Attendance Monitoring System Automation Using Fingerprint Module

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Abstract--- In the project, an attendance monitoring system is designed using a fingerprint technology . The register based conventional attendance system for the students in our educational institution is laborious, time consuming and kind of boring task for the educators. The system contains a fingerprint scanner which scans a fingerprint and creates a database which is to be stored in the pc. The system is more advantageous since it include an API module which reduces the cost of a GSM.

Keyword---- Fingerprint scanner, ARM7 microcontroller, an API module, PC/Laptop.

I. INTRODUCTION

Traditionally teachers were used to take attendance of students by maintaining some papers or registers. Teachers had to call roll numbers of each student individually and accordingly the concerned student had to stand up to answer the roll call. This lead to the problems like wastage of valuable time and papers. Sometimes fake attendance was also get marked. Also the attendance register or record can be stolen or may get damaged. Hence, by focusing all these kind of problems we have tried to design a system which will overcome these problems in some extent. We have used a fingerprint technology for the purpose of attendance marking since every person has a unique fingerprint pattern and hence no fake attendance can be marked. Also security of the system is increased. Fingerprint is much better than the RFID since RFID card can be stolen or lost and may get damaged. We have used an optical sensor to scan the fingers. An API module makes this system different from other systems which use a GSM module. API module is basically a JAVA platform based soft core module which reduces the cost needed for the GSM module. This system is designed such that an automated marking and updation of an attendance of the students on the insertion of fingerprints.

Fig: 1.Fingerprint scanner

II. LITERATURE REVIEW

In many educational systems attendance is compulsory. In order to make a educational system modern many modern and automated systems has to be there. With the help of fingerprint scanner, it has been made easier to the teachers to record the attendance. Zhu et. al. stated and proved in their studies that fingerprint systems have many advantages which include ease of use, permanent, unique, good anti-fake mechanism and recognized by many people. Technology used is biometric recognition. Biometric systems use biological characteristics of the human beings like iris, face, voice and fingerprints. Traditionally, teachers used to take attendance on registers and it was very difficult to handle the records since records(registers) can be lost, stolen or torn off.

Research on biometric methods gained a huge importance in recent years. The term 'Biometric' is derived from Greek word "bio" which means life and "metrics" means to measure. Automated biometric systems have specific importance in the field of computer and image processing. In 1858, William Herschel had properly captured the finger images for identification purposes. In 1892, Sir Galton implemented a classification system using fingerprint features like minutiae and further Sir Henry, in 1896, used the same concept for the identification of prisoners. Many researchers used different sensors as per there need like Optical sensor, capacitor sensor, IR sensor, etc. The type of an application and available environment decides the kind of scanner to be used. In 2011, Motorola phone company used a fingerprint recognition in Atrix 4G.

Apple iphone 5s in September 2013 also used fingerprint technique. Further HTC in October 2013, Samsung Galaxy S5 in 2014 used fingerprint recognition.

III. OBJECTIVE

There are many objectives of this system as it is very secured system, requires low power, low maintenance cost, easy to handle, etc. System has the following main objectives:

- Reduces human efforts in maintaining the records.
- Reduces wastage of papers.
- Generates characters and templates of fingerprints.
- Leads to the secured approach.
- Accuracy of system is more and system is more easy to handle.
- Parents will be aware of students attendance.
- Saves valuable time of teachers and students.

IV. ADVANTAGES

Main and specific advantages includes:

- Unique identification.
- More secured and accurate than traditional as well as RFID based systems.
- Functions based on ARM7 microcontroller, so changes can be made easily by just changing the code.
- No human interruption is needed and so reduces human efforts.
- No fake attendance is considered.

V. METHODOLOGY

- Fingerprint module is interfaced with the UART1 port of ARM7 i.e. LPC-2138 IC.PC is interfaced with the UART0 of LPC-2138 IC.
- LCD is connected to ARM7 IC.
- PC has an interface with API module .
- A student will insert a finger into the fingerprint module and accordingly the module will scan the finger. The scanned finger will have a comparison for matching purpose with the pattern which is already stored inside the PC.
- If the scanned pattern and the stored pattern both match with each other, then that student is an authorized student and he/she will be marked as present on the concerned date. Accordingly the status of each student is updated to the teachers and parents through an API module.

16×2 LCD Display:

A 16x2 LCD is used in this system. It displays 16 characters per line on two different lines. It has two registers. It operates on 5v. Liquid crystals do not emit light directly. LCD displays arbitrary images or fixed images with low information, which can be displayed or hidden such as preset words, 7segments and digits. They use same concept technology, except that fixed images are made up of a large numbers of small pixels, while other displays have larger elements.

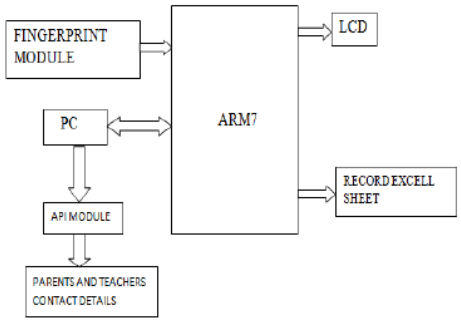


Fig: 2.Block diagram of fingerprint based attendance system

Fingerprint module:

Fingerprint processing contains two parts one is fingerprint enrollment and other is matching. In enrollment phase, a student has to insert a finger for two times. The system will process and generate a template of the finger in order to get a desired matching results. In matching part, student has to insert a finger through an optical sensor and accordingly system will create a live template of the scanned finger. Matching can be 1:1 or 1:N. For 1:1 matching live template is compared with the template stored at a specific location while for 1:N matching live template is compared with all the stored templates. In both the cases, system will give result either success or failure.

API module:

An API stands actually for application processor interface based on the JAVA platform. API module acts as a bridge between the teachers/parents and the whole attendance monitoring system. API is more advantageous over GSM module since it is all software based system and the hardware cost is reduced. The developer of the system is on the top of the system. Making a clean design leads to a good result. A simpler interface can be provided to a complex subsystem using a façade pattern..

Implementing an API façade pattern involves following basic steps:

1- Design an API- Design URLs, request parameters and responses, headers, queries, etc. Design of API should be self-consistent.

2- Implementation- This involves application developers to use your API and give you a response before your API is connected to internal systems.

3- Integrate between the pattern and the systems.

ARM7 Microcontroller:

LPC2148 microcontrollers are based on a 16-bit/32-bit ARM7TDMI-S CPU with real-time emulation i.e. RTE. The microcontroller also has a high speed flash memory of size 32kB to 512KB. For the critical code sized applications, 16-bit Thumb instruction set mode reduces code by more than 30%. ARM7 is used since a system requires two UART ports. Performance is enhanced to some extent as compared to PIC microcontrollers.

VI. CIRCUIT DIAGRAM

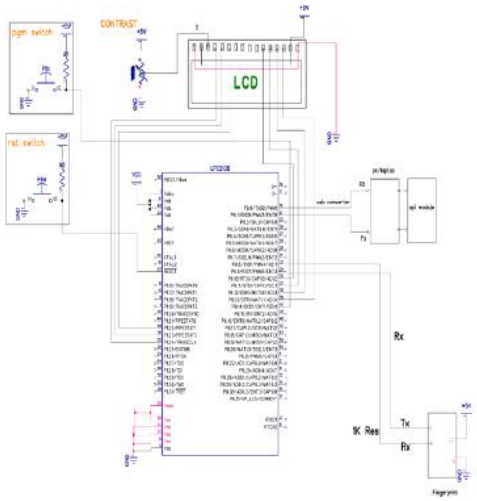
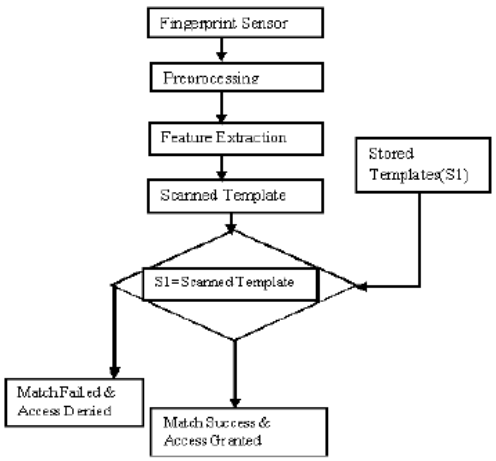


Fig3.Circuit diagram of fingerprint based attendance system

A circuit diagram contains 60-Pin ARM7 based LPC3138 IC.LCD(16x2) is connected to pins of PORT0 and PORT1 randomly. In this system only four data lines of a LCD are used. The system has two switches i.e. RESET SWITCH and PROGRAM SWITCH which are connected to PIN40 and PIN57 respectively. Fingerprint module and PC are connected to the Port0 of LPC2138 IC.

VII. FINGERPRINT MATCHING

Fig: 4.Matching flowchart



VIII. APPLICATIONS

Attendance monitoring system automation is highly used in following applications:

- High security areas like nuclear stations.
- Research Laboratories.
- Colleges and Schools.
- Ordinance Factories.
- Govt. and Private Sectors.
- Research Laboratories.
- Police stations and prison cells.
- Hospitals and pathologies.
- Amusement parks.
- Banks and other security lockers.

IX. CONCLUSION

- The system collects a real time fingerprint image processes the fingerprint image, extracts the fingerprint features, forms the template based on the extracted features and then matches the template against the templates stored in database to mark an attendance. Accordingly, the LCD displays the response of system.
- Wastage of papers and time for the attendance marking is reduced much than the traditional attendance marking system. There is no need for appointing an individual for maintaining the records in the register. The security of the system is enhanced.

X. FUTURE SCOPE

- In highly secured areas like military areas security is the main issue. So, this system can be used for military applications so that only authorized person can have an access and in this way the security can be enhanced.
- This system can also be used in the areas like scientific laboratories.
- Fingerprint system can be replaced by a face recognition systems so that more secured system can be derived.

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