Design and Implementation of a Finger Print Based Lock System for Secured Transactions

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ABSTRACT

Security has always been a major concern for the households and the office environment, and for this concern various approaches are in place to address the problem. Most of the major door lock security systems creates a concern for a secure lifestyle and proper working environment. Now-a-days there is a need for a secure systems to prevent unauthorized access especially in shared access environment. Fingerprints of the authorized users are enrolled and verified to provide access to a facility that is used by multiple users. A user can also be removed and a new user can be enrolled in the system. In this project we are implementing fingerprint sensor, vibrate sensor and fire sensor. we are using ARM7 (LPC2148) which controls and communicate with other sensor and gives the desired output that provide physical security using the finger print sensor technology.

Keywords: Bio-metrics, Fingerprint sensor, Security System, Authorization

I. INTRODUCTION

These days office/corporate environment security is a major threat faced by every individual when away from home or at the home. When it comes to security systems, it is one of the primary concerns in this busy competitive world, where human cannot find ways to provide security to his confidential belongings manually. Instead, He finds an alternative solution which provides better, reliable and atomized security. This is an era where everything is connected through network, where anyone can get hold of information from anywhere around the world. Thus chances of one's info being hacked are a serious issue. Due to these risks it's very important to have some kind of personal identification to access one's own info. Now a day's personal identification is becoming an important issue all around. Among mainstream personal identification methods we mostly see password and identification cards techniques. But it is easy to hack password now and identification cards may get lost, thus making these methods quite unreliable.

There are certain situations which are very annoying like when a person locks himself out of his house or office or he leaves his key inside or sometimes when a thief just breaks the lock and steals everything. These kinds of situations always trouble people who use manual door lock with keys. Although in some places people use smart cards, there might arise a situation when someone loses the card or keeps the card inside. Then in other scenarios there are caretakers for locking houses or offices and keeping the keys safe. But then again there are times when a person in charge of the keys might not be available

or has gone to some emergency routine, which can cause unwanted delay for people who need the key straightaway. These are some of the hassles that people might face when using keys or smart cards. That is when our system, fingerprint based lock system comes into play. Our design is implemented to provide better securities as users don't need to remember passwords and don't need any sort of keys or cards that often get lost. If

someone's fingerprint is authorized in the system he would not face any sort of delays to enter a room. Finger print recognition is one of the most secure systems because a fingerprint of one person never matches with the others. Therefore unauthorized access can be restricted by designing a lock that stores the fingerprints of one or more authorized users and unlock the system when a match is found. Bio-metrics authorization proves to be one of the best traits because the skin on our palms and soles exhibits a flow like pattern of ridges on each fingertip which is unique and immutable. This makes fingerprint a unique identification for everyone. The popularity and reliability on fingerprint scanner can be easily guessed from its use in recent hand-held devices like mobile phones and laptops.

II. BLOCK DIAGRAM
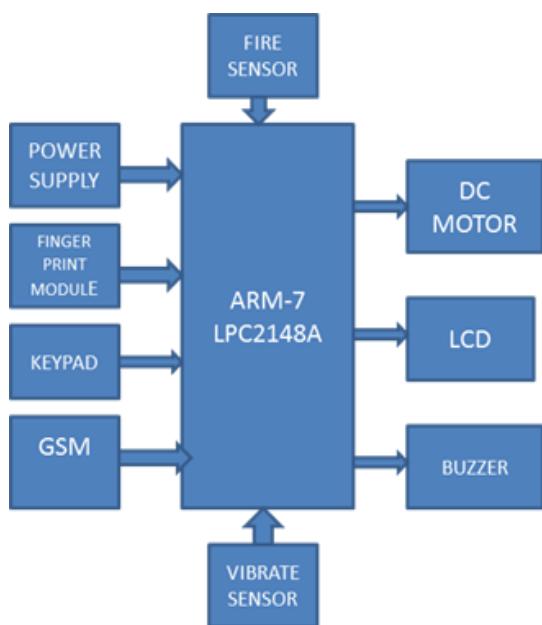
Figure 1. Block diagram Description:

Here in this project used 5v and 12v supply,12v supply for relay driver and 5v used to each other components .Fingerprint module scan the fingerprint and send to the microcontroller and verifying the scanned fingerprint with the stored fingerprint. The stored fingerprint id is displayed over the LCD.Here relay is complemented and locker system is connected with relay, So locker is opened. Hence it can only be opened when an authorized user is present. In this project we are implementing fingerprint sensor, force sensor, accelerometer sensor and fire sensor. we are using ARM7 (LPC2148) which controls and communicate with other sensor and gives the desired output that provide physical security using the finger print sensor technology.

III. HARDWARE REQUIREMENTS

1. POWER SUPPLY
2. ARM7 BASED LPC2148
3. FINGER PRINT MODULE
4. GSM
5. LIQUID CRYSTAL DISPLAY
6. DC MOTOR
7. FIRE SENSOR
8. VIBRATION SENSOR

1. POWER SUPPLY
The power supply section is the section which provide +5V for the components to work. IC LM7805 is used for providing a constant power of +5V.
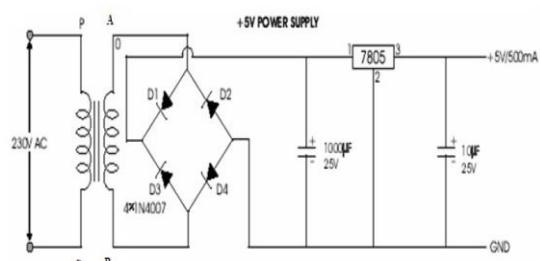

Figure 2. Circuit Diagram for Power Supply

The ac voltage, typically 220V, is connected to a transformer, which steps down that ac voltage down

to the level of the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation. A regulator circuit removes the ripples and also retains the same dc value even if the input dc voltage varies, or the load connected to the output dc voltage changes. This voltage regulation is usually obtained using one of the popular voltage regulator IC units.

2.ARM7 (LPC2148)

The LPC2148 microcontrollers are based on a 32/16 bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combines the microcontroller with embedded high speed flash memory ranging from 32 kB to 512 kB. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at the maximum clock rate. For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30 % with minimal performance penalty.

Due to their tiny size and low power consumption, LPC2148 are ideal for applications where miniaturization is a key requirement, such as access control and point-of-sale. A blend of serial communications interfaces ranging from a USB 2.0 Full Speed device, multiple UARTs, SPI, SSP to I2Cs, and on-chip SRAM of 8 kB up to 40 kB, make these devices very well suited for communication gateways and protocol converters, soft modems, voice recognition and low end imaging, providing both large buffer size and high processing power

Pin Diagram
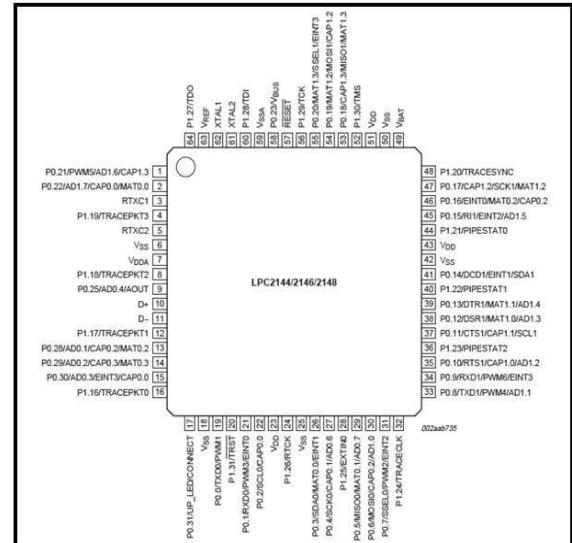
Figure 3

Pin Description

PORT 0 is a 32-bit I/O port with individual direction controls for each bit. Total of 28 pins of the Port 0 can be used as a general purpose bi-directional digital I/Os while P0.31 provides digital output functions only. The operation of port 0 pins depends upon the pin function selected via the pin connect block. Pins P0.24, P0.26 and P0.27 are not available.

PORT 1 is a 32-bit bi-directional I/O port with individual direction controls for each bit. The operation of port 1 pins depends upon the pin function selected via the pin connect block. Pins 0 through 15 of port 1 are not available.

3.FINGERPRINTMODULE:

Figure 4. Fingerprint module

Fingerprints are one of several forms of biometrics, used to recognize persons and verify their identity. The analysis of fingerprints for identical purposes generally requires the similarity of several features of the print pattern. This is a fingerprint 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 someone. The finger print module can directly interface with 3v3 or 5v Microcontroller.

Features:

➢ Power DC : 3.6V-6.0V
➢ Interface : UART(TTL logical level)/ USB 1.1
➢ Working current:100Ma
➢ Peak Current : 150mA
➢ Matching Mode: 1:1 and 1:N
➢ Character file size: 256 bytes
➢ Image acquiring time : <0.5s
➢ Template size : 512 bytes
➢ Storagecapacity:120

4.GLOBAL SYSTEM FOR MOBILE(GSM):

GSM is used to establish communication between a computer and a GSM system. GSM is an architecture used for mobile communication in most of the countries. GSM module consists of a GSM/GPRS modem assembled together with power supply circuit and communication interfaces (like RS-232, USB, etc) for computer. GSM/GPRS MODEM is a class of wireless MODEM devices that are designed for communication of a computer with the GSM and GPRS network. It requires a SIM (Subscriber Identity Module) card just like mobile phones to activate communication with the network. Also they have IMEI (International Mobile Equipment Identity) number similar to mobile phones for their identification. A GSM/GPRS MODEM can perform the following operations:

1. Receive, send or delete SMS messages in a SIM.
2. Read, add, search phonebook entries of the SIM.
3. Make, Receive, or reject a voice call.

The MODEM needs **attention commands**, for interacting with processor or controller, which are communicated through serial communication. These commands are sent by the controller/processor. The MODEM sends back a result after it receives a command. Different AT commands supported by the MODEM can be sent by the processor/controller/computer to interact with the **GSM and**

GPRS cellular network
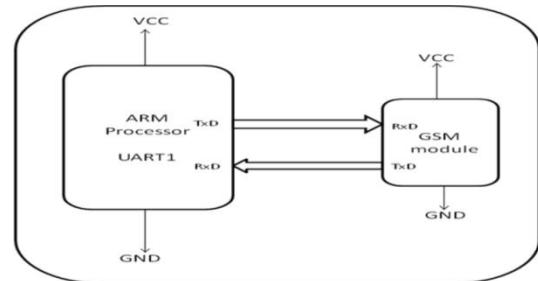
Figure 5

Features

• Quad-Band 850/ 900/ 1800/ 1900 MHz
• Dual-Band 900/ 1900 MHz
• GPRS multi-slot class 10/8GPRS mobile station class B
• Compliant to GSM phase 2/2+Class 4 (2 W @850/ 900 MHz)
• Class 1 (1 W @ 1800/1900MHz)
• Control via AT commands (GSM 07.07 ,07.05 and SIMCOM enhanced AT Commands)
• Low power consumption: 1.5mA(sleep mode)
• Operation temperature: -40°C to +85 °C

5.LIQUID CRYSTAL DISPLAY:
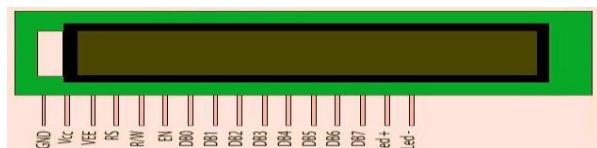
Figure 6 . LCD Display

The board which we used is shipped with 16*2 character LCD display. LCD is used to display message access granted and access denied. In LCD has16 characters per line by 2 lines and 20 characters per line by 2 lines, respectively.

When lockers will be open and close.LCD display is used

for the displaying the message or to open and close the door and also display the enter the password etc.

Pin description of LCD:

Pins and LCDs with 2 controller has 16 Pins (two pins are extra in both for back-light LED connections).

Pin No.	Name	Description
Pin no. 1	D7	Data bus line 7 (MSB)
Pin no. 2	D6	Data bus line 6
Pin no. 3	D5	Data bus line 5
Pin no. 4	D4	Data bus line 4
Pin no. 5	D3	Data bus line 3
Pin no. 6	D2	Data bus line 2
Pin no. 7	D1	Data bus line 1
Pin no. 8	D0	Data bus line 0 (LSB)
Pin no. 9	EN1	Enable signal for row 0 and 1 (1ˢᵗ controller)
Pin no. 10	R/W	0 = Write to LCD module 1 = Read from LCD module
Pin no. 11	RS	0 = Instruction input 1 = Data input
Pin no. 12	VEE	Contrast adjust
Pin no. 13	VSS	Power supply (GND)
Pin no. 14	VCC	Power supply (+5V)
Pin no. 15	EN2	Enable signal for row 2 and 3 (2ⁿᵈ controller)
Pin no. 16	NC	Not Connected

6.Fire sensor

The Fire sensor, as the name suggests, is used as a simple and compact device for protection against fire. The module makes use of IR sensor and comparator to detect fire up to a range of 1 - 2 meters depending on fire density
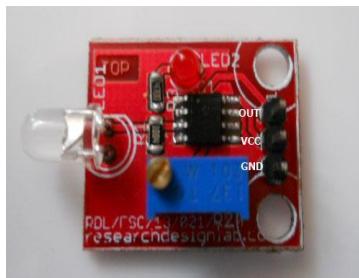
Figure 7. fire sensor

Features

- Allows your robot to detect flames from 2m away.
- Fire indicator led.
- Calibration preset for range adjustment.

7.DC MOTOR:

A **DC motor** is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor.

DC motors were the first type widely used, since they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight motor used for portable power tools and appliances. Larger DC motors are used in propulsion of electric vehicles, elevator and hoists, or in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications.


Figure 8 . Dc motor

8.Vibration sensor:

Vibration sensors are sensors for measuring, displaying, and analyzing linear velocity, displacement and proximity, or acceleration. Vibration — however subtle and unnoticed by human senses — is a telltale sign of

machine condition. Shear mode accelerometer designs feature **sensing** crystals attached between a center post and a seismic mass. ... Under acceleration, the mass causes a shear stress to be applied to the **sensing** crystals. This stress results in a proportional electrical output by the piezoelectric material.
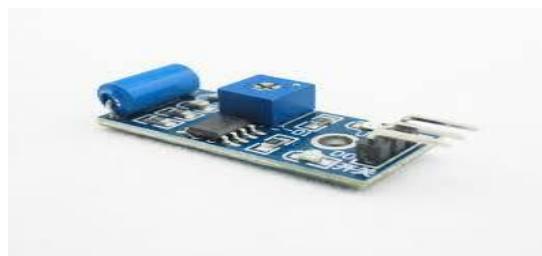
Figure 9. vibration sensor

IV. FLOWCHART
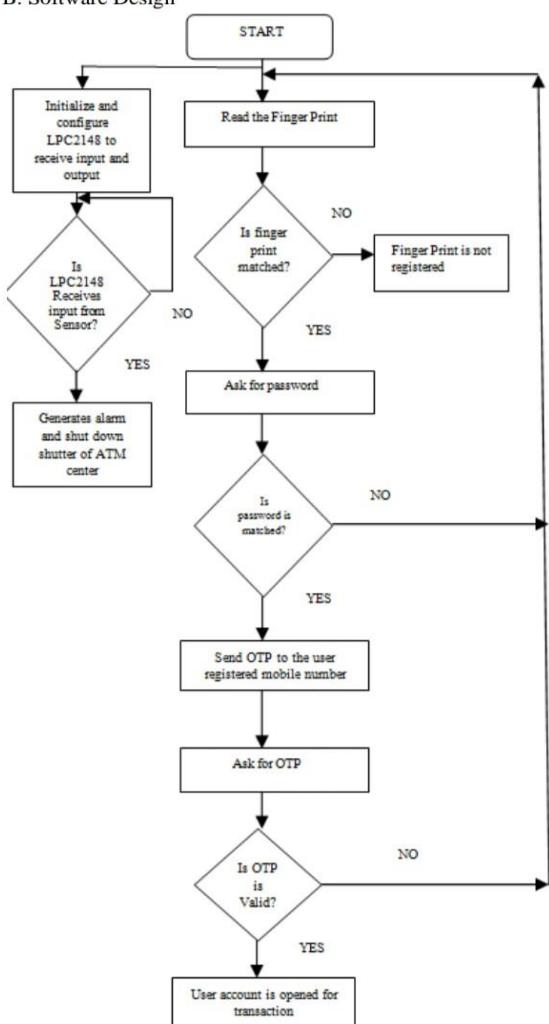
Figure 10. Flowchart of entire system.

As shown in Figure when a finger is placed on the sensor, it will read the print and match it with the fingerprints saved inside it. If no match is found, the device will not do anything. If a match is found, it will play one buzz and trigger the electronic lock to unlock the doorway.

In addition to the fingerprints saved in the device, a 4- digit password will be saved. The keypad can be used to enter the password for access. Each key pressed will make a low beeping sound, upon entering the code; if right code is entered the door will open with a single buzz. If wrong code is entered, the door will remain locked and beep twice. Upon 3 failed attempts the door will buzz continuously for 3 seconds.

- A switch will be installed inside the doorway. Upon pressing it the door will unlock with a single buzz.

V. SOFTWARE REQUIREMENTS

Language used:
EMBEDDED C: Embedded C is a set of language extension for the C programming language by the C standards committee to address commonality issues that exist between C extensions for different embedded system. Embedded C uses most of the syntax and semantics of standard C, eg : main()function, variable definition, data type declaration, conditional statements , loops, arrays and strings etc.

SOFTWARE USED:
1. **KEIL COMPILER:** Keil development tools for the 8051-micro controller architecture support every level of software developer from the professional applications to the learning about embedded software development. The industry standard keil C compiler, micro assembler, debuggers, real time kernels, single-board computers and emulators support all 8051 derivatives.
2. **FLASH MAGIC:** "flash magic is a tool which used to program hex code in EPROM of microcontroller. it

is a freeware tool. it only supports the microcontroller of Philips and NXP. you can burn hex code in to those controllers which supports ISP feature".

3. PROTEUS: Proteus combines ease of use powerful features to help you design, test and layout professional PCBs like never before. With nearly 800 micro controller variants ready for simulation straight from the schematic, one of the most intuitive professional PCB layout packages on the market and a world class shape based autoroute included as standard, proteus design suite 8 delivers the complete software package.

ADVANTAGES:
1. It is simple and unique.
2. Security

APPLICATIONS:
 Automatic teller machine(ATM).

VI. CONCLUSON

The design and implementation of fingerprint based lock system is customized and flexible.This door locking mechanism is comparatively cost-effective than the available lock system .It has high accuracy rate and is also quick to recognize fingerprints which enable seamless integration with the users and provides tighter security. The system is very secure and the sensor is able to identify most of the prints during testing. It provides greater control for access to restricted places.
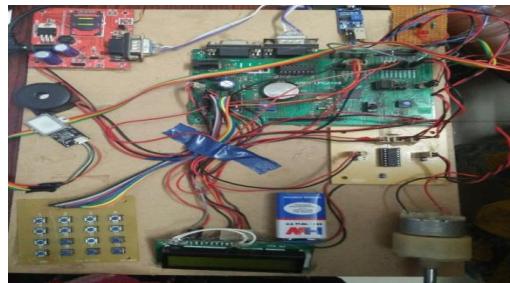
VII.   RESULTS

Figure 11. Hardware part of the project
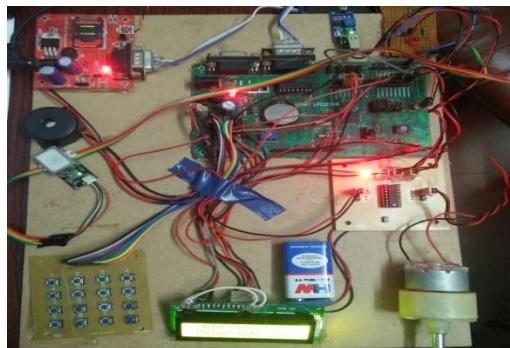
Figure 12. When kit is on


Figure 13. Initial setup in LCD
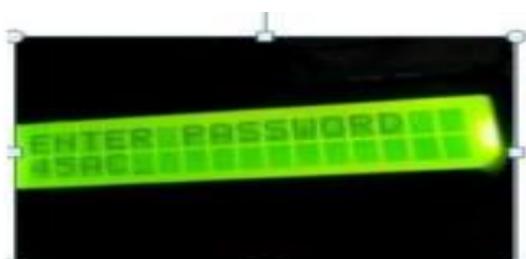
Figure 14. Entering password

Figure 15. Motor runs and door opens

Figure 16. Place the Finger
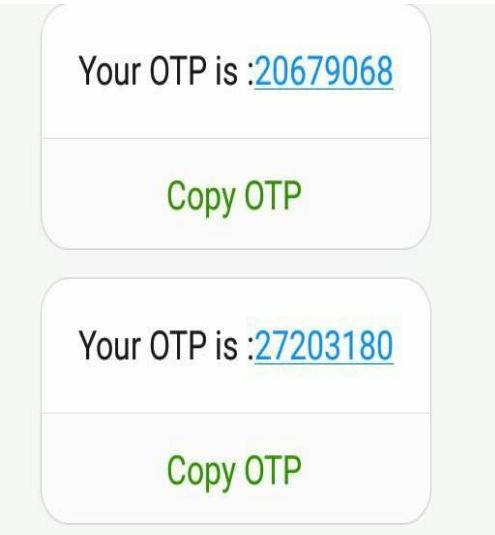
Figure 17. One time password

Figure 18. Otp message display

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