically with the help of a finger print device and the records of the attendance are stored in a database. After student's identification, attendance is marked and a message is sent to his/her Parent/ Guardian, and hence our system becomes a self monitoring intelligent ACAMS. Moreover, our system eliminates the need for stationary materials and personnel for the keeping of records.

Keywords*: Biometrics, finger print, identification, Attendance, Server, ACAMS*

I. INTRODUCTION

In the academic institutions especially in professional institutions, attendance is a very important criterion which is used for various purposes. But, at the same time attendance status of the students should also be important to their Parent/Guardian, because of the mode of travel they use, which may be own/public vehicle and of course sometimes fraudulence by the words, becomes essential to track their ward. In the present traditional method, attendance involves the use of sheets of paper or books in taking student attendance, leads towards various challenges like time consuming, complexity of the calculations, occurrence of human errors, and could be stolen, damaged or lost. Thus, there is a need for a system that would eliminate all of these trouble spots. Our ACAMS using finger print would provide the needed solution. In this attendance management system, the developed software facilitates access to the attendance of a particular student in a particular class. Rather answering for attendance, individual has to pass his/her thumb over the fingerprint scanner and the fingerprint is compared against a list of pre-registered users, and once a match are made, the individual will be registered. As soon as the attendance of a student is registered, a message would be sent to his/her Parent/Guardian at the moment itself about his presence in the class, which makes them the avoidance of tracking or worrying about their ward.

This paper discusses the related works existing in the problem domain and the proposed work both at the hardware and software level. The operation and system's test results obtained along with the observations made.

II. EXISTING AND PROPOSED METHODS

In the existing system, the technology used is an RFID, which comprises three components an antenna, a transceiver and a transponder. The antenna uses radio frequency waves to transmit signal that activates the transponder. When activated, the tag transmits data back to the antenna. Using the RF, the RFID tag can be read from a distance through the wallet, clothes, purse or backpack. Every RFID tag has a unique ID. The list of students to be registered is enrolled first and their templates are stored in the database with a specific RFID tag ID.

But, in RFID case, there is a possibility of the fraudulence of users by handling the RFID tag through any unauthorized person instead of authorized person's enrolment which leads to poor success rate of the system. In order to overcome this drawback, in our system biometrics is introduced for attendance registration.

The biometric is a science of establishing a human identity based on physiological or behavioural characteristics and in this proposed system fingerprint is used as Biometrics. On receipt of live template fingerprint, it is verified with the database and identification process takes place based on ***Close enough***. If more clues, then is accepted otherwise rejected. Later, for the accepted person, the software manages all the things, which is developed using **PHP and CGI** scripts and theweb sitee using **Lighthttpd** server, to share a common database of **SQLite,** designed for embedded devices. The complete process is an automated one and no one needs to monitor the system's behaviour. For the students those who are absent, the fingerprints are

not registered in the live template, a warning SMS will be sent after a prescribed time, which is set at a threshold time of college/university, to the Parent / Guardian with a content informing that the student is not present in order to avoid fraudulent if any.

Biometric Vs RFID

Biometric type	verification	identification	accuracy	Long term stability	Easy to use
Finger print	✓	✓	4	3	3
Facial recognition	✓	X	3	2	2
Hand geometry	✓	X	3	2	2
RFID	✓	X	2	2	2
Retinal Scan	✓	X	3	3	1

In a typical ACAMS set up a biometric device setup will be provided in each classroom. These devices are connected with the CAMS local server housed inside the College. Every day the students will have to register their attendance through the biometric device. The CAMS local server will process the attendance data in real time and compared with the database for synchronization and identification with the CAMS Online Server (COS). After identification, COS will proceed the attendance process and send SMS the present text to the Parent/Guardian of the student and in case of absence after the predefined time, send SMS the absent text to the Parent/Guardian of the student via the CAMS SMS gateway server if required.

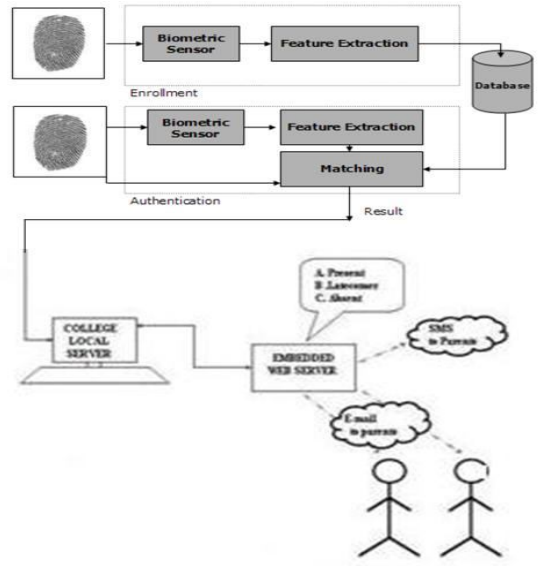


Fig.1 Functional block diagram of proposed system

Problems exist in the present Attendance System

- Registration of all students' attendance made in paper or book in every classroom
- The process is tedious and time consuming
- Manual calculation, which is complex and Validation, insertion and removal of data, report preparation
- Number of classrooms and records
- Personnel dependence to convey the attendance status to Parent/Guardian

To overcome the above said problems, ACAMS is proposed and the functional block diagram of our proposed method is shown in Fig.1.

III. FINGER PRINT SYSTEM

In this proposed system, a fingerprint scanner is used as the biometric device. The fingerprint is a unique human characteristic and hence this is used in the attendance system to make it fool proof. This will be installed in every classroom, where the student needs to get the finger swiped once in the day to make sure that the student himself is present. When the student swipes the finger which would be same as the one which was swiped while registering then the swiped finger will be matched with the finger database, once matched the attendance of the student for the day will be finalized and stored completely. The same will be notified and intimated by an SMS for the confirmation of the same.

Advantages:

I. ***Physical Resistance****:* They are physically more resistant than systems based on semi-conductors, in terms of resistance to impacts, scratches, corrosion and durability. This resistance is very useful for outdoor systems.

II. ***Low maintenance cost****:* Fingerprint recognition systems based on semi-conductor chips have greatest maintenance costs due to its fragility.

III. ***Non-electrostatic problems****:* semiconductor systems are susceptible to electrostatic energy damages. Moreover, electrostatic energy can start a fire.

***Disadvantage*:**

A disadvantage of this type of sensor is that the image capturing capabilities are affected by the skin quality of the finger. For example, a maker or dirty finger is difficult to be captured properly.

It is also possible for an individual to erode the outer layer of skin on the fingertips till a point where the fingerprint is no longer visible. It can be fooled by an image of the fingerprint if it is not connected to a live finger detector.

IV. EMBEDDED WEB SERVER

The server application will be built using PHP and CGI C scripts and the website will be built using

Lighthttpd web server specially designed for embedded devices and the integrity between them is very strong.

Many of the uses of CGI can be duplicated by newer technology such as JavaScript and ActiveX. The primary benefit to using CGI rather than browser based scripting is that you can be sure that all of your readers (with very few exceptions) will be able to use the program. Java, JavaScript, and ActiveX can all be turned off within the browser, and many browsers simply don't support them.

Also, it is becoming more common for company firewalls to disallow these technologies to work in their system (often for security or bandwidth reasons). Because CGI scripts are run on the external Web server, they are not limited by browser or firewall limitations.

V. WEB TOOLS AND LANGUAGES

UClinux: is a smooth and painless process and an excellent way to embed any system. A good starting point for the most up-to-date resources and information

Lighthttpd: is an open-source web server more optimized for speed-critical environments than common products while remaining standards-compliant, secure and flexible.

Advantages:

- Lighttpd occupies a different, low-resources spot in the memory/CPU that facilities trade off
- Owners of low memory/CPU systems, routers, ARM-powered devices may prefer using lighttpd rather than Apache

PHP: is a general-purpose server-side scripting language originally designed for Web development to produce dynamic Web pages. It is one of the first developed server-side scripting languages to be embedded into an HTML source document rather than calling an external file to process data. The code is interpreted by a Web server with a PHP processor module which generates the resulting Web page. It also has evolved to include a command-line interface capability and can be used

in standalone graphical applications.
PHP can be deployed on most Web servers and also as a standalone shell on almost every operating system and platform free of charge

Advantages:

- PHP is completely free.
- PHP is easy to learn compared to many other scripting languages.
- PHP can be easily embedded directly into HTML.
- PHP runs native on all UNIX and Windows platforms.
- PHP is a real programming language. Stability, Speed, Open source licensing, fast feature development, Popularity.

SQLite is an embedded SQL database engine. Unlike most other SQL databases, SQLite does not have a separate server process. SQLite reads and writes directly to ordinary disk files. A complete SQL database with multiple tables, indices, triggers, and views, is contained in a single disk file. The database file format is cross-platform - you can freely copy a database between 32-bit and 64-bit systems or between big-endian and little-endian architectures. These features make SQLite a popular choice as an Application File Format.

Advantages:

***Speed*:**

- In many cases at least 2-3 times faster than MySQL/ PostgreSQL.
- Fast PHP interface.
- No socket and/or TCP/IP overhead.

Functionality:

- Sub-selects, Triggers, Transactions, Views.
- Up to 2TB of data storage.
- Small memory footprint.
- Self-contained: No external dependencies.
- Atomic commit and rollback protect data integrity.
- Easily movable database.

Security:

- Each user has its own independent database(s).

VI. PROPOSED ALGORITHM

Step1: Initialize the biometric device

Step2: Get the user ID and authenticate using a database.

Step3: If authenticated through a web server, automatically send messages to their parents that the student is present; else go to

step 2.

Step 4: Set biometric device in idle mode when not in use; go to **step 2**

Step 5: If any unauthorized user uses more

than 3/5 times, send an alert signal through buzzer to avoid such situations; go to **step2.**

VII. EXPERIMENTAL RESULTS

User Enrollment

- Enrolment is the procedure to create ID number and scan a finger to create a template three times.
- This template is associated with the user ID number and stored up.
- Using the MENU button to enter the User enroll, Access the Enrol Fingerprint to press [OK] as in Fig. 2(a).

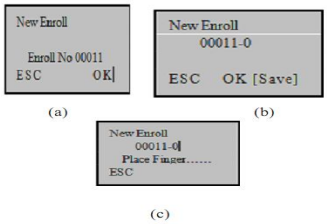
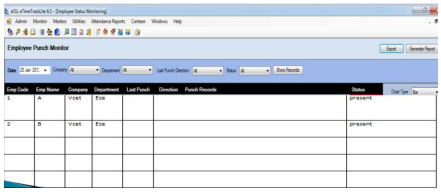


Fig. 2 Enrollment Screen Shots

- Input the Enrol Number (the range is between 0 and 65534), press [OK] as given in Fig. 2 (b)
- The Last digit '0' represents the first fingerprint
- After three successful tests in a row, a message will appear as in Fig. 2 (c) to place finger
- The same display will remain until the template is created; if not will be asked to try again.

VIII. RESULT



IX. CONCLUSION AND FUTURE WORK

This paper demonstrates how an automated attendance system can be implemented using Biometric (Fingerprint) and embedded Web Server with PHP in a university or an educational institution. The system performance would be good with some limitations such as the system would fail if it is not kept on always, and if a student gets wounded on the finger, at the time of registration he may not have marked as present. However, this system would definitely be helpful for the institutions, which has more care for their students' future.

In the enhanced version of this proposed work, energy saving concepts can also be incorporated to manage the particular classroom intelligently. Mobile application software can be developed in order to track the student using GPS (Global Positioning System) in case of his absence within the institution premises.

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