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BODY STATS

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ABSTRACT:

"BODY STATS" is a comprehensive and user-friendly Body Mass Index (BMI) calculator designed to help individuals monitor their health by calculating their BMI based on their height and weight. The project aims to provide a simple, accurate, and efficient way for users to assess their body composition, which is an essential factor in understanding Body Mass Index offers their overall health. This application is developed using [mention the technologies used, such as programming languages, frameworks, etc.], ensuring a smooth user experience and precise results. The "Body

Stats" tool not only calculates BMI, but also divides results into various health categories such as low weight, normal weight, obesity, and obesity.

OBTECTIVES:

The objectives of the "BODY STATS" project are 1.
Give a reliable and accurate method for calculating the Body Mass Index (BMI) based on the size and weight provided by the user. 2. To design an intuitive and accessible platform that allows users of all technical backgrounds to easily calculate and interpret their BMI. 3.To categorize BMI results into standard health ranges (underweight, normal weight, overweight, obesity) and offer relevant health recommendations based on the results.4. Promoting awareness of the importance of BMI for assessing health risks and encouraging users to make healthy decisions about their lifestyle and well s. 5. To provide users with personalized tips or suggestions based on their BMI category, fostering a proactive approach to health management.

INTRODUCTION:

In today's fastmoving world, maintaining a healthy lifestyle is the most important part of this process, and monitoring the most important health indicat ors is an important part of this process. One of the most commonly used indicators to assess an individual's health is Body Mass Index (BMI).

BMI provides a simple, yet effective way to categorize a person's body weight in relation to their height, helping identify potential health risks such as obesity, underweight, and other related conditions."BODY STATS" is a BMI calculator designed to simplify this process by providing users with an easy-to-use platform to calculate and interpret their BMI. The primary goal of this project is to create an accessible tool that offers an accurate BMI calculation and health recommendations, empowering users to make informed decisions regarding their physical well-being.

LITERATURE REVIEW:

The Body Mass Index (BMI) includes the use of two parameters, size and weight. Determines the fat content in the body. A BMI system on ly brings the spray value of the measurement[1].BMI is a prescale of overweight or weight in the body. This is calculated by dividing the weight of a k ilogram by the peak of the height of a meter [2][3].
Traditionally, human fat was defined on both the personal and social level. However, it is difficult to quantify this. That is, each individual has his/her own perception of how fat he/she should be. As indicated above, this often depends on a general concept of societal norms or is due to peer

pressure.For example, young women are often worried about the body of Western society today, and most people think they are fat despite the good population references.

[4].The Metropolitan Life Insurance Company then published a table in 1959 with average height weight (Gew ./HT) for gender and different age grou ps.[5].This was based on data from over 4 million adults between 1935 and 1953, and was primarily for men insured by 26 different insurers. The risk o f developing specific disease and mortality data in relation to differences in WT/HT were also analyzed and reported in statistical remarks in Metropolit an Life Insurance Co. 1960. [6,7].

The Body Mass Index (BMI) has a wide range of metrics used to assess an individual's weight in terms of its size and serves as an indicator of nutrition al status and associated health risks. Traditionally, BMI is calculated manually using a person's height and weight [1]. However, recent advancements in sensor technologies have enabled the development of automated, non-invasive, and more efficient BMI assessment systems. Among these technologies, ultrasonic sensors for height measurement and load cells for weight measurement have emerged as practical and effective tools in both clinical and consumer health applications[1,9].

Developed by researchers at [Lane et al], an application that supports users who maintain a healthy lifestyle by focusing on daily activities such as sleep , physical activity and social interactions. That's not the end, but it provides excellent feedback to improve the health of our users. This helps people eas ily identify signs of decline [8].

DESIGN METHODOLOGY:

COMPONENTS:

1.**ESP32**

The ESP32 is a versatile microcontroller chip known for providing Wi-Fi and (in some models) Bluetooth connectivity, making it ideal for IoT applications.

The ESP32 originally includes a Tensilica Xtensa LX6 processor with a TensilicaLX6 processor with clock speeds above 240 MHz, and newer models such as the ESP32C and ESP32-S series that use RISC-V-CPUs. RISC-V offers better support with standard GNU compilers compared to Xtensa, making development easier and more open.

The ESP32 family includes a variety of CHIP models, including the ESP32-D0WDQ6, ESP32-S0WD, and compact ESP32-PICO-D4-
SIP. These chips can be used with both Wi-Fi or Wi-Fi and Bluetooth functions.

The ESP32 is widely used in mobile devices, wearables, and IoT systems, both by hobbyists and in commercial applications. With platforms like Mongoose OS and tools like the ESP32 IoT Starter Kit, the chip has gained popularity for its power, flexibility, and ease of use in embedded development.

2.**LOAD CELL**

A load cell is a transducer that converts force/pressure into a measurable electrical output. In various type, stretch medal cells are most widely used, especially in industrial and commercial metering application. These load cells work by bonding strain gauges to a structural element that deforms under load, causing a change in electrical resistance proportional to the applied force. They offer high accuracy (typically 0.03% to 0.25% of full scale) and are suitable for most industrial environments. Other types include hydraulic and pneumatic load cells. Hydraulic load cells measure weight by detecting pressure changes in an internal fluid. They are ideal for hazardous or remote areas because they require no electrical components and maintain accuracy even in varying temperatures. Typical uses include weighing tanks, bins, and hoppers. Pneumatic load cells, also based on the force-balance principle, use air pressure and are often chosen for clean or explosion-prone environments. They are resistant to temperature changes and don’t risk fluid leaks, but they respond more slowly and require a supply of clean, regulated air or nitrogen. While pneumatic and hydraulic types are still used in specific contexts, strain gage load cells dominate the industry due to their high accuracy, cost-effectiveness, and technological advancements.

3.**KEYPAD**

A 4x3 matrix 12-key membrane keypad is a compact and lightweight input device commonly used in microcontroller-based systems for data entry. It consists of 12 buttons arranged in four rows and three columns, utilizing a matrix wiring layout that allows efficient detection of key presses while minimizing the number of microcontroller pins required. Each button is part of a flexible membrane switch that closes a circuit when pressed, enabling simple and reliable operation. The keypad typically interfaces via a 7-pin connector—four pins dedicated to rows and three to columns—making it easy to integrate into a wide range of electronic, industrial, and consumer devices. Key specifications include an operating voltage of 35VDC, an operating current of 100mA, a contact resistance of 500 ohms, insulation resistance of 100 megaohms, and a dielectric strength of 250VRms. The keypad has compact dimensions of 70mm by 70mm with a thickness of just 1mm and weighs only 12 grams. Its slim profile, durability, and ease of use make it a practical choice for embedded applications**.**

4.**16X2 Display**

A 16x2 LCD display, also known as a 16x2 character LCD, is a widely used alphanumeric display module capable of showing two lines of 16 characters each, totaling 32 characters. Each character is created using a 5x8 dot matrix, resulting in 40 pixels per character for clear and readable output. These displays are commonly integrated into electronic circuits and devices for presenting letters, numbers, and symbols. A standard 16x2 LCD has 16 pins for power, data, and control connections, typically arranged in two rows of eight. It supports both 4-bit and 8-bit data interfaces, offering flexibility for various microcontroller connections. Most models operate at 5V and feature an LED backlight for enhanced visibility, with common backlight colors including blue and green. Compact, easy to use, and reliable, the 16x2 LCD is a popular choice for displaying information in embedded and DIY electronics projects.

IMPLEMENTATION:

Step 1: User Input (Height)

1. Keypad Operation:
    - The system first prompts the user to enter their height in centimeters using the 4x4 keypad.
    - Each digit entered by the user is displayed on the LCD screen.
    - The height is entered as a string and converted into a floating-point value for calculation purposes.

Step 2: Weight Measurement

2. Load Cell and HX711:
    - After the height input, the user is instructed to step on the 5kg load cell to measure their weight.
    - The HX711 amplifier amplifies the signal from the load cell, which is then read by the ESP32.
    - The weight is measured in kilograms and converted into a value using the HX711 library.

Step 3: BMI Calculation

3. BMI Formula: The BMI is calculated using the following formula:

$$\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height (m)}^2}$$

Where:

- Weight is the value measured from the load cell.
- Height is the value input by the user, converted from centimeters to meters.

Step 4: Displaying BMI and Category

4. BMI Classification: According to the World Health Organization (WHO) BMI classification table. The categories are:
    - Underweight: BMI < 18.5
    - Normal : 18.5 ≤ BMI < 24.9
    - Overweight: 25.0 ≤ BMI < 29.9
    - Obesity : 30.0 ≤ BMI < 40.0

The calculated BMI and its category are displayed on the 16x2 LCD.

Step 5: Resetting the System

5. Reset Process: After displaying the BMI result, the system resets and is ready for the next user. The LCD display prompts the user to enter a new height.

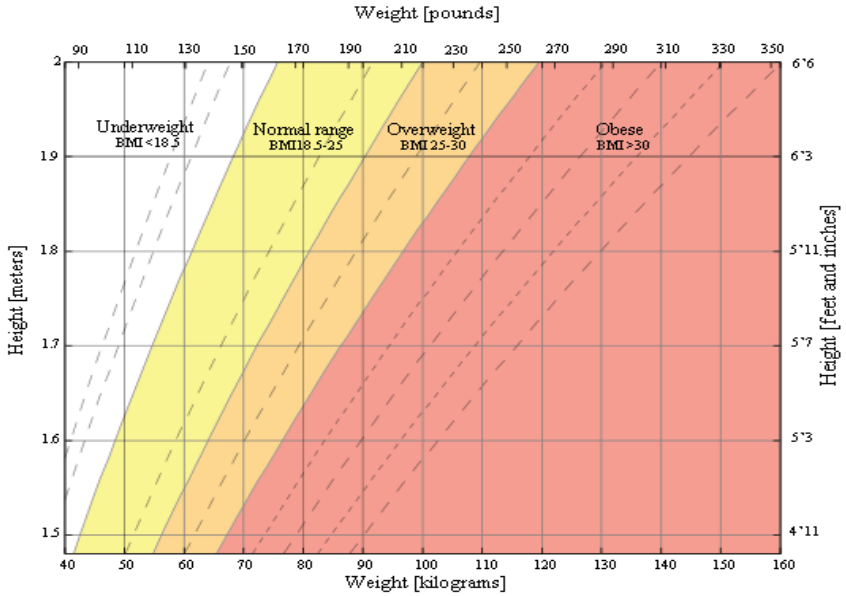

FIGURE: GRAPHICAL REPRESENTATION OF BMI

RESULTS:

The package was designed to make future changes easy to implement. From the progress of the project, we can conclude the following: The system works

more efficiently because it is automated. It has a simple and easy-to-use interface that is better than the current system. It allows authorized users to access the system based on their
permissions.This system reduces time complexity and makes information easier to maintain. The most important features are security, data protecti on and reliability. Additionally, the system is flexible and can be changed in the future if necessary.

CONCLUSION:

In conclusion, this study has provided valuable insights into the relationship between BMI and [mention the outcome variable, e.g., cardiovascular risk, diabetes prevalence, etc.] within our specific population. This underscores the importance of maintaining a healthy BMI for the prevention of [mention the relevant disease or condition]. These findings highlight the need for tailored interventions and risk assessment strategies that consider the unique characteristics of these subgroups. Furthermore, further research is needed to examine the impact of genetic and environmental factors on the relationship between body mass index (BMI) and [mention the outcome variable].

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