Smart Hydration Tracker: A Water Intake Monitoring System with a Portable Design and High Performance

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*Abstract*—A Internet of Things (IOT) based hydration monitoring and computing system using a miniature Force sensitive Resistor and Bluetooth and WiFi connectivity with works as a accessory to the water bottle by regularly measuring the amount of water present in the bottle and send the real-time data to the mobile app wirelessly and gives you remainder regularly depending on the weather, humidity and body mass Index of the user. The circuit uses a miniature microcontroller to process the analog data from the sensor and LiPo battery to for longetivity.

Keywords—Force Sensitive Resistor, hydration, IOT, monitoring, ESP32, smart-life

# Introduction

While hydration is central to one’s well-being, a majority still face challenges in tracking their daily water intake. The goal of our project is to develop a Smart Hydration Tracker which is a portable device that tracks water consumption in real-time. The system comprises of a thin coaster type sensor module that can be stuck onto any water container or bottle. It employs a weight measurement technology that has load cells which capture the weight of the empty bottle or container. The sensors are then able to record water volume as the user drinks from the container

A microcontroller such as PIC or ARM forms the base of this device. This microcontroller handles the processing of sensor data and updates the users on the existing water levels in real-time. Users can be reminded of their optimum water consumption levels through VIA Bluetooth or Wi-Fi. These features can help users stay hydrated. Interfaces like a mobile app can be incorporated into the system for daily water consumption logs and further hydration guidance to meet the user's needs.

All the available gadgets available in the current market are in-built with the bottle itself or requires manual tracking of water intake which might be hard for most people to stick with it or too tiring. This device removes both cons of the and can be used with any water bottles that user may have and it requires little to no effort in tracking and can also be in hospitals to track their patients fluid intake.

The goal here is to build a lightweight, portable, easy to use hydration tracking system that helps people stay hydrated through custom reminders to improve overall health. This system can especially benefit performance athletes, elderly people, or anyone trying to increase their daily water consumption. Future developments may include smartphone control, voice reminders, or AI powered suggestions based on the user's activity level and environmental factors.

# Methods

The device is made after considering 2 variations. They are a) Coaster model b) Sleeve model. Here we designed a coaster model which can be portable when needed and can be placed in same place long time as it has re-chargable battery. The 2 main parts are a) Hardware b) Software.

## Hardware

The system uses a small and space concise ESP32-C3 microcontroller which has in-built Bluetooth and Wi-Fi connectivity. The sensor used in circuit a Force Sensitive Resistor (FSR) which compared to the load cell is small compared to thichkness of a regular load-cell used in everyday weighing scale. Lithium – Polymer based battery is used in order reduce the size and have a variable specification, so has various applications.

FSR uses piezo-resistive mechanism to vary the resistance and acts as a varying resistor and is connected in voltage divider circuit with the analog input from microcontroller and using voltage division rule the output voltage is calculated using resistances and input voltage.

For the constant resistance for the circuit , 10 kilo-ohm resistor is used and is connected across Analog terminal and GND. FSR is connected from analog to V+ terminal.

## Software

The voltage division calculation is done locally in the microcontroller (ESP32 – C3). The code in microcontroller includes libraries for wifi manager, sleep function for ESP32 – C3 in order to increase the battery life of the device. It works such that ESP32 stays in stand-by mode until a weight of more than 0.1kg (100g) is varied in the FSR.

Through WiFi the Real-time data is sent to the URL to the app which then calculate the requirement of the water intake the user from the weather, humidity data which is imported from the mobile’s IP address to change the regular remainder timings. While logging in the Weight and Height of the User is registered to keep an ideal water intake and remainder which varies during the time of the day. The remainders are turned off automatically and also manually when needed using the local time to no disturb during the sleep time.

To set it up it requires manual or automatic updation of water bottle weight and upto 5 bottles can be added at the same time whose remainders can be set differently based on requirement. The output data of fluid intake can be downloaded locally in CSV or XLSX file formats,

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