



Industrial Attachment – GizanTech

Embedded Systems

Final Requirement Analysis

Team – 03

Team Members-

Shah Ahmed Raad_2003042

Zabed Iqbal Chowdhury_2003011

| | |
|---|----------|
| Final Requirement Analysis..... | 3 |
| Smart Fingerprint Attendance System..... | 3 |
| 1. Hardware Requirements: | 3 |
| 2. Software Requirements: | 3 |
| 3. System Requirements: | 4 |
| 4. User Interface Requirements: | 4 |
| Additional Considerations:..... | 4 |

Final Requirement Analysis

Smart Fingerprint Attendance System

The final requirements analysis ensures that all necessary components, both hardware and software, are in place to successfully automate the employee attendance system, with a focus on capturing fingerprint data as an ID.

1. Hardware Requirements:

The hardware for this system needs to be reliable and capable of supporting the system's functionality:

- **ESP32 Microcontroller:** This will act as the central processing unit, interfacing with all sensors and handling data transmission.
- **Fingerprint Sensor:** The selected sensor will capture fingerprint scans and convert them into unique IDs that will be stored and used for employee authentication.
- **External Power Supply:** An additional power is necessary to ensure that all components receive the correct voltage and operate reliably.
- **Data Storage Components:** The system will utilize **SPIFFS (Serial Peripheral Interface Flash File System)** for storing employee ID data and fingerprint templates securely (offline).

2. Software Requirements:

The software should enable smooth integration and management of all hardware components while ensuring efficient operation:

- **Arduino IDE:** The programming environment for coding the ESP32, where the microcontroller's logic will be implemented.
- **Fingerprint Sensor Libraries:** Specific libraries for managing fingerprint data input (Adafruit Fingerprint Sensor Library), processing the scanned fingerprints, and converting them into IDs for storage and verification.
- **Database System:** A robust database, such as MySQL, will be used to store employee details (e.g., name, employee ID) and fingerprint IDs, ensuring secure and efficient data retrieval for attendance tracking.

- **OTA (Over-The-Air) Update Capability:** This will allow for remote software updates to the ESP32, providing ease of maintenance and ensuring that the system stays up-to-date without requiring manual intervention.

3. System Requirements:

The system must meet specific functional goals to effectively automate attendance management:

- **Fingerprint Enrollment and ID Association:** The system must be capable of registering fingerprints and associating each one with a unique employee ID.
- **Data Storage:** All fingerprint data (as IDs) and employee records must be stored in non-volatile memory, **SPIFFS** of the ESP32, for reliability and ease of retrieval.
- **Attendance Retrieval:** The system must allow for quick retrieval and display of attendance data, enabling administrators to track who has clocked in or out.

4. User Interface Requirements:

A well-designed user interface is essential for ease of system management:

- **Administrator Interface:** A simple, user-friendly interface must be available for administrators to add, update, or delete employee records, including fingerprint data linked to employee IDs.
- **Attendance Querying:** The system should offer an efficient query feature, allowing administrators to retrieve employee attendance details for a specific day, week, or month with minimal effort.

Additional Considerations:

- **Scalability:** The system must be scalable, allowing the addition of new employees without significant system overhauls.
- **Security:** As fingerprint data is sensitive, security protocols must be implemented to protect the stored IDs and prevent unauthorized access.
- **Accuracy:** The fingerprint recognition system should provide a high level of accuracy in matching employee fingerprints to stored IDs, minimizing errors.