L&T Technology Services

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FINGERPRINT BASED BIOMETRIC ATTENDANCE SYSTEM

1 INTRODUCTION
1.1 OBJECTIVE

Biometric Attendance systems are commonly used systems to mark the presence in school, college, business organization, offices where marking of attendance is required accurately with time. Fingerprint based biometric Attendance system is proposed. By using the fingerprint sensor, the system will become more secure for the users. The Biometric Attendance system is designed using an AVR microcontroller.
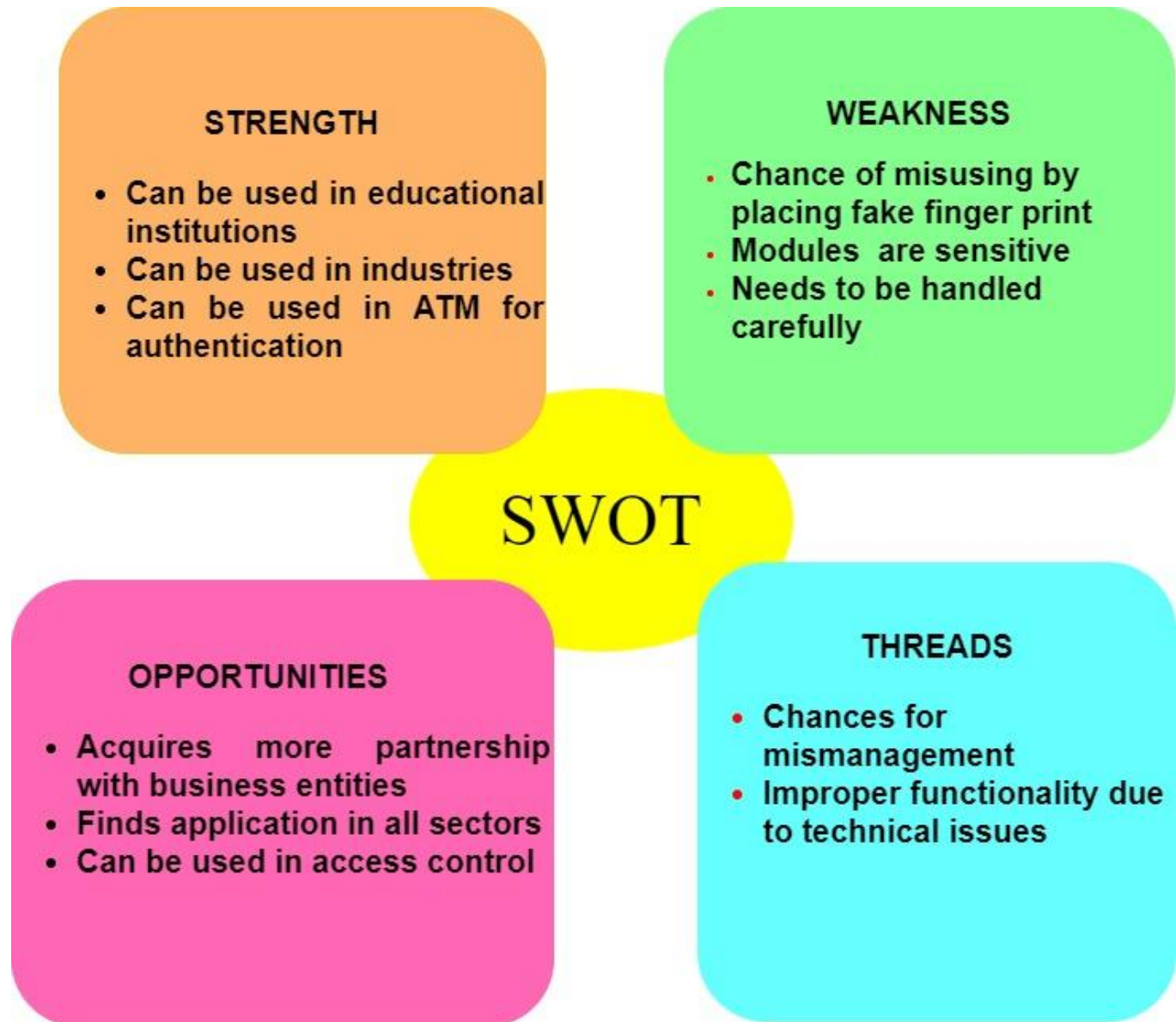
1.2 FINGERPRINT BASED BIOMETRIC ATTENDANCE SYSTEM PRINCIPLE

Fingerprint identification is based on the fact that no two persons will have the same fingerprint in this world. Finger print module differentiates between two fingers based on the ridges and valleys on finger print. Main heart of the circuit is the **fingerprint module.** This sends commands to the controller whenever the fingerprint is matched. Microcontroller receives these commands from the finger print module and uses the internal EEPROM to store the attendance. Keypad is used to send the requests to the controller either to enroll the new one or to save the attendance or to exit. LCD displays display the messages related to the commands received.

1.3 FEATURES OF THE SYSTEM
- Integrated image collecting and algorithm chip together, ALL-in-One
- Fingerprint can conduct secondary development & embedded into a variety of end products
- Low power consumption, low cost, small size, excellent performance

1.4 SWOT ANALYSIS

STRENGTH

- Can be used in educational institutions
- Can be used in industries
- Can be used in ATM for authentication

WEAKNESS

- Chance of misusing by placing fake finger print
- Modules are sensitive
- Needs to be handled carefully

SWOT

OPPORTUNITIES

- Acquires more partnership with business entities
- Finds application in all sectors
- Can be used in access control

THREADS

- Chances for mismanagement
- Improper functionality due to technical issues

1.5 4 W & 1 H ANALYSIS

- **WHAT** - Biometric Attendance system is used to mark the attendance along with time and date automatically by using the fingerprint which is placed on the sensor.

- **WHERE** - Wide application in school, college, business organization, offices where marking of attendance is required accurately with time.

- **WHEN** - Can be used whenever required in order to mark attendance.

- **WHY** - Biometric Attendance system is capable of marking and maintaining attendance without any manual needs and hence the attendance marked is accurate and precise.

- **HOW -** By building the perfect system, testing and executing it.

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2 REQUIREMENTS

## 2.1 HIGH LEVEL REQUIREMENTS

ID	DESCRIPTION	CATEGORY	STATUS
HR01	User should be able to register his/her fingerprint	Technical	Upheld
HR02	System should be able to match input fingerprint	Technical	Upheld
HR03	System should be able to save attendance with accurate date and time	Technical	Upheld
HR04	System should have human interface	Technical	Upheld
HR05	System stored and maintain attendance	Technical	Upheld

2.2 LOW LEVEL REQUIREMENTS

| ID	DESCRIPTION	HLR ID	STATUS
LR01	System should have fingerprint sensor module to sense the fingerprint	HR01	Upheld
LR02	System should have external memory to match fingerprint	HR02	Upheld
LR03	System must have RTC module to set date and time	HR03	Upheld
LR04	System must have LCD and keypad for human interface	HR04	Upheld
LR05	System should have external memory to store fingerprint	HR05	Upheld

3 SYSTEM DESIGN

3.1 BLOCK DIAGRAM
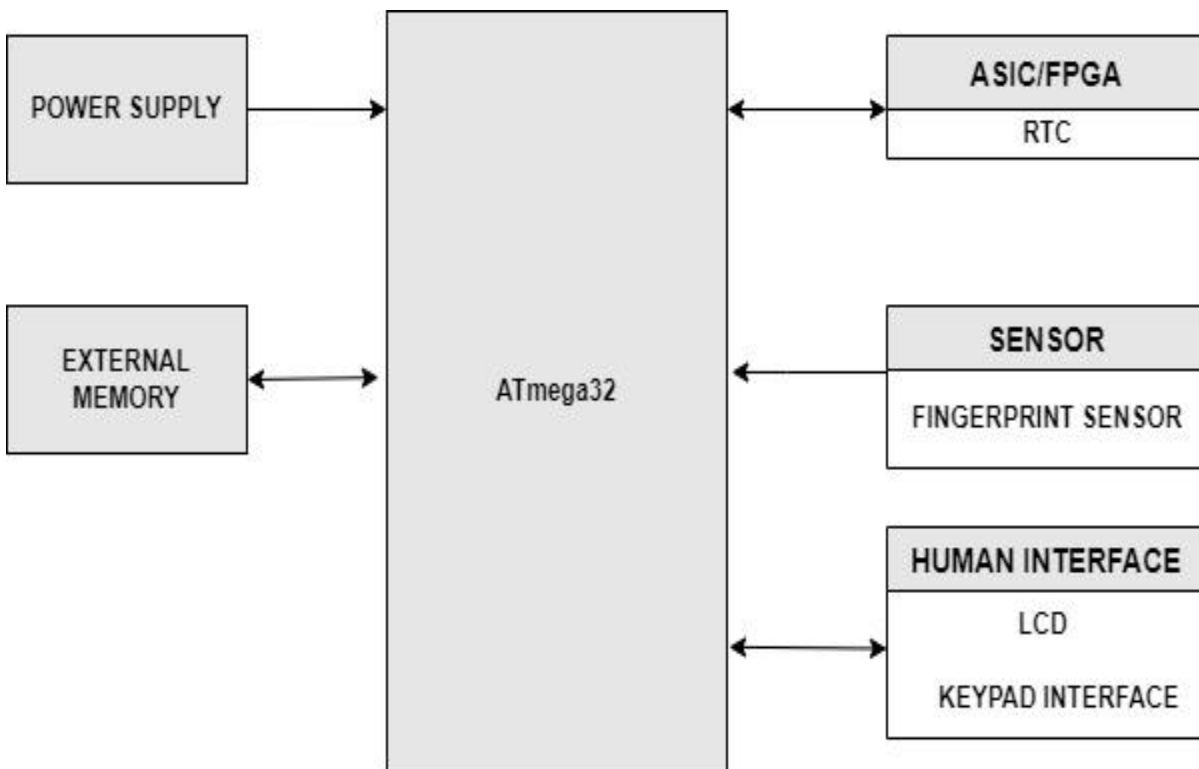
Figure : Sequential Diagram of Fingerprint based biometric Attendance system
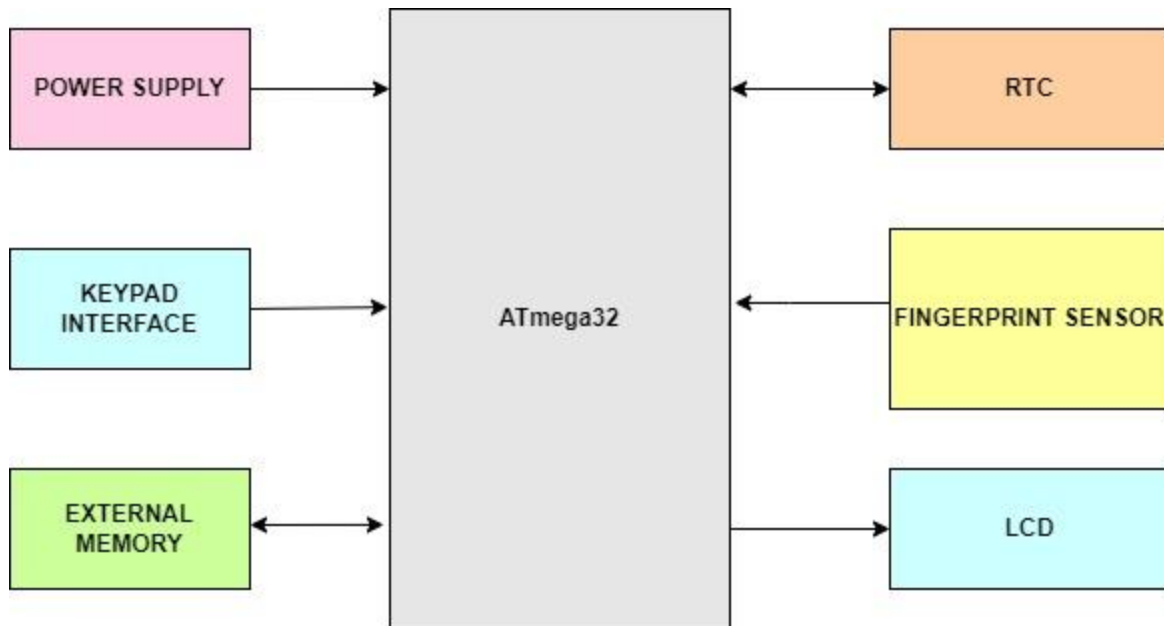
Figure : Block Diagram of Fingerprint based biometric Attendance system

3.2 COMPONENTS REQUIRED

The whole system is divided into following parts:

- Fingerprint Sensor module
- ATmega 32
- Power supply unit
- Keypad Interface
- Real Time Clock
- LCD Display
- External Memory

FINGERPRINT SENSOR MODULE

The Fingerprint module is the **Sensor** module. Fingerprint Sensor module is used to authenticate a person or employee's identity by taking their finger-print input in the system. Here fingerprint sensor R305 is used. FingerPrint Sensor (R305) -TTL UART is a fingerprint sensor module with TTL UART interface. The user can store the fingerprint data in the module and can configure it in 1:1 or 1: N mode for identifying the person. The finger print module can directly interface with a 3v3 or 5v Microcontroller.

ATMEGA 32 MICROCONTROLLER

ATmega32 microController is a low power CMOS technology based controller. Due to RISC architecture AVR microcontrollers can execute 1 million instructions per second if the cycle frequency is 1 MHz provided by a crystal oscillator. It has 1024 bytes EEPROM, with 32 programmable I/O lines. It has 8 KB of flash memory, 512 bytes of EEPROM, 1KB of SRAM.

KEYPAD INTERFACE

The Keypad interface is the **Human Interface** of this system. Here the keypad used has 4 push buttons to **enroll, Delete, Increment and Decrement** finger-print data**.** Their functions are mentioned below

- **Key 1** is used for **enrollment of fingerprin**t a new person into the system.
- **key 2** has double function, like when user enrolls new finger and key 2 is also used for **reset or delete data**
- **Key 3 & 4** is used to **select** finger-print ID

REAL TIME CLOCK (RTC)

Real-time clocks (RTC) are timers dedicated to maintaining a one-second timebase. In addition, an RTC is often used to keep track of clock time and calendar date either in software or hardware. Here RTC is used to track attendance with accurate time and date.

LCD DISPLAY

LCD display is the **Human Interface** of this system. Here a 16 x 2 LCD display is used. Liquid crystal display is used for displaying the messages.

EXTERNAL MEMORY

External memory used is EEPROM. EEPROM (electrically erasable programmable read-only memory) is user-modifiable read-only memory (ROM) that allows users to erase and reprogram stored data repeatedly in an application. Here it is implemented to writing attendance data to EEPROM and reading attendance data from EEPROM.

PIN DIAGRAM OF ATMEGA 32
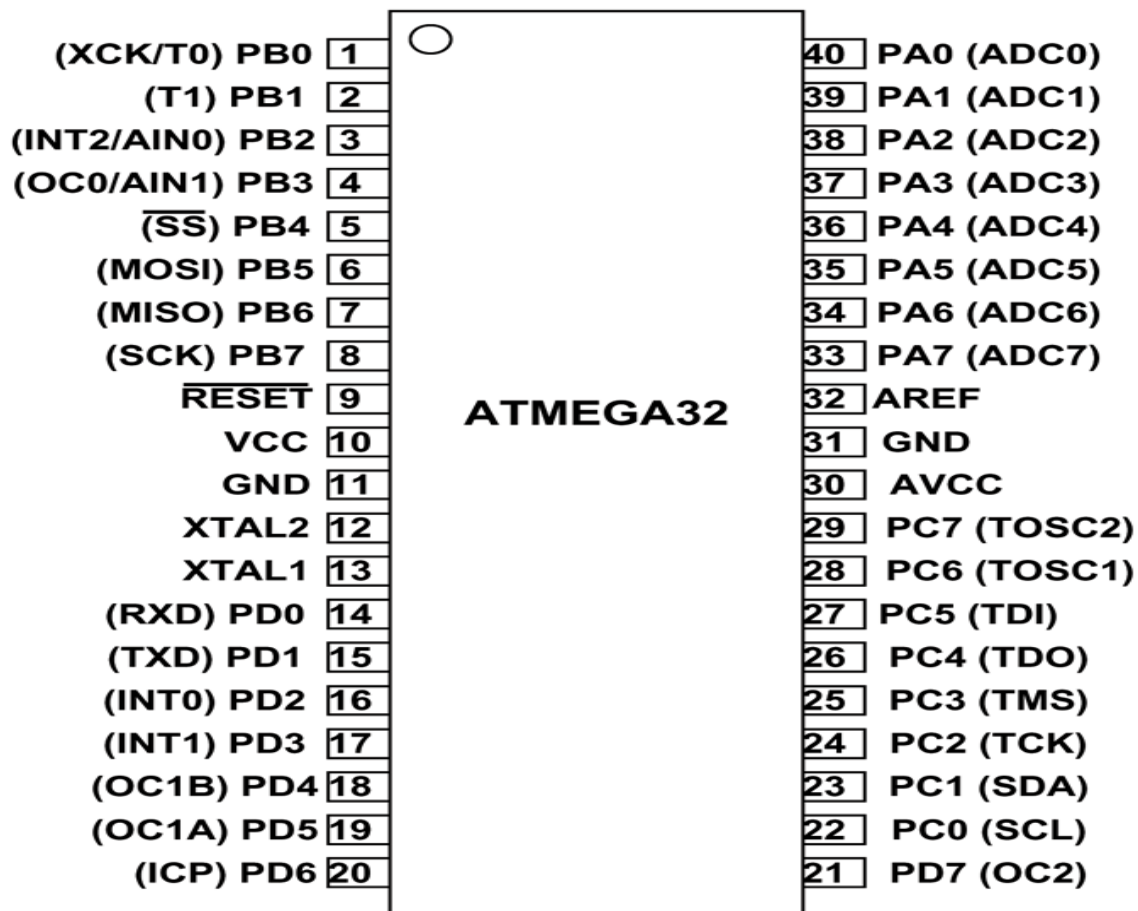
PIN CONFIGURATION FOR THE SYSTEM

- **Push or Membrane Buttons**

  Pin PA2 (ENROL key 1)

  Pin PA3(DEL key 2)

  Pin PA0(UP key 3)

  Pin PA1(DOWN key 4) of microcontroller with respect to the ground or PA4.

- **Fingerprint module's** Rx and Tx directly connected at Serial pin PD1 and PD3 of microcontroller.

- **16x2 LCD** is configured in 4-bit mode and its RS, RW, EN, D4, D5, D6, and D7 are directly connected at pin PB0, PB1, PB2, PB4, PB5, PB6, PB7 of microcontroller

- **RTC module** is connected at I2Cpin PC0 SCL and PC1 SDA.

  PD7 is used as soft UART Tx pin for getting the current time.

WORKING OF THE SYSTEM

- Whenever a user places his finger over the fingerprint module the fingerprint module captures the finger image, and searches if any ID is associated with this fingerprint in the system.

- If fingerprint ID is detected then LCD will show Attendance registered.

- Time and date are running continuously in the system, so Microcontroller can take time and date whenever a true user places his finger over the fingerprint sensor and then saves them in the EEPROM at the allotted slot of memory.

- Users may download the attendance data by pressing and holding key 4. By connecting the supply to circuit, the LCD will show 'Downloading....'.user can see the attendance data over serial

- If the user wants to delete all the data then he/she has to press and hold key 2 and then connect power and wait for some time. Now after some time LCD will show 'Please wait…' and then 'Record Deleted successfully'.

APPLICATIONS OF THE SYSTEM

1. This can be used in educational institutions.
2. Biometric attendance systems can be used in industries.
3. Biometrics can be used in ATMs for authentication.
4. Fingerprint authentication can be used in access control.