CS19P11 – Internet of Things essentials Presentation

ELECTRO PROTEIN PRECISION SCALE

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Abstract

This project introduces a novel smart weighing scale designed to revolutionize protein measurement in dietary management. By combining Arduino technology, high-precision load cell sensors, and HX711 amplifiers, the scale offers a sophisticated yet user-friendly solution for optimizing protein intake.In today's health-conscious society, accurately assessing protein consumption is crucial. Traditional methods lack precision and convenience, hindering informed dietary decisions. The proposed scale solves this by quantifying protein content in food items in real-time with exceptional accuracy.Applications include personal nutrition tracking for achieving dietary goals and aiding healthcare professionals in clinical nutrition settings. The scale also benefits the food industry and research sectors by enabling precise measurement and analysis of protein content.

INTRODUCTION

In the modern era of health-conscious living, precise nutritional information is crucial for balanced diets and fitness goals. This project introduces an automated protein content measurement system using the HX711 load cell amplifier, Arduino Uno, and IoT technology. The HX711 precisely measures food weight, and the data is processed via IoT and a cloud-based platform to calculate protein content. Results are viewable on a laptop, providing a user-friendly interface. This innovative system enhances the accuracy of protein analysis and meets the growing demand for detailed dietary information. By integrating advanced sensor technology with cloud computing, this project demonstrates the potential for smart, health-focused applications. It aims to empower individuals to make informed dietary choices easily and efficiently.

Objectives

- Accurate Protein Measurement:
- User-Friendly Interface:
- Integration of Advanced Sensor Technology:
- Application Versatility
- Multiple Data Calculation

Literature Survey

TITLE	YEAR	AUTHOR	TECHNIQUE
Pertanika Journal of Tropical Agricultural Science	2024	Lubis, Rifqi Kamaddin Sholeh, Rahmat Rasyid, and Meqorry Yusfi	Baby weight and length measurement system using ultrasonic (HC-SR04) and load cell sensors (four half-bridge load cells of 50 kg), microcontroller NodeMCU ESP32, data storage with MySQL, and website interface. Average error: 0.494% for length, 0.949% for weight.
International Conference on Interdisciplinary Approaches in Technology and Management for Social Innovation (IATMSI)	2024	Nayak, Samidha, Aarya Agrawal, Jyoti Yadav, Jitendra Zalke, and Sandeepkumar R. Pandey	Innovative intravenous (IV) fluid level indicator system designed for real-time measurements and alerts. Integration of NodeMCU microcontroller, Load Cell, HX711 amplifier, and Blynk platform for monitoring and dosage administration. NodeMCU facilitates automation, Load Cell captures weight, HX711 enables ADC conversion,
Journal Serambi Engineering	2024	Simatupang, Joni Welman, and Abdul Aziz Ar-Rafif	Smart Trash Bin for composting process. Utilizes Arduino Uno microcontroller with Ultrasonic Sensor HC-SR04 for distance detection and Load Cell HX711 for waste weighing. Results displayed on LCD and compared with manual scale.

MOTIVATION

The motivation behind this project stems from a collective desire to empower individuals with the knowledge and tools they need to make informed dietary choices effortlessly. In an era where health consciousness is on the rise and nutritional awareness is paramount, there exists a growing need for accessible, accurate, and user-friendly methods of analyzing food composition. By developing an automated protein content measurement system using advanced sensor technology and IoT integration, we aim to bridge this gap and provide individuals with a practical solution to monitor and optimize their protein intake. This project not only addresses the immediate need for precise nutritional information but also aligns with broader societal goals of promoting healthier lifestyles and enhancing well-being.

KEY CHALLENGES

1. Sensor Accuracy and Reliability
2. Data Transmission and Integration
3. Machine Learning Model Training
4. Real-Time Alerting Mechanism
5. User Interface and Experience

EXISTING SYSTEM

Currently, existing systems for measuring protein content in food often rely on manual methods or laboratory analysis, which can be time-consuming, expensive, and impractical for everyday use. Traditional methods such as chemical assays or spectroscopic techniques require specialized equipment and trained personnel, limiting accessibility to the general public. While some commercial devices offer rapid protein analysis, they are often costly and may lack accuracy or versatility. Additionally, standalone kitchen scales or nutritional apps provide basic weight measurements but lack the ability to directly assess protein content. As a result, there remains a significant gap in the market for an affordable, user-friendly solution that offers real-time protein analysis in a convenient and accessible manner.

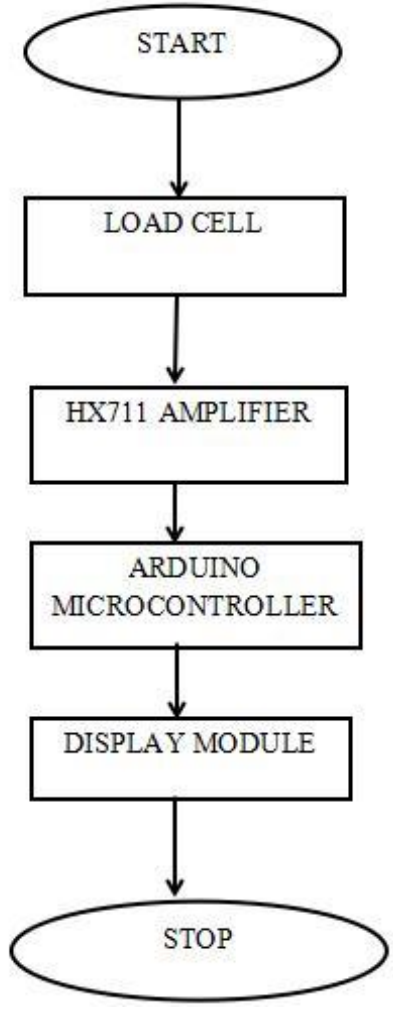
Proposed System

The proposed smart weighing scale system represents a cutting-edge solution for precise protein measurement in dietary management and nutrition monitoring. Combining advanced hardware components with intelligent software algorithms, the system offers a comprehensive and user-friendly platform for tracking protein intake with unprecedented accuracy and convenience. At the core of the system lies the Arduino microcontroller, serving as the central processing unit responsible for orchestrating the operation of the scale's components. Coupled with a high-precision load cell sensor and HX711 amplifier, the system can accurately measure the weight of food items placed on its platform with exceptional sensitivity and resolution. The system's software component, built using the Arduino Integrated Development Environment (IDE), implements proprietary algorithms for analyzing weight data collected from the load cell sensor. These algorithms correlate weight measurements with known protein densities or calibration curves stored in the system's memory, enabling real-time estimation of the protein content of food items.

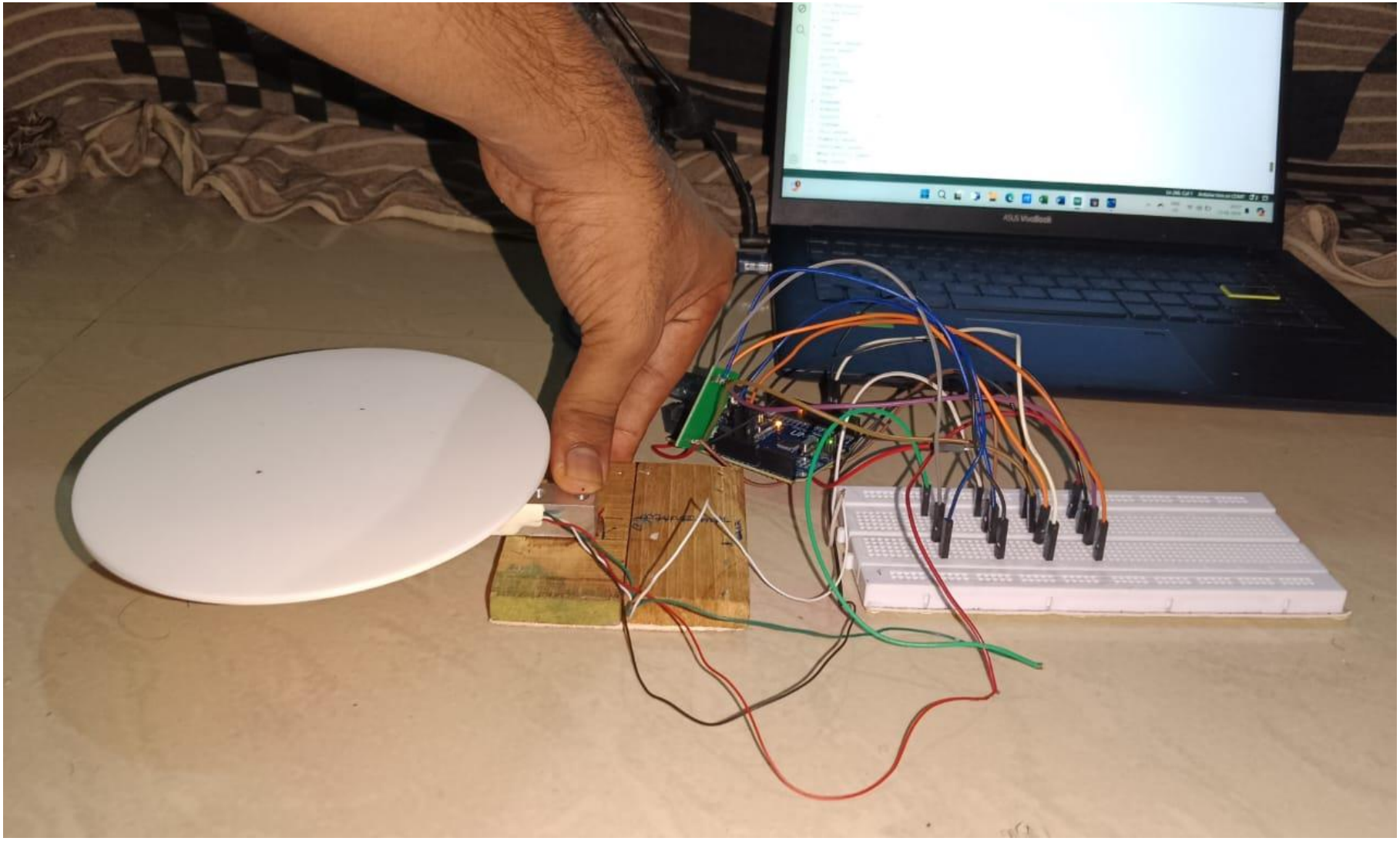
Novelty in Proposed System

The proposed smart weighing scale combines Arduino microcontroller technology, high-precision load cell sensors, and HX711 amplifiers to accurately measure protein content in food. This innovative tool uses real-time data processing and proprietary algorithms to provide precise protein estimates via an intuitive display. It features a comprehensive food database, self-calibrating capabilities, and a modular design for future enhancements like wireless communication. Applicable in personal nutrition, fitness, clinical nutrition, and food industry research, this scale supports accurate protein intake tracking, promoting informed dietary decisions and healthier lifestyles.

Block Diagram



Prototype



REAL TIME OUTPUT

yahya.ino

```
235
236   void changeSavedCalFactor() {
237     float oldCalibrationValue = LoadCell.getCalFactor();
238     boolean _resume = false;
239     Serial.println("***");
```

Output Serial Monitor ×

Message (Enter to send message to 'Arduino Uno' on 'COM7')

```
Select a food item:
Protein value :12.14
:g Load_cell output val: 91.74
Food Options:
1. Chicken breast
2. Turkey breast
3. Salmon
4. Tuna
5. Eggs
6. Cottage cheese
7. Greek yogurt
8. Quinoa
9. Lentils
10. Chickpeas
11. Black beans
12. Tempeh
13. Tofu
14. Edamame
15. Almonds
```

Hardware/Software Requirements

Hardware Requirements

S.NO	COMPONENTS
1.	Arduino
2.	Load Cell
3.	HX711 Amplifier
4.	Power Supply

Hardware/Software Requirements

Software requirements

S.NO	SOFTWARE REQUIRED
1	Arduino IDE

FUTURE ENHANCEMENTS

Looking to the future, there are several potential enhancements that could further elevate the functionality and usability of this protein content measurement system. Firstly, integrating additional sensors beyond just weight measurement, such as pH or moisture sensors, could provide a more comprehensive analysis of food composition. Secondly, expanding the connectivity options to include mobile devices beyond just laptops, such as smartphones and tablets, would enhance accessibility for users on-the-go. Additionally, implementing machine learning algorithms could enable the system to learn from user preferences and dietary habits, providing personalized nutritional recommendations. Furthermore, enhancing the cloud-based platform with social sharing features or integration with fitness tracking apps could foster a community aspect, encouraging users to support and motivate each other in their health journeys. Lastly, exploring options for miniaturization and portability could make the system more versatile and applicable in various settings, such as in kitchens, restaurants, or even during outdoor activities. Overall, these future enhancements hold the potential to make the protein content measurement system even more effective, user-friendly, and adaptable to the evolving needs of health-conscious individuals

References

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