FINGERPRINT BASED ATTENDANCE SYSTEM WITH SMS ALERT

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ABSTRACT: In this project fingerprint attendance recognition system is minutiae based fingerprint algorithms used in various techniques. This line of track mainly involves extraction of minutiae points from the model fingerprint images and fingerprint matching based on the number of minutiae pairings among two fingerprints. This project also provides the design method of fingerprint based attendance with help of GSM. This system ignores the requirement for stationary materials and personnel for keeping of records.
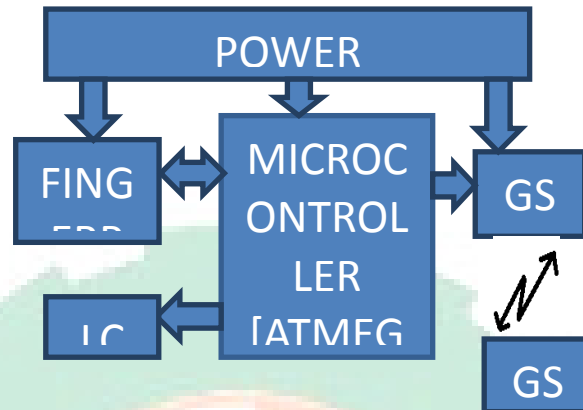
I.   INTRODUCTION

The skin on our palms and fingers exhibits a flow like patterns of ridges and valleys. The papillary ridges on the finger, called friction ridges, which help the hand to grasp objects and increase friction and improve the tactile sensing of the surface structure. These ridge patterns are now scientifically proved as unique for each person. The cuts and burns in a person's finger may alter these patterns temporarily but they reappear after the injury heals. Fingerprints are now used widely for identification and verification purpose. They are used for attendance purpose in organizations to avoid proxy for criminal identification like terrorist, murderer and violators and also in passports (a matter of national high importance) of person. Here in this project we have tried to automate a classroom attendance procedure by using a fingerprint recognition module interfaced with ATmega 8A microcontroller. In verification, the system compares an input fingerprint to the "enrolled" fingerprint of a specific user to determine if they are from the same finger (1:1 match). In identification, the system compares an input fingerprint with the prints of all enrolled users in the database to determine if the person is already known under a duplicate or false identity (1:N match). This report also involves the product based design of a physical fingerprint system and also layout of fingerprint matching algorithm.

II.   OVERVIEW

During enrolment, the fingerprint of the user is captured and its unique features extracted and stored in a database along with the users identity as a template for the subject. The unique features called minutiae points were extracted using the Crossing Number (CN) method which extracts the ridge endings and bifurcations from the skeleton image by examining the local neighborhoods of each ridge pixel using a 3 x 3 window. During authentication, the fingerprint of the user is captured again and the extracted features compared with the template in the database to determine a match before attendance is made.

Attendance management system is one of the most advanced applications in biometric technology. It cannot be forged easily. With the integration and use of biometric technology getting simpler, many institutions are using down the biometric road to verify the time and attendance of their students and staffs. The system also contains a GMS Modem, which can be used to send the attendance information of the students automatically to their parents. The Embedded system using a small LCD user interface can be interfaced with the computer by using serial communication interface. The previous papers done were only the fingerprint based attendance system and a report generation. It does not have any SMS alert to the parents. This paper is to send SMS alert to parents by means of GSM.

III.   BLOCK DIAGRAM

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                    ┌──────────────────────┐
                    │        POWER         │
                    └──────────────────────┘
              │              │              │
              ▼              ▼              ▼
        ┌─────────┐    ┌──────────┐    ┌─────────┐
        │  FING   │◄──►│ MICROC   │───►│   GS    │
        │  ERR    │    │ ONTROL   │    │         │
        └─────────┘    │ LER      │    └─────────┘
                       │          │         ↕
        ┌─────────┐    │ [ATMEG   │    ┌─────────┐
        │   LC    │◄───│          │    │   GS    │
        └─────────┘    └──────────┘    └─────────┘
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IV.   EXECUTION AND WORKING:

The working of the product is split Two parts:

1. Fingerprint module

2. GSM Module

3a.Fingerprint module

Fingerprint Sensor can easily be connected to any controller via MAX232. The fingerprint module is capable of storing about 100 images in the inbuilt memory.

Fig 3a. Fingerprint module

Image Acquisition:

The Fingerprint images from various users are taken using the module. The finger module itself has an internal memory which can store about 100 images in it. These images are used for the enhancement in next stages.

**Image Enhancement:**

The image is enhanced using the techniques like Histogram Equalization [4]. It is nothing but the graph plot for number of pixels against the gray level. The overall contrast of the image is made uniform and image looks enhanced. Now the image is suitable for the extraction of minutiae extraction.

Edge Detection:

They are many operators used for detecting the edges. The operators are Prewitt, Laplacian, Sobels, Robertson Operators [5]. The Prewitt operator is one of the best edge detecting operator and we are implementingPrewitt operator in this paper. The edges have to be detected in order to match the input image with already saved image. There are two types of masking used here. They are

    i)   Horizontal masking

    ii)   Vertical masking
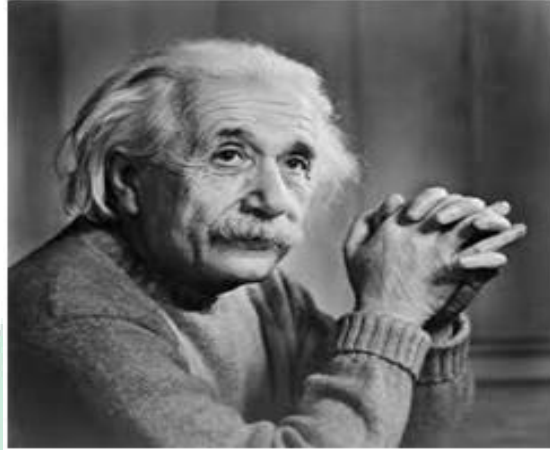
Fig .3.a. original image

Fig. 3.a.Horizondal mask

Fig. 3.a.Vertical mask

Extraction of Miniature Points and Matching:

After the extraction of edges, the points are marked in it. Those points which are detected after edge detection are known as miniature points. The miniature points that are extracted are compared with already stored images . In order to find the matching process the correlation factor and the Euclidean distance has to be found out. Based on the tolerance value the matching results can be found out.
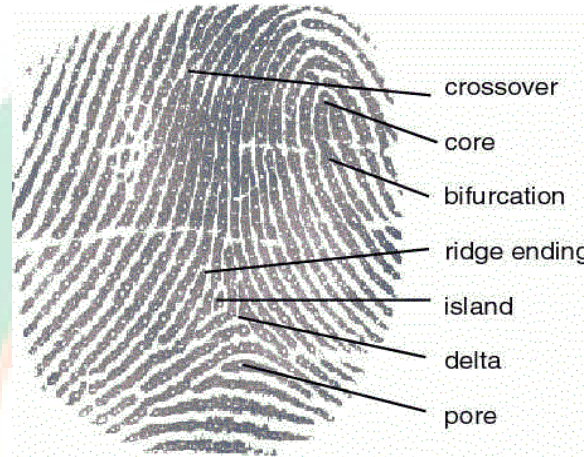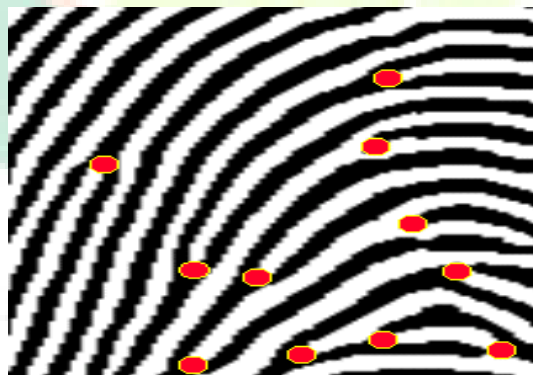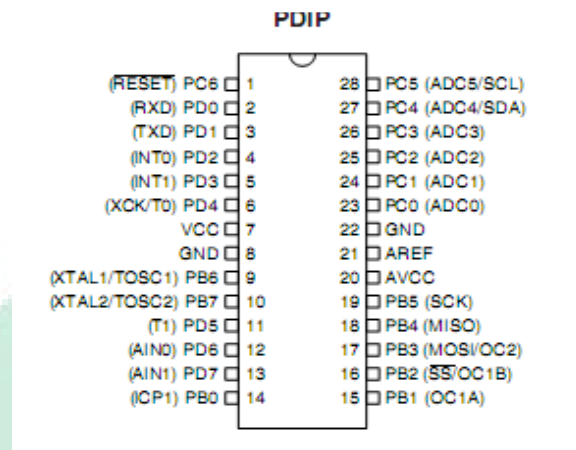

Fig. 3.a. minutiae before marking

Fig. 3.b. minutiae after marking

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MICROCONTROLLER:

Fig. 3.a. pin diagram of microcontroller

3.bGSM MODULE:

GSM/GPRS Modem-RS232 is built with Dual Band GSM/GPRS engine- SIM900A, works on frequencies 900/ 1800 MHz The Modem is coming with RS232 interface, which allows you connect PC as well as microcontroller with RS232Chip (MAX232).

The baud rate is configurable from 9600-115200 through AT command. TheGSM/GPRS Modem is having internal TCP/IP stack to enable you to connect with internet via GPRS. It is suitable for SMS, Voice as well as DATA transfer application in M2M interface.The onboard Regulated Power supply allows you to connect wide range unregulated power supply . Using this modem, you can make audio calls, SMS,Read SMS, attend the incoming calls and internet etc. through simple AT commands.

The main purpose of the GSM in projects is to send and receive the messages. But not only that we can make a call and can we also browse using the GSM . The GSM has the operating voltage of 12v. It has mainly of three pins namely transmitter, ground and the receiver pin.

To perform these tasks, a GSM modem must support an "extended AT command set" for sending/receiving SMS messages. GSM is one of the most useful inventions in the modern world. It has many advantages than other technology standards. The Advantages of GSM are,

Worldwide roaming
Security
Reasonable devices and facilities
Extensive spectrums obtainable

Fig. 3b- GSM module

COMMUNICATION OF GSM WITH MICROCONTROLLER:

The result from the fingerprint module is taken and it is analyzed in the microcontroller. We use "ATMEGA 16" microcontroller in the paper. The result from the GSM module is received by microcontroller. If the already stored image in the memory and input image are matched then microcontroller will sent the control to the GSM module. The GSM will send the messages to respective parent's mobile numbers [8]. If the fingerprints are mismatched then the control signal will not be sent to the GSM module.

After some time interval the details of the students who were not present were taken. Those persons details were taken and message of "NOT PRESENT "is sent to their respective parent's mobile numbers. So, the parents may know about the student's presence immediately. The Students cannot forget this system easily.

V. CONCLUSION

This paper has presented the design and development of portable attendance system which is based on fingerprint identification. The system helped to reduce many issues such as,denying the possibilities of cheating in recording the attendance, helps to ease the lecturers to keep data of students' attendance, the encryption technique adds more security so there will be no anonymous fingerprint which is able to tamper with the recorded data, and the portability saves time in taking attendance instead of queuing in a line. Future works will be making this system wireless and using IOT (internet of things) concept.

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