

IOT Based Automatic Ration Distribution System

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ABSTRACT

The ration distribution system provides food items like rice, wheat, and sugar through government ration shops. Many shops still use manual methods, which can cause long waiting times, errors, and misuse of ration materials.

This project proposes an IoT-based Automatic Ration Distribution System to improve efficiency. The system uses a microcontroller (ESP32), load cell, analog to digital converter, motor driver, stepper motor, LCD display, and buzzer to automatically measure and distribute the ration.

The load cell measures the weight of the ration, and the microcontroller controls the motor to dispense the correct quantity. The LCD shows the weight, and the buzzer gives alerts.

This system is simple, low-cost, and accurate, helping to reduce errors and ensure fair ration distribution.

Key Words

This project uses an automatic system with ESP32 and weight sensor to distribute the correct quantity of ration accurately and reduce manual errors.

1.INTRODUCTION

The Smart Ration Vending Machine is an automated system designed to distribute food grains such as rice, wheat, and sugar accurately using sensors and a microcontroller. The main goal of this system is to make the ration distribution process faster, more accurate, and transparent.

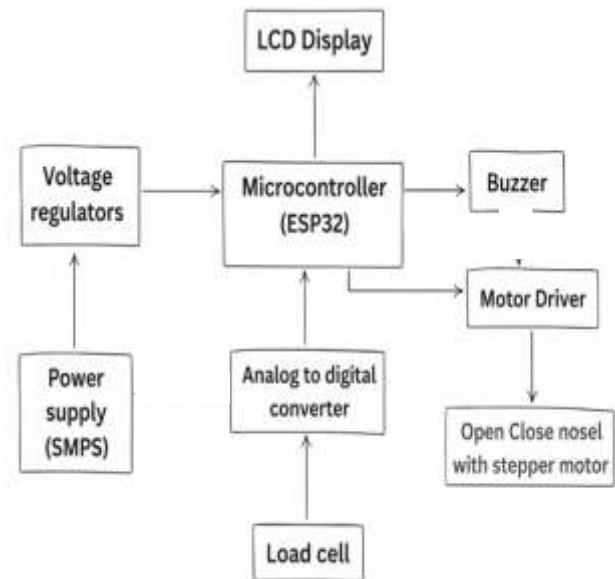
In many public distribution systems, ration is still distributed manually by shopkeepers. They measure grains using weighing machines and record details in registers. This traditional method often causes problems such as human errors, long waiting queues, incorrect measurements, and poor record keeping. Sometimes customers receive less quantity due to manual mistakes, and maintaining records in books can lead to incorrect entries or data loss.

The Smart Ration Vending Machine solves these issues by automating the distribution process. It uses a load cell sensor to measure the weight of grains accurately. The load cell converts the weight into an electrical signal, which is then converted into digital data using an Analog-to-Digital Converter (ADC). This data is processed by the ESP32 microcontroller, which controls the entire system.

When a user enters or scans their Ration ID, the system verifies the user and determines the quantity of grains allowed. The microcontroller then activates a stepper motor that opens a nozzle or gate to release grains from the container. The load cell continuously measures the weight, and once the required quantity is reached, the system automatically stops the motor. An LCD display shows details such as user ID, grain type, and quantity, while a buzzer indicates the start or completion of dispensing. This automated system reduces

human errors, ensures accurate measurement, saves time, and improves transparency in ration distribution

2.Block Diagram & Explanation



Explanation

1. Power Supply (SMPS)

The SMPS (Switched Mode Power Supply) provides electrical power to the system. It converts high-voltage AC electricity into low-voltage DC electricity that electronic circuits can use.

2. Voltage Regulators

The voltage regulators stabilize and adjust the voltage from the power supply. Different components need different voltage levels, so the regulator ensures that each part receives a safe and constant voltage.

3. Load Cell

The load cell is a sensor used to measure weight or force. When force is applied to it, the sensor produces a very small analog electrical signal.

4. Analog to Digital Converter (ADC)

The signal from the load cell is analog, but the microcontroller works with digital signals.

The Analog to Digital Converter (ADC) converts the analog signal from the load cell into a digital signal that the microcontroller can read and process.

5. Microcontroller (ESP32)

The ESP32 microcontroller is the main control unit of the system. It receives digital data from the ADC, processes the data, and sends commands to other components such as the display, buzzer, and motor driver.

6. LCD Display

The LCD display is used to show system information such as the measured weight or system status.

7. Buzzer

The buzzer produces sound alerts when the microcontroller sends a signal to it. It is used for notifications or warnings.

8. Motor Driver

The motor driver acts as an interface between the microcontroller and the motor. Since the microcontroller cannot provide enough current to drive the motor directly, the motor driver supplies the required power to the motor based on control signals from the ESP32.

9. Stepper Motor (Open/Close Nozzle)

The stepper motor is used to control the opening and closing of a nozzle. The motor receives commands from the motor driver, which is controlled by the ESP32.

3. Working Principle

The Smart Ration Vending Machine works using a microcontroller (ESP32), sensors, and motor control system to distribute grains automatically and accurately.

First, the SMPS power supply provides electrical power to the system. The voltage regulator converts this power into a stable voltage required for electronic components such as the microcontroller, sensors, and display.

The load cell is used to measure the weight of the grains. When grains are placed on the weighing platform, the load cell converts the weight into an electrical signal. This signal is an analog signal, so it is sent to the Analog to Digital Converter (ADC). The ADC converts the analog signal into digital data. This digital data is then sent to the ESP32 microcontroller, which acts as the main controller of the system. The microcontroller processes the data and decides how much grain should be dispensed.

The motor driver receives signals from the microcontroller and controls the stepper motor. The stepper motor opens or closes the nozzle (gate) of the grain container. When the motor rotates, grains start flowing out.

At the same time, the load cell continuously measures the weight of the grains. When the required quantity is reached, the microcontroller sends a signal to stop the motor and close the nozzle.

The LCD display shows important information such as system status, grain quantity, or user details. The buzzer gives a sound indication when the dispensing process starts or finishes.

In this way, the system automatically distributes the correct amount of grains with high accuracy and reduces human effort.

Components Used

Sr No	Component	Function
1	Power Supply (SMPS)	Converts AC mains power into DC power required for the circuit.
2	Voltage Regulator	Maintains a constant voltage (5V/3.3V) for stable operation of electronic components.
3	Microcontroller (ESP32)	Acts as the main controller that processes data and controls all components..
4	Load Cell	Measures the weight of ration/material placed on it.
5	Analog to Digital	Converts the analog signal from the load cell into a digital signal for the microcontroller.
6	LCD Display	Displays information such as weight, status, and system messages.
7	Motor Driver	Drives and controls the stepper motor based on signals from the microcontroller.
8	Stepper Motor	Opens and closes the ration outlet nozzle to control material flow.
9	Buzzer	Provides sound alerts or notifications during operation..

Advantages

- Accurate measurement
- Reduced manpower
- Transparent ration distribution
- Faster service
- Digital record keeping

Applications

- Smart Public Distribution System (PDS)
- Real-Time Monitoring of Food Stocks
- Leakage and Fraud Prevention
- Automated Ration Dispensing
- Beneficiary Authentication
- Remote Monitoring by Government Authorities

4.CONCLUSION

The Smart Ration Vending Machine provides a reliable and automated solution for public ration distribution.

The system ensures accurate weight measurement, transparent distribution, and efficient operation, making it suitable for government ration shops and automated vending systems

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6. REFERENCES

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