_____

Wireless Biometric Attendance Management System

Shaikh Sardar Salim
Department Of Computer Engineering
TSSM'S BSCOER
PUNE
superuser@shaikhsardar.me

Jamdade Sonam Baburao
Department Of Computer Engineering
TSSM'S BSCOER
PUNE
sonamjamdade96@gmail.com

Patil Pranoti Jotiram
Department Of Computer Engineering
TSSM'S BSCOER
PUNE
pranotipatil73@gmail.com

Pawar Abhishek Vikas
Department Of Computer Engineering
TSSM'S BSCOER
PUNE
erabhishetpawar@gmail.com

Guided By:
Mrs. Sagare Varsha
Department Of Computer Engineering
TSSM'S BSCOER
PUNE
sagare.varsha@gmail.com

Abstract—Design of an automated system by using real time NRF - biometric system for simple and time saving attendance on a regular basis using the finger prints of the students at any college or department level along with the students incoming and outgoing log maintenance. Initially students fingerprints are scanned by the scanner and then a unique number is allotted as their individual enrollment. While taking the attendance, when students impress their fingerprints against the scanner, the system will compare the new fingerprint patterns and the connection between various points in the fingerprint and then match with the enrolment database. A match is recorded as an indication of processing, matching and mark of attendance respectively. Through this automated system,time, paperwork and manpower is reduced to the great extent.

Keywords- Arduino, NRF, R305.

_____*********_____

I.   INTRODUCTION

The most commonly used method of tracking the attendance in classrooms is by asking the students to manually sign the attendance sheet which is normally passed around the classroom while the professor is conducting the lectureor by calling the roll calls sequentially after the lecture is completed. Previously this method of taking attendance and its maintenance was very difficult and inconvenient. After considering these issues, we developed a **wireless biometric attendance system** which automates the complete process of taking the student attendance and maintaining it regularly .
Fingerprint identification is one of the most commonly used and a very common means of biometric identification system. Because of the uniqueness & consistency in fingerprint patterns over time, they have been used for identification over many years ago and now a days recently becoming automated due to advancement in computing capabilities and latest computer technologies. So, here the fingerprint identification technique was used for maintaining the attendance record. The record of the fingerprints with their unique identitynumber of various students was maintained in a database. The communication between the PC and Module was done wirelessly over Bluetooth.

- For controlling both these modules the microcontroller board, Arduino Mega 2560 was used.
- For Implementing GUI Python's Tkinter library was used.
- The database was maintained over MySQL.

At the beginning of every year for a particular course,students are supposed to enrol their fingerprint.

II.   MICROCONTROLLER

The Arduino Uno as shown in Fig. 1 is a microcontroller board based on the ATmega328. The Arduino is a simple system designed for beginners as well as people with experience. Arduino is an open-source electronics platform based on easy-to-use hardware and software. It's intended for anyone making interactive projects.
Arduino senses the environment through various sensors, and affects its surroundings by controlling lights, motors, and other actuators. You can tell your Arduino what to do by writing code in the Arduino programming language and using the Arduino development environment. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6

_____

_____

analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button.

Fig. 1 Arduino Module

Specifications of Arduino Uno

Microcontroller	ATmega328
Operating Voltage	5V
Input Voltage	7-12V
Input Voltage(limits)	6-20V
Digital I/O pins	14(Pin 6 provide PWM output)
Analog Input pins	6
DC Current at I/O pin	40mA
DC Current for 3.3V Pin	50mA
Flash Memory	32KB(ATmega328) of which 0.5KB used by bootloader
SRAM	2KB(ATmega328)
EEPROM	1KB(ATmega328)
Clock Speed	16MHz

Characteristics of Arduino

1. Inexpensive - Arduino boards are much cheaper as compared to other microcontroller platforms.

2. Cross-platform - The Arduino software runs on Windows, Macintosh OSX, and Linux operating systems. Most microcontroller systems are limited to Windows

3. Simple programming environment - The Arduino programming environment is easy-to-use and has several features for more experienced programmers.

4. Extensible software- The Arduino software is published as open source tools. Users can create their own libraries.

5. Open source and extensible hardware – The Arduino design is available on their website. Experienced circuit designers can create their own Arduino board and make extensions to the available designs.

III. FINGERPRINT MODULE

Fig. 2 R305 module

Operating Voltage	DC 3.6V-6.0V
Operating Current	Typical:100mA Peak:150mA
Baud Rate	(9600*N)bps, N=1~12(default N=6)
Average Searching time	<0.8s(1:880)
Working Environment RH: 40%-85%	Temp:- 10□ C - +40□ C
Interface	UART(TTL logical level)/USB 1.1
Matching Mode	1:1 and 1:N
Character File size	256 bytes
Template size	512 bytes
Window dimension	18mm*22mm

A. *Image Processing*

Fingerprint images that are found or scanned are not of optimum quality. So weremove noises and enhance their quality. We extract features like minutiae and others for matching. If the sets of minutiae are matched with those in the database, we call it an identified fingerprint. After matching, we perform post-matching steps which may include showing details of identified candidate, marking attendance etc.
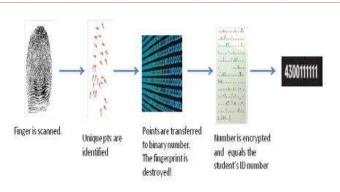
_____

_____

Fig. 3 Image Processing

A fingerprint is an impression of the friction ridges on all parts of the finger. A friction ridge is a raised portion of the epidermis on the palmar (palm) or digits (fingers and toes) or plantar (sole) skin, consisting of one or more connected ridge units of friction ridge skin. These are sometimes known as "epidermal ridges" which caused by the underlying interface between the dermal papillae of the dermis A fingerprint is an impression of the friction ridges on all parts of the finger. A friction ridge is a raised portion of the epidermis on the palmar (palm) or digits (fingers and toes) or plantar (sole) skin, consisting of one or more connected ridge units of friction ridge skin. These are sometimes known as "epidermal ridges" which caused by the underlying interface between the dermal papillae of the dermis The term fingerprint is refers impressions transferred from the pad last joint of fingers and thumbs, though fingerprint cards also typically record portions of lower joint areas of the fingers (which are also used to make identifications). It is believed that no two people have identical fingerprint in world, so the fingerprint verification and identification is most popular way to verify the authenticity or identity of a person wherever the security is a problematic question. The reason for popularity of fingerprint technique is uniqueness of person arises from his behavior ; personal characteristics are like, for instance uniqueness, which indicates that each and every fingerprint is unique, different from one other. Universality ,that means every person hold the individual characteristics of fingerprint. The three basic patterns of fingerprint ridges are the arch, loop, and whorl.
An arch is a pattern where the ridges enter from one side of the finger, rise in the center forming an arc, and then exit the other side of the finger.
The loop is a pattern where the ridges enter from one side of a finger, form a curve, and tend to exit from the same side they enter.
In the whorl pattern, ridges form circularly around a central point on the finger. Scientists have found that family members often share the same general fingerprint patterns, leading to the belief that these patterns are inherited Automatic attendance system using fingerprint verification technique. A fingerprint is captured by user interface, which are likely to be

an optical solid state or an ultrasound sensor. Generally, there are two approaches are used for fingerprint verification system among them first one is Minutiae based technique, in which minutiae is represented by ending or termination and bifurcations. Other one is Image based method or matching pattern.

Minutiae-based matching: This is the most popular and widely used technique, being the basis of the fingerprint comparison made by fingerprint examiners. Minutiae are extracted from the two fingerprints and stored as sets of points in the two- dimensional plane. Minutiae-based matching essentially consists of finding the alignment between the template and the input minutiae sets that results in the maximum number of minutiae pairings.

Pattern or Image based matching: Pattern based matching use algorithms to compare the basic fingerprint patterns like arch, whorl or loop between a previously stored template and candidate fingerprint.For this purpose image is required to be alignment in same orientation. In matching process algorithms finds a central point on the fingerprint image and centre on the image. In pattern based algorithm, the template contains the type, size and orientation of pattern within the aligned fingerprint image. The candidate fingerprint image is graphically compared with the template to determine the degree to which the match.

IV.   WORKING PRINCIPLE

*Enrolling***:** To enroll the fingerprint for the first time the finger needs be pressed to the module until it is stored with its unique number. Every time it creates a template for the finger that was put on the optical sensor. Once successful enrolment of the fingerprint is done, device sends a unique identity number related to the finger enrolled. This identity number can be saved and later used for verification purpose.

Enrolling Procedure:

1. EnrollStart(ID);// Issue command to start enrolling over the passed ID as parameter.

2. CaptureFinger ; // Take snapshot of the finger

3. Enroll1; // Create template of the Image

4. Enrollment successful

5. CaptureFinger;

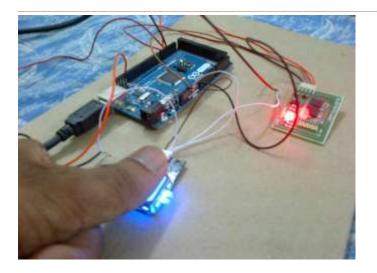   *(* In case of any error in the above procedure, the device sends an error code.)*

_____

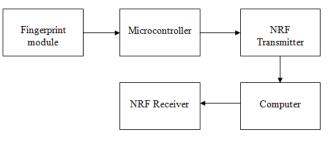**Fig. 4 Connectivity of Modules**

Fig. 5 Working Process

A. Storing:
- The first part is to store the fingerprints of all the students.
- For this the microcontroller has to first send the command to the fingerprint module to get the image.
- The student is required to place his finger on the module at this time. The module informs the microcontroller whether the image was captured successfully or not.
- If the fingerprint image was captured successfully, it gets stored in the image buffer.
- Thus the fingerprint gets stored in the database with a unique identity number which further can be used for comparing the matching fingerprint.

B. Searching:
- For marking the attendance, the finger placed on the module has to be compared with each and every stored fingerprint and its unique identity number.
- Initially the command to get image is sent by the microcontroller.
- The captured image has to be converted to a character file. And we already have second character file as stored with previously taken fingerprint.

- The two character files are then combined to generate the template using the Remodel command.
- Now this template in the char buffer is then to be compared with each and every template stored in the module. This is done by sending the search command.
- This returns the page ID at which the match has been found. If no match is found, the module returns the acknowledgement for no match found.

C. Transmission:
- This page ID now has to be transmitted to the computer.
- Before this, the NRF modules have to be set up.
- The NRF network is given a Pan ID, this allows other NRF boards to identify the network.
- The transmitter NRF transmits the page ID to the receiver NRF which is connected to the computer.

D. Database:
- Terminal software is used to read the page ID.
- The page ID is then compared and used to identify the student whose attendance is to be marked.
- Thus the attendance of the particular student is marked.

V. CONCLUSION

This Wireless fingerprint attendance system is elegant and efficient way to track the presence of students in the class over an entire semester for various courses. It also gives easy interface to get detailed information of relevant queries. Using this attendance system, Professor can get the attendance of a particular student throughout whole semester, attendance of whole class for a particular day and attendance of whole class throughout the semester in a tabular form within few seconds .

After the text edit has been completed, the paper is ready for the template. Duplicate the template file by using the Save As command, and use the naming convention prescribed by your conference for the name of your paper. In this newly created file, highlight all of the contents and import your prepared text file. You are now ready to style your paper.

_____

REFERENCES

[1] Davide Maltoni, Dario Maio, Anil K. Jain & Salil Prabhakar, "Handbook of Fingerprint Recognition", Springer, second edition, 2009.

[2] .Yongqiang Zhang and Ji Liu, "Wireless Fingerprint Attendance Management System", Proceedings of the 2007 WSEAS International Conference on Computer Engineering and Applications, Gold Coast, Australia, January 17-19,2007.

[3] A. K. Jain, F. Patrick, A. Arun, "Handbook of Biometri cs", Springer, science Business Media, LLC, 1st edition, pp. 1-42,2008.

[4] Antonio R. C. Paiva and Tolga Tasdizen, "Fingerprint image segmentation using data Manifold characteristic features", International journal of pattern recognition and artificial intelligence, vol. 26, no. 4 (2012), pages 1-23, Aug 29. 2012.

[5] Sunny Arief and Rudi Trisno, "Adaptable Fingerprint Minutiae Extraction algorithm based on crossing number method for hardware implementation using FPGA", International Journal of Computer Science, Engineering and Information Technology (IJCSEIT), Volume 2. Issue 3, June 2012.

[6] Leon Adams, "Choosing the Right Architecture for Real-Time Signal Processing Designs", White Paper, SPRA879 - November 2002.

[7] Chang Ning, 'The Implementation of Fingerprint Identification Pre processing Algorithm on DSP", International Conference on Intelligent Computation Technology and Automation, 2010.

[8] Tsai-Yang Jea, "Minutiae-Based Partial Fingerprint Recognition, Ph.D. thesis", 2005, State University of New York at Buffalo.

[9] Lin Hong, "Automatic Personal Identification Using Fingerprints", Ph.D. Thesis, 1998, Department of Computer Science, Michigan State of university.

[10] Salil Prabhakar, "Fingerprint Classification and Mat ching Using a Filter bank", Ph.D.thesis, (2001), Department of Computer Science and Engineering, Michigan State University.

_____