BMI Calculator using STM32F103C8T6, OLED Display, and 4x3 Matrix Keypad.

Aim:

To design and implement a BMI (Body Mass Index) calculator using the STM32F103C8T6 microcontroller, a 4x3 matrix keypad for user input, and an OLED display for output visualization.

Description of the Work:

The project focuses on developing an embedded system capable of calculating and displaying the Body Mass Index (BMI) based on weight and height inputs provided by the user.

- ***Hardware Used:***
  - ✓ STM32F103C8T6 microcontroller.
  - ✓ 4x3 matrix keypad (for numeric input of weight and height).
  - ✓ OLED Display (SSD1306 driver, I2C interface).
  - ✓ ST-Link V2 Debugger.
  - ✓ Jumper Wires.

- ***Software Used:***
  - ✓ STM32CubeIDE (for code development and flashing).
  - ✓ HAL library for GPIO and I2C handling.
  - ✓ ssd1306.h , ssd1306.c , fonts.h and fonts.c as provided in OLED lab experiment for OLED handling.

- ***Working Principle:***
  1. Upon powering the circuit, the text , “BMI calculator” , appears on the OLED display.
  2. The user is prompted to enter weight (in kilograms) and height (in centimeters) using the keypad.
  3. The microcontroller computes BMI using the standard formula:

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

4. The calculated BMI value is displayed on the OLED along with a health status category (Underweight, Normal, Overweight, or Obese).

- ***Program Flow:***
  - ✓ Initialization of GPIO pins and OLED communication through I2C.
  - ✓ Keypad scanning through row-column technique to detect user input.
  - ✓ Data conversion and computation of BMI.
  - ✓ OLED output update with the final BMI result and classification.

Result:

- ✓ The system successfully accepts user inputs for Weight and Height through the 4x3 keypad.
- ✓ The OLED display accurately shows the computed BMI value and corresponding category.
- ✓ The results matched theoretical BMI calculations.
- ✓ The interface and code were verified and debugged through STM32CubeIDE and real hardware testing.

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