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Fingerprint Based Wireless Attendance System Using Zig-Bee

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ABSTRACT: *This project is designed & developed to record & track student attendance using fingerprint based identification. That allows monitoring of student attendance in class electronically in existing manual system that uses paper sheet, students can easily put a signature of other student who is absent which is also called as "proxy". So to overcome this problem, we have designed fingerprint based wireless attendance system using zig-bee the system is able to see the records of student like his/her overall percentage attendance, subject wise attendance etc. also there is no need to do complex calculation for finding percentage attendance of each & every student manually. The system will calculate it without any error. All the records will be stored in system database graphical user interface. Here to mark student attendance every student just need to press their thumb on machine and their attendance will automatically recorded in computer from device.*

KEYWORDS*:Fingerprint, Zig-Bee, Wireless, Student Attendance.*

I. INTRODUCTION

The attendance system truly reflects staff attendance, which provides references for competent authorities. Management of Attendance is one of the most basic and important management link. Currently, the magnetic card attendance system is widely used. This pattern is flexible and practical. But it has some disadvantages like the card is easy to lose and damage. Lot of literature is available of using fingermarks detection for attendance management. The fingermarks has a lot of advantages, such as well anti fake, permanent, unique, and easy to use it. So it is recognized increasingly by people. The ZIG-BEE technology is an emerging technology developed in recent years. Comparing with some existing wireless technologies, the ZIG-BEE has advantages in low-power and low-cost. It is very suitable for application to wireless sensor networks. Keeping target at the disadvantages of old wire attendance system, a design method of wireless fingerprint attendance system based on ZIG-BEE technology is proposed. It achieves attendance monitoring by fingerprint identification. It realizes cheap cost, low power and high performance fingerprint information acquisition, transmission and recognition function, which provided a new attendance way for enterprises and institutions. In the proposed paper complete development and implementation of the attendance management system is provided. Various modules where it constitute different parts of the attendance management system are explained using their hardware requirement. Also in the end a complete costing of the proposed system is listed.

II. PROPOSED SYSTEM

At the moment, the current system in lecture or lab sessions, lectures will deliver sheets of paper a list of students to enroll in classes for the students who attend it. Cheating in attendance often and easily seen. For example, another student signed his or her friend's attendance. So, to avoid this problem, it is appropriate to develop attendance management system using fingerprint recognition that will track and record the attendance of each student in the class. RFID is easy to produce and copy, but fingerprints are unique to each person. Iris as well, it is a unique retinal tracking system but it takes a long time to scan the retina. Thus, the system is not developed based on the current RFID system in smart card student or retinal tracking system (iris).

III. SYSTEM STRUCTURE AND PRINCIPLE

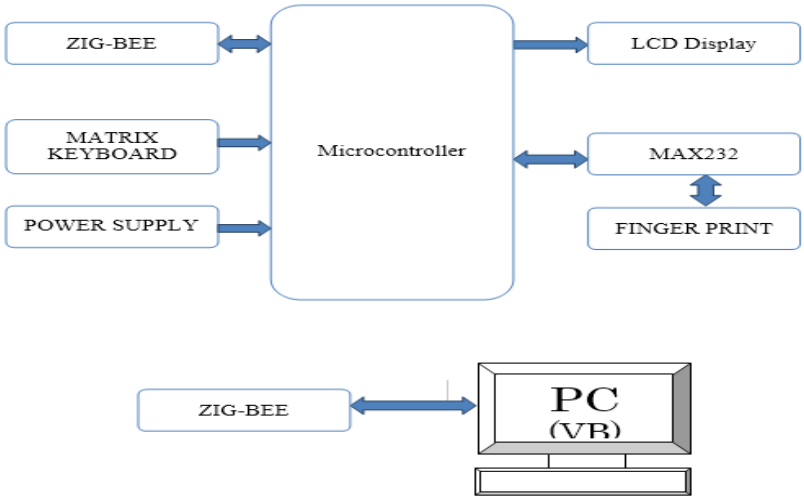

Figure: block diagram

A. Fingerprint module:

This is a finger print sensor module with TTL UART interface. The user can store the finger print data in the module and can configure it in 1:1 or 1: N mode for identifying the person. The FP module can directly interface with 3v3 or 5v Microcontroller. A level converter (like MAX232) is required for interfacing with PC.

B. XBEE Transmitter and Receiver:

The XBEE and XBEE-PRO RF Modules as shown in Fig. 3 were engineered to meet IEEE 802.15.4 standards. They are used to create low cost and low power wireless networks. The modules require very little power and provide reliable delivery of data between devices. The modules operate within the ISM 2.4 GHz frequency band. XBEE Modules are available in two form-factors; Through-Hole and Surface Mount. All XBEEs (with the exception of the XBEE 868LP) are available in the popular 20-pin Through-Hole form-factor. Certain XBEE modules are also available in a 37-pad Surface Mount design, which is popular for higher volume applications due to the reduced manufacturing costs of SMT technology. XBEE uses ZIG-BEE technology. ZIG-BEE is an emerging technology developed in recent years. Comparing with some existing wireless communication technologies, ZIG-BEE has advantages in low-power and low-cost. It is very suitable for application to wireless sensor networks. Low power-usage allows longer life with smaller batteries. Mesh networking provides high reliability and more extensive range. ZIG-BEE chip vendors typically sell integrated radios and microcontrollers with between 60 KB and 256 KB flash memory. ZIG-BEE operates in the industrial, scientific and medical (ISM) radio bands; 868 MHz in Europe, 915 MHz in the USA and Australia, and 2.4 GHz in most jurisdictions worldwide. Data transmission rates vary from 20 to 250 kilobits/second. The ZIG-BEE network layer natively supports both star and tree typical networks, and generic mesh networks.

C. Matrix Keypad:

Keypad is basically used to provide the input to the microcontroller. The keypad consist of micro switches which are connected to the microcontroller pins in a matrix format. Each key is assigned with the special character or symbol or digit. When user press the key the respective assigned ASCII value of that key is provided to the microcontroller via software.

D. Liquid Crystal Display:

LCD is used in a project to visualize the output of the application. We have used 16x2 LCD which indicates 16 columns and 2 rows. So, we can write 16 characters in each line. So, total 32 characters we can display on 16x2 LCD. LCD can also use in a project to check the output of different modules interfaced with the microcontroller. Thus LCD plays a vital role in a project to see the output and to debug the system module wise in case of system failure in order to rectify the problem.

E. Microcontroller:

This unit is the heart of the complete system. It is actually responsible for all the process being executed. The job of this is to continuously scan the data from the RF Receiver, to display the messages on the LCD, to communicate with the network etc. In short we can say that the complete intelligence of the project resides in the software code embedded in the Microcontroller.

IV. CIRCUIT DIAGRAM DESCRIPTION

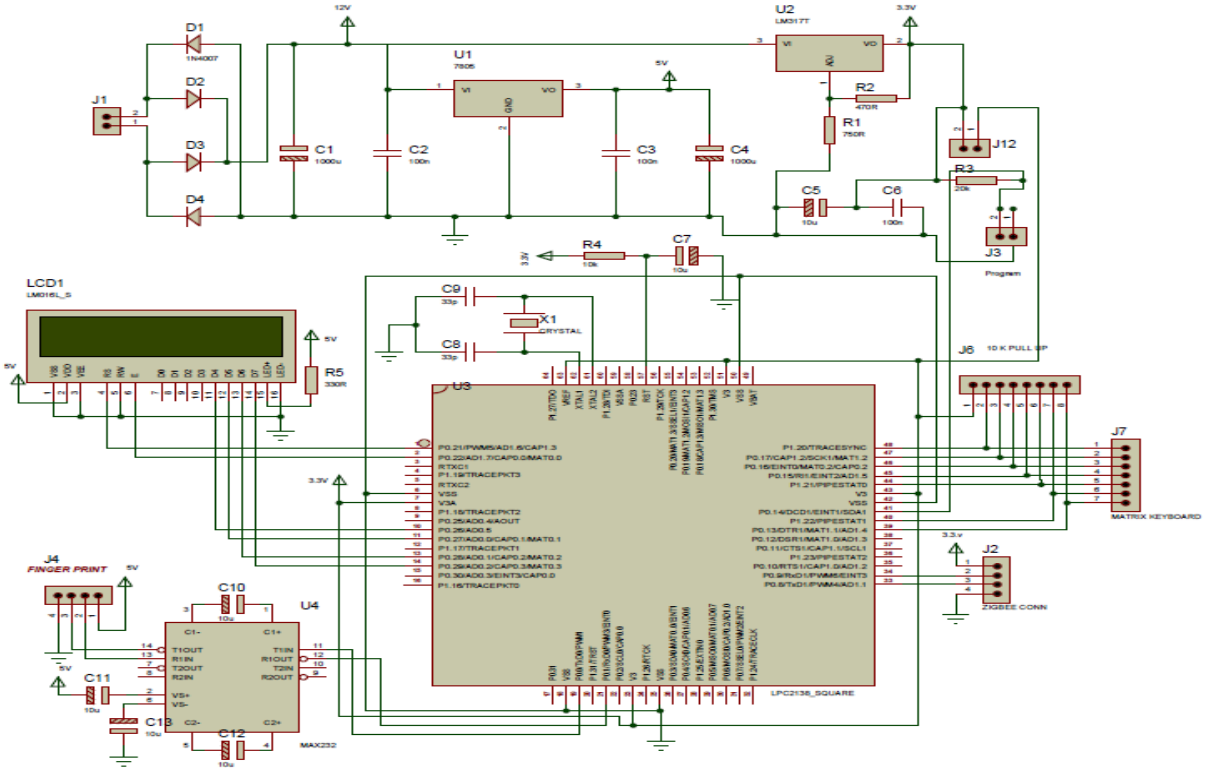

Figure: circuit diagram

RESET & CRYSTAL DESIGN

A. RESET CIRCUIT:

Reset is used for putting the microcontroller into a 'known' condition. That practically means that microcontroller can behave rather inaccurately under certain undesirable conditions. In order to continue its proper functioning it has to be reset, meaning all registers would be placed in a starting position. Reset is not only used when microcontroller doesn't behave the way we want it to, but can also be used when trying out a device as an interrupt in program execution, or to get a microcontroller ready when loading a program. Recommended time of reset = 1 µsec Here the RC time can vary from 10 µsec to 1 msec. In order to prevent from bringing a logical zero RESET pin accidentally, RESET has to be connected via resistor to the positive supply pole AND a capacitor from RESET to the ground. Resistor should be between 5 and 10K and the capacitor can be in between 1µf tp 10 µf. This kind of resistor capacitor combination, gives the RC time delay for the µc to reset properly

As shown in the above circuit we are connecting an RC circuit to the RESET (pin 57) of µC .The ARM µC has an active low reset, therefore we connect an RC circuit. As shown the capacitor is initially at 0v.It charges via the supply through a 10 kohm resistance in series, therefore the reset time of our circuit is:

R*C = 10kohm * 0.1 µf = 1 msec

Recommended time of reset = 1 µsec

Here the RC time can vary from 10 µsec to 1 msec.

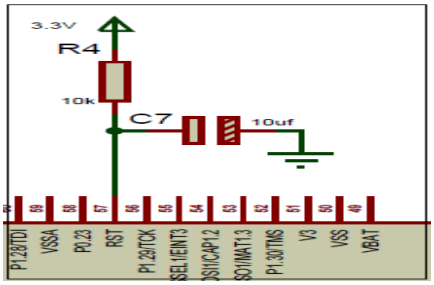

Fig- Reset Circuit

B. CRYSTAL DESIGN:

Pins OSC1 & OSC2 are provided for connecting a resonant network to form oscillator. Typically a quartz crystal and capacitors are employed. The crystal frequency is the basic internal clock frequency of the microcontroller. The

manufacturers make available PIC designs that can run at specified maximum & minimum frequencies, typically 1 Mhz to 32 Mhz. here we are connecting two ceramic capacitors which are basically used for filtering.In other words.to give a pure square wave to the µC we are connecting the two capacitorsThe basic rule for placing the crystal on the board is that it should be as close to the µC as possible to avoid any interference in the clock

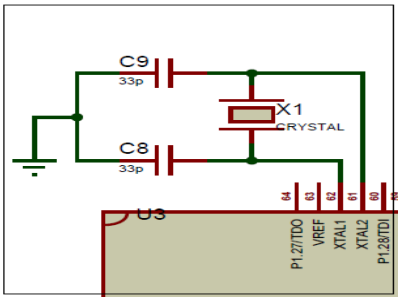

Fig- Crystal Design

C. RS 232:

RS 232 IC is a driver IC to convert the µC TTL logic(0-5) to the RS 232 logic (+-9v).Many device today work on RS 232 logic such as PC, GSM modem, GPS etc. . . .so in order to communicate with such devices we have to bring the logic levels to the 232 logic (+/-9v).

Here as we can see the RS 232 chip has 2 pairs of TTL and 232 logic viz, pair 1: Pin 7,8,9,10 of RS 232 Pair 2 : pin 11,12,13,14 of RS 232

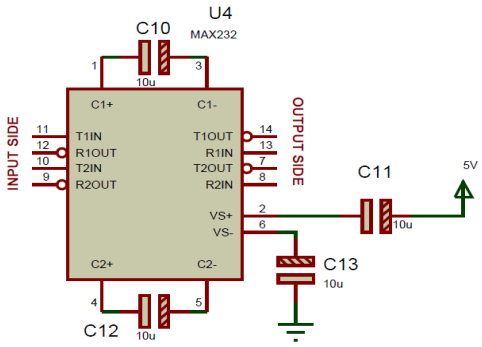

FIG- RS 232

We can use any one pair in our project either 7,8,9,10 pair or 11,12,13,14 pair. If we require 2 serial ports then Depending on the requirement of the project we may have to use both the pair in the same project.

The µC works on TTL logic (0-5 v).So to convert the TTL logic to 232 logic we use the 4 capacitors connected to the RS232 IC. These capacitors are called charge pumps used to convert the TTL voltage to the +/- 9 v swing required by the 232 IC.

D. Dual Charge-Pump Voltage Converter:

The MAX220–MAX249 have two internal charge-pumps that convert +5V to ±10V (unloaded) for RS-232 driver operation. The first converter uses capacitor C1 to double the +5V input to +10V on C3 at the V+ output. The Second converter uses capacitor C2 to invert +10V to -10V on C4 at the V- output.

V. CONCLUSION

A design method of wireless fingerprint attendance system based on ZigBee technology is proposed. The paper gives the system hardware circuit and software flow chart. Considering low-rate and short-distance characteristic of ZigBee technology, ZigBee network structure and transmission mode is improved. The transmission time is saved over one third and transmission efficiency is improved greatly. The system realized low-cost, low-power, efficient and stable attendance function. It has important reference and practical value for security, finance, credit consumption, immigration management and the other fingerprint recognition field.

There are although a few limitations that are as follows:

- The system would fail if it is not kept on always.
- If a student gets hurt on the finger he has put in the system he will have to get it changed otherwise he will not be marked present.
- The security of biometric device is a must.
- The location of the student will only by known till the student is in campus.

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