Oxyweight Monitor System

1st Bharati Jadhav
Electronics and Telecommunication SVERI's College of Engineering (Poly), Pandharpur
Pandharpur, India
bharatijadhav1507@gmail.com

2nd Kadira Sutar
Electronics and Telecommunication
SVERI's College of Engineering (Poly), Pandharpur Pandharpur, India
Sutarkadira@gmail.com

Abstract

The Oxyweight Machine is a coin-operated health monitoring system designed to provide basic health information in a simple and affordable way. It measures key health parameters such as body weight, blood oxygen level (SpO_2), and pulse rate using appropriate sensors. A load cell with an amplifier is used to measure body weight, while a pulse oximeter sensor is used to detect oxygen level and pulse rate.

The system is controlled by a microcontroller that processes the collected data. It compares the user's weight with their height and age to determine categories like underweight, normal, or overweight. A keypad is provided for entering user details such as age and height. Based on this input, the system calculates BMI and generates basic diet suggestions. These suggestions are then sent to the user's mobile phone through a Bluetooth HC-05 module.

The machine is easy to use and suitable for public places such as hospitals, gyms, and shopping areas. It provides quick health information without the need for medical assistance. The main aim of this project is to increase health awareness by combining multiple health measurements into one low-cost and automated system.

Keywords: Oxyweight Monitor System, BMI Calculation, Weight Sensor (Load Cell), HX711 Module, Arduino, HC-05 Bluetooth Module, Mobile Application, Diet Recommendation, Health Analysis, IoT Healthcare, Body Weight Measurement, Fitness Monitoring, Wireless Communication, Smart Healthcare Device, Personalized Health Suggestions.

1. INTRODUCTION

This project is based on the design and development of an Oxyweight monitor system to measure and analyze body weight. The system uses a load cell to measure the user's weight accurately, and an HX711 module is used to amplify the signal for better accuracy. A microcontroller is used to process the data and calculate the Body Mass Index (BMI), which helps in understanding a person's health condition based on their height and weight. According to the BMI value, the system classifies the user as underweight, normal, overweight, or obese.

Based on this result, the system provides suitable diet and health suggestions. The HC-05 Bluetooth module is used to send the data to a mobile application wirelessly. The mobile app displays the results in a clear and easy-to-understand format and also gives diet plans and daily health tips according to the BMI category. This makes the system useful for regular health monitoring.

The project is helpful for fitness tracking and basic health analysis. It reduces the need for manual calculations and provides quick results. The system is low-cost, portable, and easy to operate. Overall, it helps users stay aware of their health and encourages a healthier lifestyle.

2. LITERATURE REVIEW

Many researchers have worked on smart health monitoring systems using sensors and embedded technology. Load cells are commonly used for accurate weight measurement, where force is converted into electrical signals with the help of strain gauges.

The HX711 module is widely used in such systems as a high-precision analog-to-digital converter. It amplifies the small signals received from the load cell and provides accurate digital data to the microcontroller.

In IoT-based health monitoring systems, different sensors are combined to measure parameters like weight, temperature, and heart rate. These systems support real-time monitoring and allow data to be sent to other devices, making healthcare more accessible.

Body Mass Index (BMI) is a simple and widely used method to assess body fat based on height and weight. It helps in classifying individuals into categories such as underweight, normal, overweight, and obese, and is useful for identifying possible health risks.

Some systems have been developed to calculate BMI automatically by using load cells, ultrasonic sensors, and microcontrollers to measure both weight and height. While these systems provide accurate results, they often do not include personalized health suggestions.

Recent developments also include systems that offer diet and fitness recommendations based on user data. However, many of these systems mainly focus on monitoring and do not provide real-time guidance or easy-to-use mobile applications.

3. BLOCK DIAGRAM

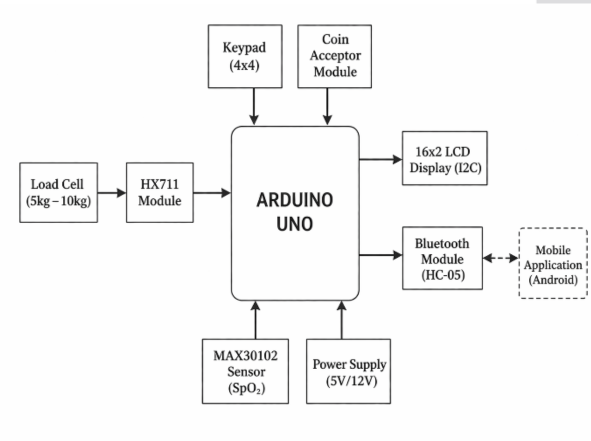

Fig. Block Diagram of Oxyweight Monitor System

1. Arduino Uno

Fig. Arduino uno

Arduino Uno is the main microcontroller used in the system. It controls and coordinates all components like sensors, display, and communication modules. It processes input data and generates appropriate output. It is easy to program using Arduino IDE and widely used in embedded systems.

2. Load Cell

Fig. Load cell

The load cell is used to measure the weight of the user. It works on the strain gauge principle, where resistance changes with applied force. It produces a very small analog signal proportional to weight. This signal needs amplification before processing.

3. HX711 Module

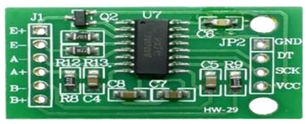

Fig. HX711 amplifier

HX711 is an amplifier and analog-to-digital converter designed for load cells. It amplifies the small signal from the load cell. It converts analog signals into digital values. This digital output is sent to Arduino for accurate weight calculation.

4. MAX30102 Sensor

Fig. MAX30102

MAX30102 is a pulse oximeter and heart rate sensor. It measures blood oxygen level (SpO_2) and pulse rate using infrared light. It communicates with Arduino using I2C protocol. It is compact, low-power, and suitable for wearable and medical devices.

5. 16x2 LCD Display (I2C)

Fig. I2C display

The LCD display is used to show output results like weight, SpO_2, BMI, and health status. It uses I2C interface, which reduces the number of connecting wires. It provides a simple and clear user interface. It operates at 5V.

6. Keypad (4x4)

Fig. Keypad

The keypad is used for user input such as age and height. It consists of 16 keys arranged in rows and columns. It sends input signals to Arduino when keys are pressed. It helps in making the system interactive.

7. Coin Acceptor Module

Fig. Coin acceptor module

The coin acceptor is used to control access to the system. It detects valid coins and sends a pulse signal to Arduino. The system activates only after coin insertion. It is useful for implementing a paid service model.

8. Bluetooth Module (HC-05)

Fig. Bluetooth HC-05

The HC-05 Bluetooth module enables wireless communication. It transmits data from Arduino to a mobile application. It works using serial communication (TX and RX pins). It operates at 3.3V logic level.

9. Serial Bluetooth Terminal (App)

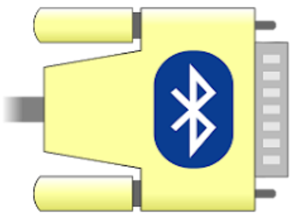

Fig. Serial Bluetooth terminal

It is a mobile application used to communicate with the HC-05 Bluetooth module. It receives data sent from the Arduino and displays health parameters like weight, SpO□, and BMI. It works using serial communication over Bluetooth. It helps users view results and suggestions directly on their smartphone.

4. METHODOLOGY:

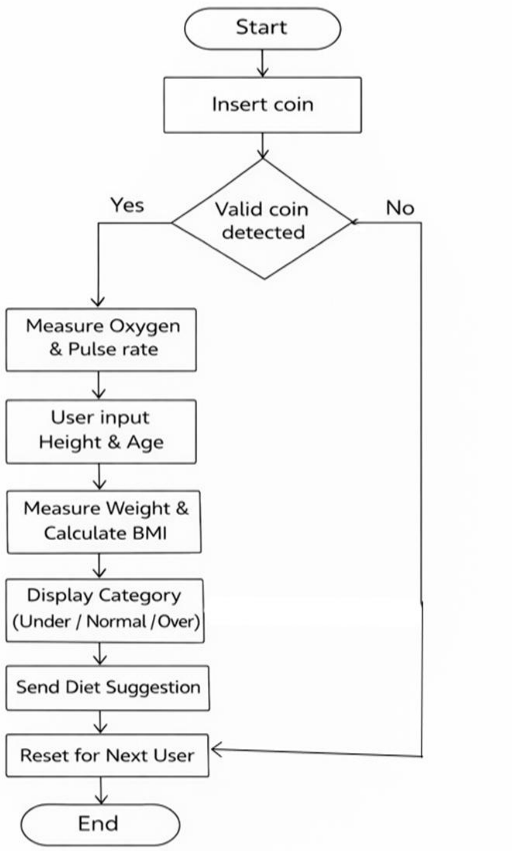

Fig. Flow Chart of Oxyweight Monitor System

Step 1: Start

The system is powered ON and all components are initialized.

It waits for user interaction to begin the process.

Step 2: Insert Coin

The user inserts a coin into the coin acceptor module.

This step ensures controlled and paid access to the system.

Step 3: Valid Coin Detection

The system checks whether the inserted coin is valid.

If invalid, it rejects the coin and waits; if valid, it proceeds further.

Step 4: Measure Oxygen and Pulse rate

The sensor measures blood oxygen level (SpO_2) and heart rate (BPM).

These values help in basic health monitoring of the user.

Step 5: User Input (age and height)

The user enters their height (in centimeters) and age into the system.

These inputs are required for BMI calculation and health analysis.

Step 6: Measure Weight

The load cell sensor measures the user's body weight in kilograms.

The measured value is processed and prepared for BMI calculation.

Step 7: Calculate BMI

The system calculates BMI using the formula:

BMI = Weight (kg) / $Height^2$ (cm^2)

Step 8: Determine Categary

The system compares calculated BMI with standard ranges.

Categories are assigned based on the following table:

- Less than 18.5 → Underweight
- 18.5 – 24.9 → Normal
- 25 – 29.9 → Overweight

Step 9: Display Category

The system displays the user's health category on the screen.

This helps the user understand their physical condition easily.

Step 10: Send Diet suggestion via Bluetooth

The system transmits the diet to a mobile application using HC-05.

The user can view diet suggetion wirelessly on their smartphone.

Step 11: Reset for Next User

After completion, the system clears all previous data.

It returns to initial state, ready for the next user.

Step 12: End

The process is completed successfully for one user.

The system stops current operation until restarted again.

5. RESULTS AND DISCUSSION:

The system accurately measures body weight using a load cell with HX711 and vital parameters such as oxygen level (SpO_2) and pulse rate using the MAX30102 sensor. After inserting a coin, the system activates and collects user data reliably. All measured parameters are clearly displayed on the screen, ensuring easy understanding for users. Additionally, the system supports diet suggestions sent to the user's mobile, enhancing its usefulness.

6. CONCLUSIONS:

The Oxyweight monitor system project successfully demonstrates a simple, low-cost, and effective solution for basic health monitoring.

The system is capable of measuring important health parameters such as body weight and blood oxygen level (SpO_2) using appropriate sensors and processing the data through a microcontroller. By integrating multiple components into a single system, the project overcomes the limitations of existing devices that focus on only one parameter. The coin-operated mechanism ensures controlled usage, making the system suitable for installation in public places.

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