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Finger Print Based Electronic Voting System Using ARM7LPC2148 for Rigging Free Governance

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ABSTRACT:

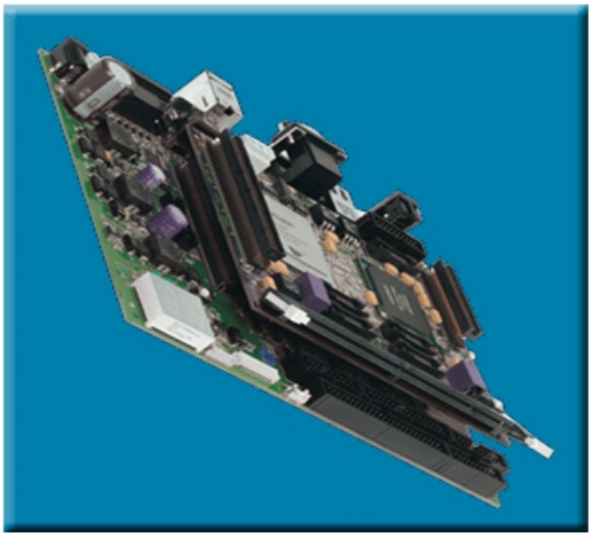
According ancient Greek scripts BIOMETRICS means study of life. Biometrics studies commonly include fingerprint, face, iris, voice, signature, and hand geometry recognition and verification. Many other modalities are in various stages of development and assessment. Among these available biometric traits Finger Print proves to be one of the best traits providing good mismatch ratio and also reliable.

Firstly discussing about Biometrics we are concentrating on Fingerprint scanning. For this we are using FIM 3030N high voltage module as a scanner. This module has in-built ROM, DSP and RAM. This module can operate in 2 modes they are Master mode and User mode. We will be using Master mode to register the fingerprints which will be stored in the ROM present on the scanner with a unique id and in Master mode we can register only 20 users.

When this module is interfaced to the LPC2148, we will be using it in user mode. In this mode we will be verifying the scanned images with the stored images. When coming to our application, only authorized persons can be available for voting and they should not vote for a person more than once, there by avoiding rigging.

This scanner is interfaced to LPC2148 microcontroller. By using this controller we will be controlling the scanning process. After the scanning has been completed the person has to press a key among available switches, immediately one vote is credited and stored in the EEPROM. After the voting has been completed if he presses the switch again, the vote will not be considered. If an unauthorized person tries to scan his image then an indication will be given by a buzzer which is interfaced to the controller.

ARM PROCESSOR:



ARM7TDMI Processor Core:

- Current low-end ARM core for applications like digital mobile phones
- TDMI

oT: Thumb, 16-bit compressed instruction set

oD: on-chip Debug support, enabling the pro cessor to halt in response to a debug request

oM: enhanced Multiplier, yield a full 64-bit result, high performance

oI: Embedded ICE hardware

- Von Neumann architecture

The LPC2148 are based on a 16/32 bit ARM7TDMI-S™ CPU with real-time emulation and embedded trace support, together with 128/512 kilobytes of embedded high speed flash memory.

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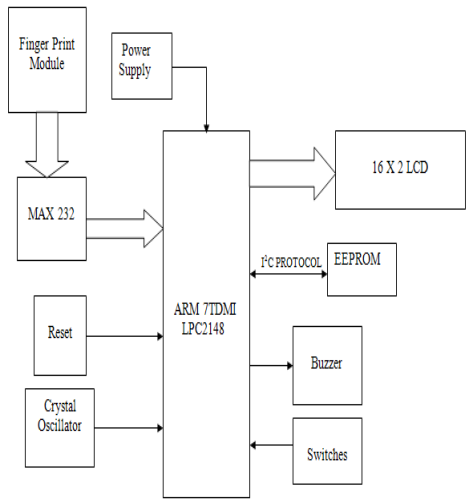
A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at maximum clock rate. For critical code size applications, the alternative 16-bit Thumb Mode reduces code by more than 30% with minimal performance penalty. With their compact 64 pin package, low power consumption, various 32-bit timers, 4- channel 10-bit ADC, USB The LPC2148 are based on a 16/32 bit ARM7TDMI-S™ CPU with real-time emulation and embedded trace support, together with 128/512 kilobytes of embedded high speed flash memory. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at maximum clock rate. For critical code size applications, the alternative 16-bit Thumb Mode reduces code by more than 30% with minimal performance penalty. With their compact 64 pin package, low power consumption, various 32-bit timers, 4- channel 10-bit ADC, USB PORT,PWM channels and 46 GPIO lines with up to 9 external interrupt pins these microcontrollers are particularly suitable for industrial control, medical systems, access control and point-of-sale.

With a wide range of serial communications interfaces, they are also very well suited for communication gateways, protocol converters and embedded soft modems as well as many other general-purpose applications. This project uses two power supplies, one is regulated 5V for modules and other one is 3.3V for LPC2148. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac out put of secondary of 230/12V step down transformer.

BLOCK DIAGRAM:

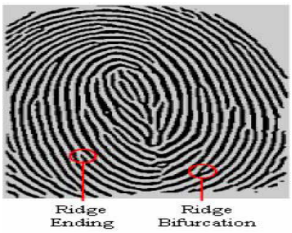


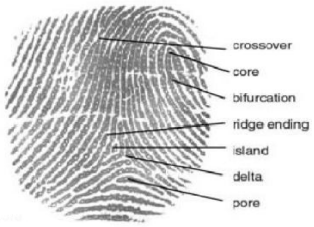
Finger print identification:

The fingerprint identification process will change slightly between products and systems. Standard systems are comprised of a sensor for scanning a fingerprint and a processor which stores the fingerprint database and software which compares and matches the fingerprint to the predefined database. Within the database, a fingerprint is usually matched to a reference number, or PIN number which is then matched to a person's name or account.

The basic information about fingerprint is that it is unique for each person. Even a twin brother will not have the same fingerprint. Thus each fingerprint is used to store a unique identifiable piece of information. The uniqueness in each fingerprint is due to the peculiar genetic code of DNA in each person.

This code causes the formation of a different pattern of our fingerprint. A fingerprint consists of ridges and valleys. They together provide friction for the skin. The main identification of the skin is based upon the minutiae, which actually is the location and direction of the ridge endings and splits along a ridge path.





The image shows all the other characteristics of a fingerprint. These characteristics may also be helpful during the process of minutiae extraction. The unique information used for the identification includes the flow of the friction ridges, the sequence and also the presence/absence of the individual friction ridge path features.

Working of Fingerprint scanner :

There are mainly two types of scanning methods for this technology. Either an optical or capacitance scanner is used to scan and make a picture of your finger. Though both the methods produce the same type of image, the making of it is completely different.

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This scanned image is then compared with an earlier existing finger print of yours to get the correct identity. The comparison is carried out by the processor and the comparison is made between the valleys and ridges though your whole fingerprint is recorded, the computer takes only parts of the print to compare with other records.

Optical Scanner:

The electrical signal created in response to the light hitting on the CCD (charge coupled device) forms pixels which are collectively joined to form an image. The heart of an optical scanner is a charge coupled device (CCD), the same light sensor system used in digital cameras. A CCD is simply an array of light-sensitive diodes called photosites, which generate an electrical signal in response to light photons. Each photosite records a pixel, a tiny dot representing the light that hit that spot. Collectively, the light and dark pixels form an image of the scanned scene (a finger, for example). Typically, an analogue to digital converter in the scanner system processes the analog electrical signal to generate a digital representation of this image.

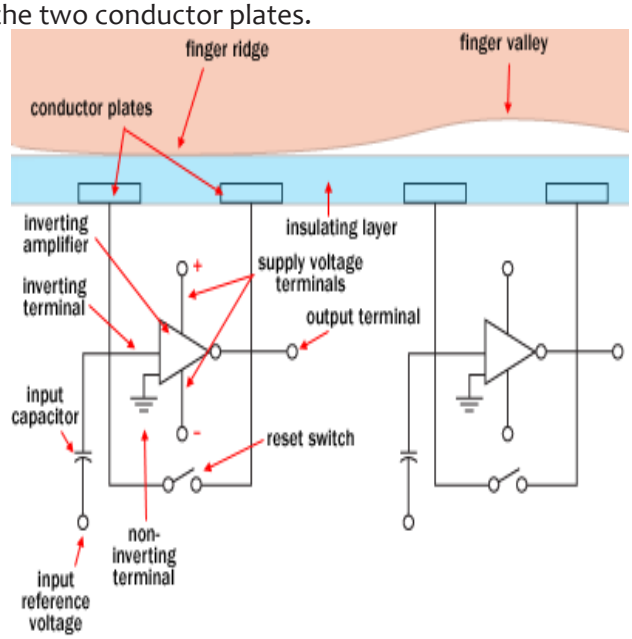
The scanning device consists of a glass plate, on top of which you are supposed to place your finger. After the scanning takes place, an inverted image of the finger is stored. This image will show the ridges and valleys of your finger. The ridges can be spotted by the darker areas where the light reflection is greater. The valleys can be spotted by the lighter areas, where the light reflected is lesser. The scanner is also designed to re-check the image captured. The scanner checks whether the image captured has satisfactory pixel darkness. If a problem is seen in the checking process, the image will be rejected and the suitable adjustments will be made so as to get a better quality picture. After all these procedures, the image will be compared with the existing stored images.

Before comparing the print to stored data, the scanner processor makes sure the CCD has captured a clear image. It checks the average pixel darkness, or the overall values in a small sample, and rejects the scan if the overall image is too dark or too light. If the image is rejected, the scanner adjusts the exposure time to let in more or less light, and then tries the scan again.

If the darkness level is adequate, the scanner system goes on to check the image (how sharp the fingerprint scan is). The processor looks at several straight lines moving horizontally and vertically across the image. If the fingerprint image has good definition, a line running perpendicular to the ridges will be made up of alternating sections of very dark pixels and very light pixels. If the processor finds that the image is crisp and properly exposed, it proceeds to comparing the captured fingerprint with fingerprints on file. We'll look at this process in a minute.

Capacitance Scanner:

Capacitance scanner uses electrical current to display the image. The principle of capacitance is used in this device. As shown in the diagram, each sensor consists of arrays of cells. These cells have two conductor plates, which are covered with an insulating layer. Thus, they form a simple capacitor which is used to store the charge. The cells are so small that their actual size will be smaller than the width of a ridge from our finger. These sensors will then be connected to an integrator. The output of the integrator will be given to the input of an inverting operational amplifier. This op-amp will consist of hundreds of transistors, resistors and capacitors. This op-amp is alters the input voltage with respect to the reference voltage provided to the other input. The non-inverting input is connected to the ground. The inverting input is given to the reference voltage and then to the feedback circuit. This feedback circuit is given to the amplifier output and also includes the two conductor plates.



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When the finger is placed for recognition, it acts as another capacitor plate. It is separated with the help of insulating layers. When moving the finger from one point to another, the capacitance changes due to the variation in distance between the capacitor plates Thus, the output voltage is recorded with the change in output voltage according to the appearance of ridges and valleys. A perfect output image of the fingerprint is thus obtained.

This device is much better than an optical scanner as it is very compact and harder to trick. The device needs a real fingerprint shape to get the output. The optical scanner a dark and light pattern is more than enough to make an output image. Though an optical scanner needs CCD devices for sensing, a capacitance scanner needs only semi-conductor chips.

Advantages of fingerprint reader:

- You are actually able to provide a physical evidence of yourself.
- This type of an identity cannot be easily faked like identity cards.
- Though you can guess a password of another person, it cannot be done so in the case of a fingerprint.
- You may lose your identity card. But, you are not going to lose your fingerprint; the same will be the case of a password.

Working procedure of this project

- We need to operate this in two modes.
- One is to register the images of voters.
- The other one is to poll their vote.
- If the voter is authorized then that will be displayed on LCD
- If he/she is not authorized then that will be indicated on LCD so that polling officer can take necessary action and their vote will not be counted by the controller
- Counting of the votes will also be done immediately.

Advantages:

No manual errors

No false Voting

Need not remember any password

Need not to carry any card

Applications:

- Government Elect]ions
- Company / Corporate internal elections
- Union Elections

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