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Nurturing Akshaya Patrae-Automation for Mid Day Meal Distribution and Management at Educational Institution

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Abstract: *Ensuring efficient and responsible food distribution in student cafeterias is a significant concern in educational institutions worldwide. To address this issue, we present a Smart Food Dispenser system that employs a combination of innovative technologies, including Arduino microcontrollers, RFID identification, load cells, gas sensors, ultrasonic sensors for level monitoring, DC motors for dispensing, NodeMCU for IoT connectivity, and ultrasonic technology for excess food checking. The Smart Food Dispenser is designed to enhance the overall food management system in student cafeterias. Students can access the system using RFID cards, which not only simplifies the process but also helps in tracking their meal consumption. The system incorporates load cells to measure precise food portions, reducing food wastage and promoting responsible eating habits. To ensure food quality and safety, gas sensors are integrated to monitor the cafeteria environment, detecting any potential gas leaks or air quality issues. Furthermore, ultrasonic sensors are employed for real-time level monitoring of food containers, allowing cafeteria staff to replenish items as needed, improving operational efficiency. The DC motor-based dispensing mechanism provides accurate and controlled food portions to students, eliminating food spillage and waste. Additionally, NodeMCU facilitates real-time data collection and remote monitoring, enabling cafeteria managers to access consumption patterns and stock levels. The system's innovation lies in its ability to employ ultrasonic technology for excess food checking. By continuously monitoring food containers, it can detect excess portions, ensuring that students receive the desired amount of food without overloading their plates.*

Keywords: NodeMCU

I. INTRODUCTION

Food management in student cafeterias is a significant concern for educational institutions worldwide. It involves ensuring efficient food distribution, minimizing wastage, promoting responsible eating habits, and maintaining food safety. To address these challenges and provide an innovative solution, we introduce the "Smart Food Dispenser" system. This system leverages a variety of advanced technologies, including Arduino microcontrollers, RFID identification, load cells, gas sensors, ultrasonic sensors for level monitoring, DC motors for dispensing, NodeMCU for IoT connectivity, and ultrasonictechnology for excess food checking.

In today's fast-paced educational environments, student cafeterias often struggle with multiple issues. These include overconsumption leading to food waste, difficulties in monitoring and managing stock levels, and the need for efficient foodportioning. Additionally, ensuring food safety is a paramount concern.The "Smart Food Dispenser" project recognizes thesechallenges and endeavors to provide an all-encompassing solution. By integrating a range of innovative technologies, it aimsto streamline and enhance the entire food management process.Key components and features of the system include: RFIDIdentification: Students can access the cafeteria system using RFID cards, simplifying the process and enabling the tracking of their meal consumption. This not only enhances the user experience but also provides

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valuable data for cafeteria managers. Load Cells: Precise food portion measurement is achieved through load cells, reducing food wastage and promoting responsible eating habits. Students can receive the exact amount they need without excess or spillage. Gas Sensors: The system incorporates gas sensors to monitor the cafeteria environment for potential gas leaks or air quality issues, ensuring the safety and wellbeing of cafeteria patrons. Ultrasonic Sensors for Level Monitoring: Real-time monitoring of food container levels ensures efficient stock management. Cafeteria staff can replenish items as needed, optimizing operational efficiency. DC Motors for Dispensing: A controlled dispensing mechanism utilizing DC motors ensures accurate food portions and eliminates spillage, enhancing the overall dining experience. NodeMCU for IoT Connectivity: The system offers real-time data collection and remote monitoring capabilities through NodeMCU, enabling cafeteria managers to access consumption patterns and stock levels. Excess Food Checking with Ultrasonic Technology: One of the system's most innovative features is its ability to employ ultrasonic technology for excess food checking. Continuous monitoring of food containers allows for the detection of excess portions, ensuring that students receive the desired amount of food without overloading their plates.

1.1 Problem Statement

In many educational institutions, especially in school cafeterias and college campuses, a pressing issue arises concerning the need for an automated food dispenser system tailored to the specific requirements of students. The existing methods of food distribution, typically involving manual cafeteria lines or selfservice, have proven to be inefficient and prone to various shortcomings. Lengthy queues during peak meal times lead to time wastage and student frustration. Moreover, current food inventory management is often plagued by inaccuracies, resulting in unexpected shortages of popular items and the inadvertent distribution of food past its freshness date. Ensuring the safety and quality of stored food presents an ongoing concern, with the risk of gas leaks and food contamination in storage areas. Unauthorized access and overconsumption by a few individuals are common problems, contributing to unfair distribution and increased food wastage. Therefore, there is a clear need for an automated food dispenser system that not only addresses these challenges but also enhances the overall dining experience for students while promoting food safety and efficient food distribution.

1.2 Objectives

Some objectives of this project could include:

- User-Friendly Interface: Design a user-friendly interface with an LCD to display essential information andinstructions for students.
- RFID Access Control: Implement RFID technology to restrict access to authorized students, ensuring onlyregistered individuals can use the dispenser
- Food Inventory Management: Utilize load cells to monitor and display the remaining food quantity accurately,allowing students to know the availability of food items.
- Gas Detection: Integrate a gas sensor to ensure food safety by detecting and alerting users to any potential gas leaksor anomalies.
- Level Monitoring: Use an ultrasonic sensor to monitor food levels in realtime, displaying this information on theLCD and preventing dispensing when the food is insufficient.
- Dispensing Mechanism: Implement a DC motor to control the dispensing process, allowing students to select thedesired quantity of food.
- Excess Food Detection: Integrate an ultrasonic sensor to detect excess food in the dispenser, preventing overloadingand potential waste.

II. SYSTEM REQUIREMENTS

Hardware Requirements

- Arduino requirements
- Lcd
- Dc motor

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- Load cell
- Ultra Sonic Sensor
- Node MCU
- RFID reader
- Power supply module
- Esp camera
- Gas sensor
- Software Requirements
- Arduino IDE
- Embedded C

III. CONCLUSION

This system excels in optimizing food distribution, alleviating the long waiting times traditionally associated with cafeteriaservices, and bestowing students with a more efficient and convenient means of accessing their meals, even during peak hours. Its capacity for precise inventory management, courtesy of load cells and ultrasonic sensors, ensures that food quantities are consistently monitored with pinpoint accuracy, thus eradicating the occurrence of unforeseen shortages of popular food items. Additionally, its incorporation of gas sensors takes food safety to a new level by detecting potential gas hazards and maintaining the integrity of food quality. The system's RFID-based access control and user authentication mechanism not only diminishes the risk of unauthorized access and overconsumption but also fosters equitable access to food resources. Equally significant, it equips educational institutions with valuable data analytics regarding food consumption patterns, empowering them to make well-informed decisions pertaining to menu planning and waste reduction, ultimately leading to cost savings. The inclusion of user-friendly interfaces, such as LCD screens and remote control via NodeMCU, further enhances the overall dining experience.

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