Project Title : Biometric-Based Ration Distribution System with Fingerprint Authentication, Load Balancing, and User Addition/Removal Functionality

Aim:

To develop a secure, automated ration distribution system that uses biometric fingerprint authentication to ensure only authorized users receive their allocated ration, with features for load measurement and user management.

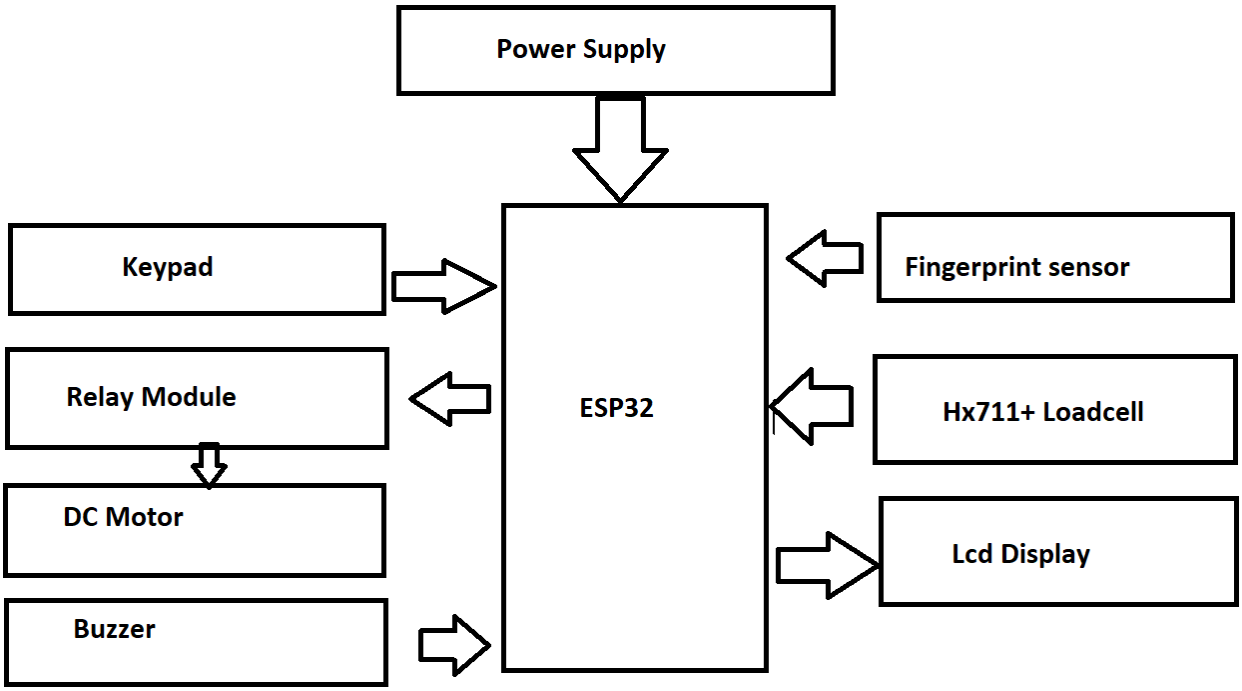
Objectives:

- To authenticate users using biometric (fingerprint) verification.
- To measure and dispense ration according to predefined quotas.
- To ensure fairness and prevent duplication or fraud.
- To allow administrators to add or remove users as needed.
- To provide a transparent and digital alternative to traditional ration systems.

Working Principle:

Each user is enrolled in the system with their fingerprint data. When the user scans their finger on the fingerprint module, the system checks the match in its database. If valid, the load cell is activated to measure and dispense the correct amount of ration (e.g., rice, wheat). The system records the transaction and ensures users cannot claim more than their allotted share. An admin interface (buttons, RFID, or keypad) allows adding/removing users when required.

Block Diagram



Hardware Components:

- ESP32
- Fingerprint Sensor (R305 / GT511C3)
- Load Cell with HX711 Amplifier
- DC Motor (for dispensing)
- LCD Display
- Keypad
- Buzzer / LEDs
- Power Supply

Software Used:

- Arduino IDE
- Embedded C/C++

Advantages:

- Prevents ration fraud and ensures secure distribution
- No need for paper or smart cards—biometric is enough
- Reduces manual labor and speeds up the process
- Easy to add or remove users
- Transparent and trackable

Disadvantages:

- Requires fingerprint sensor calibration and maintenance
- Fingerprint recognition may fail with dirty or worn fingers
- Load cell must be protected from moisture or overloading
- Needs admin intervention for user updates

Applications:

- Government ration shops
- Military or hostel mess systems
- School mid-day meal programs
- Community kitchens and NGO ration points

Future Scope:

- Add GSM/Wi-Fi to sync data with central server or government portal
- Use face or iris recognition as an alternative biometric
- Generate SMS alerts or printed receipts for users
- Link Aadhaar or national ID for verification
- Mobile app for admin access and remote monitoring

Conclusion:

This biometric-based ration distribution system ensures secure, fair, and automated dispensing of food supplies using fingerprint authentication. With added load balancing and user management features, it's an ideal solution for modernizing public food distribution systems and ensuring accountability and transparency.