



The Smart Water Bottle

Team A6: Alan, Erin, Matthew

Why a Smart Water Bottle?

\$4.03 Billion

Global water bottle market



1,000,000+

Reviews for water tracking apps

On average, how many 16 oz glasses of water do you drink per day? (1 bottle of water = 16 oz)

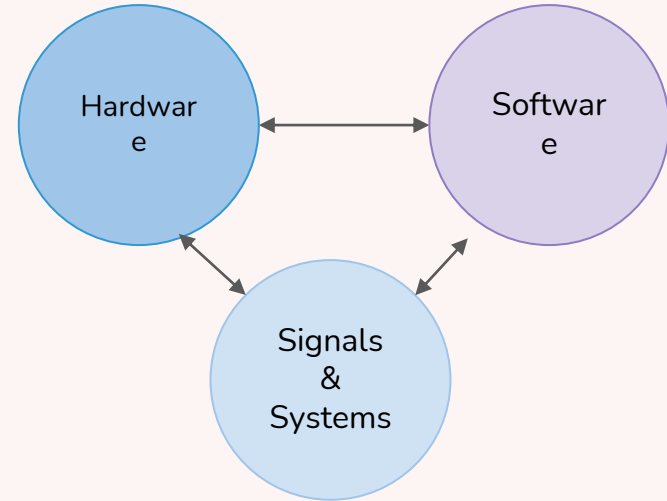


2,861 responses from 01/13/2023 to 01/16/2023
Weighted by U.S. Census 18+
Percentages do not sum to 100 due to rounding
© CivicScience 2023

Our Solution

Merge water bottles and the tracking app into one

1. Track water consumption
2. Identify different liquids
3. Gamification through streaks + social media



Use Case Requirements

1. Track liquid consumption

Bottle measures level of water within **+/- 20%**

2. Differentiate liquids

Categorize between water, soda, coffee, juice with at least **85% accuracy**

3. Bottle -> App

Communication

Send data about water to user's phone via **Bluetooth** with a maximum latency of **5 seconds**

4. User Interface

Accessible user interface in **app** and on the **bottle** for users to see

5. Battery life

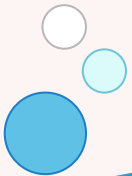
Endure at least **2 days** of typical usage

6. Food Safety

Follow **3-A Sanitary standards** to ensure **hygiene** and **washability**

7. Track temperature

Bottle measures liquid temperature within **+/- 4°F**



Our Approach

Hardware Bottle

- **Seeed Xiao**
- **LCD** display for on-bottle display
- **Ultrasound** sensor for water level
- **Temperature sensor**
- **Capacitance** for identifying liquid
- **Photodiode** for color of liquid
- **Accelerometer** for detecting motion

React Native App

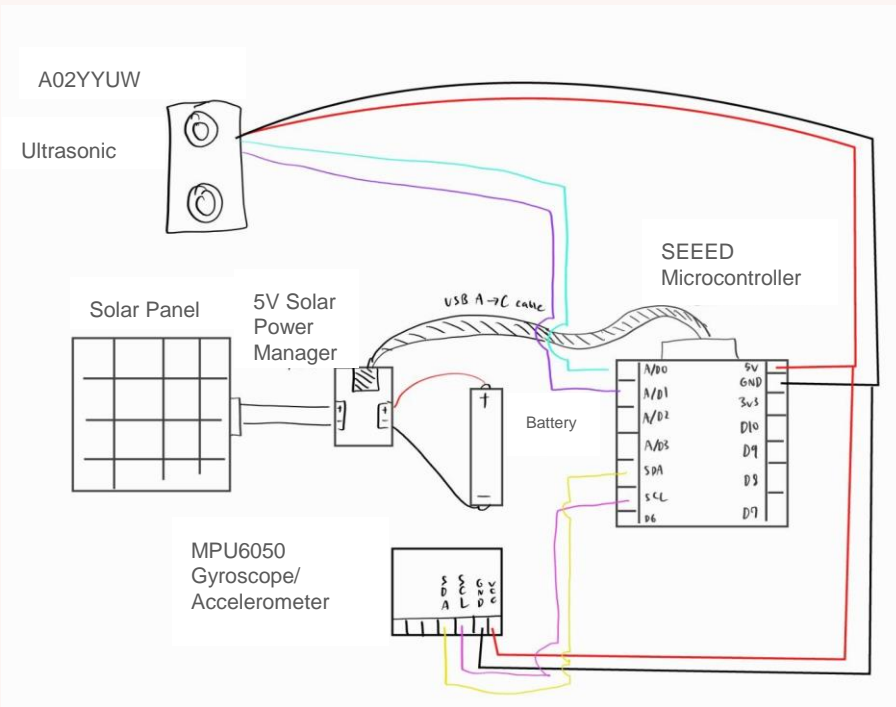
- **Android + IOS** app
- Get sensor data from bottle via **Bluetooth** when needed
- **Accessible UI** for all users
- **Streaks** Page
- Friends/**Social** view
- **Total water intake** view

DB Liquid Differentiator

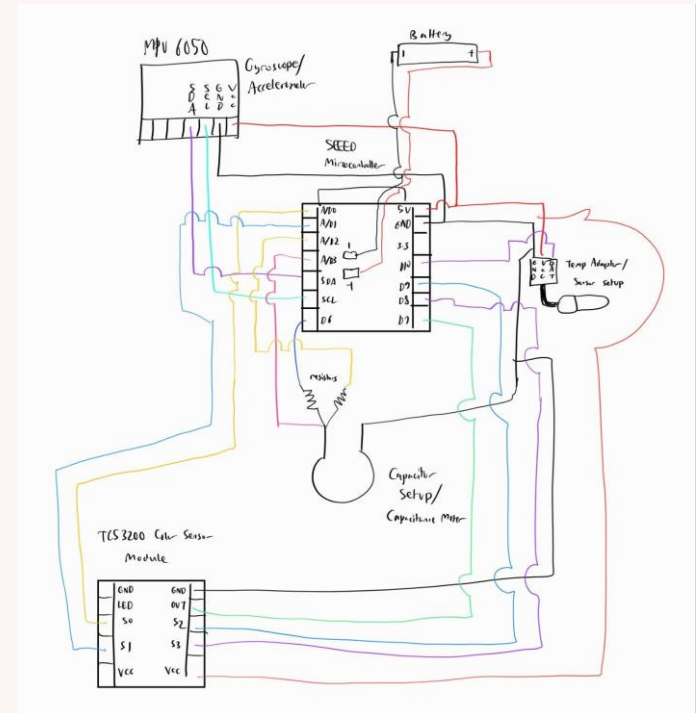
- Use **capacitance, temperature, color** to categorize
- **Classify** liquid between: **coffee, soda, water, juice + user-added liquids**

Hardware Schematic

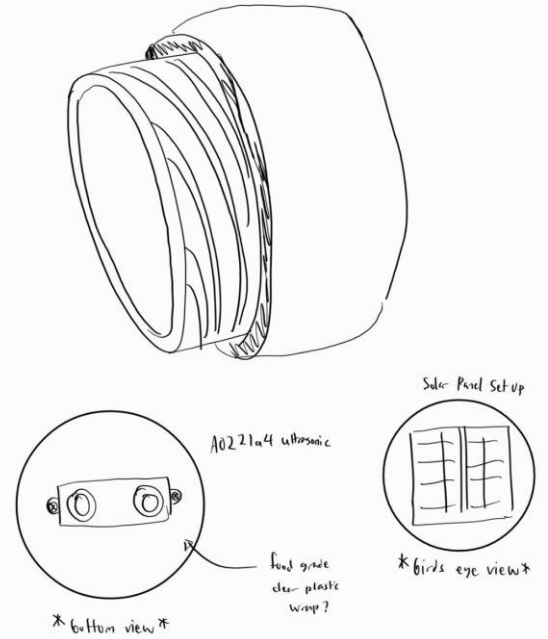
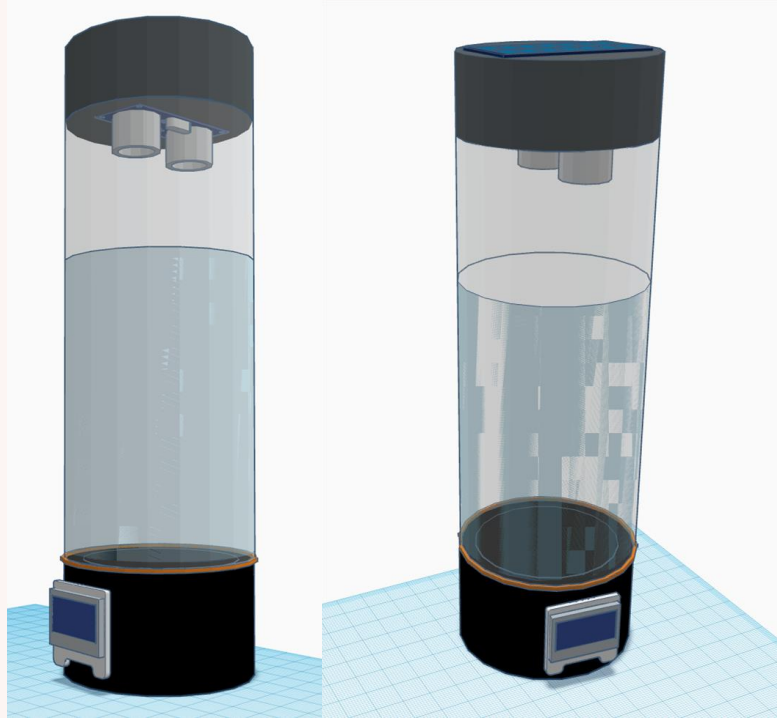
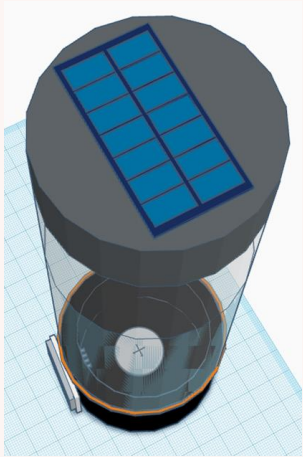
Top



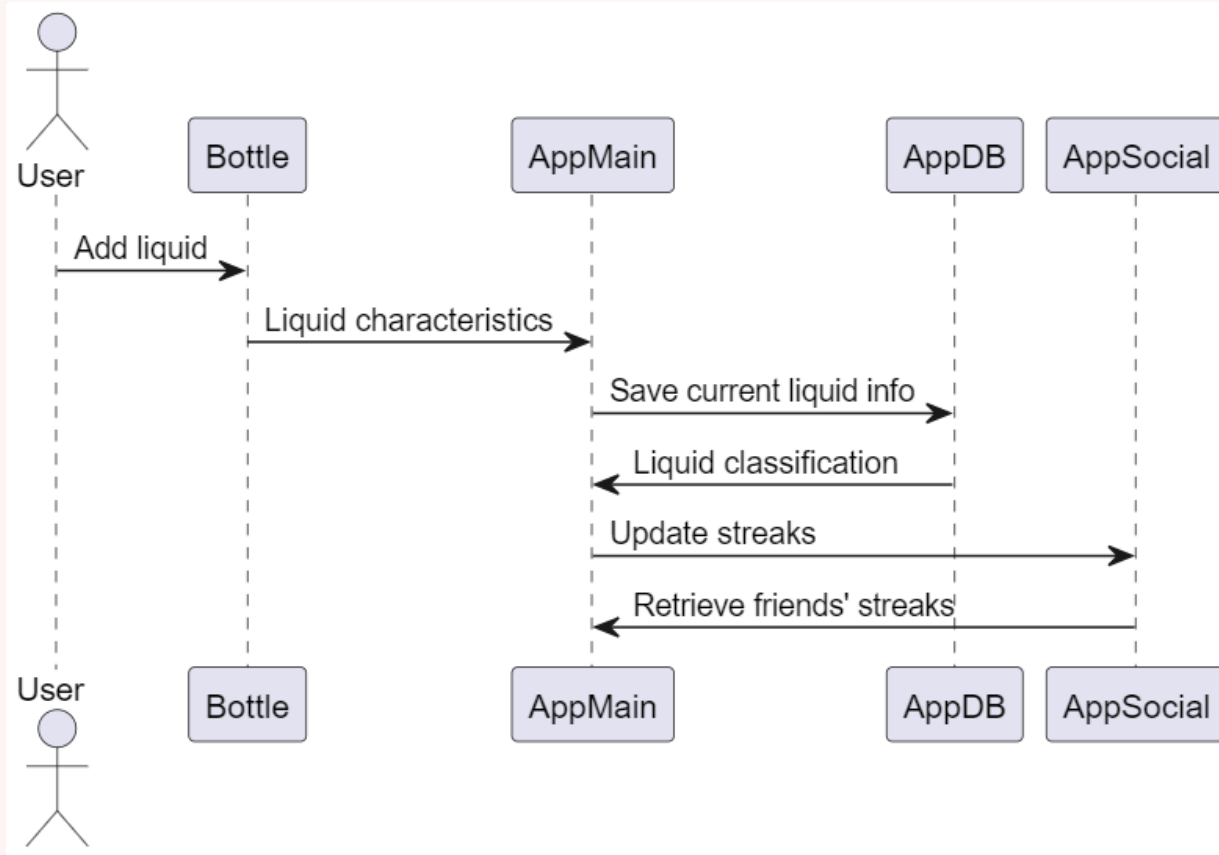
Bottom



Bottle Mockup



Software Diagram



Testing, Verification, and Metrics

Requirement	Test	Mitigation of failure
Water level	Use a graded recipient and contrast with the sensor reading	Switch measuring sensor (Piezo or photoelectric)
Classify liquids	1- Create datasets based on sensor reading (pre assembly) 2-Load different liquids into the bottle (post assembly)	Switch sensors, switch classifying metrics
Battery power	Leave bottle running for at least 2 days while simulating usage	Increase battery pack, increase solar panel area
Food safety	Analyze each sensor according to 3-A standards; wash and inspect for sediment/integrity	Switch sensors, improve sealing

Testing, Verification, and Metrics - continued

Requirement	Test	Mitigation of failure
Temperature	Use a food thermometer as ground truth and compare the thermometer reading	Switch measuring sensor
Bluetooth connection	1- Send dummy data from seed and time it (pre assembly) 2-Send data from bottle and time it (post assembly)	Redesign package transport and processing structure
App reliability	1-Atomic unit testing (pre assembly) 2-Integration testing (post assembly)	Debug, switch structuring
Accelerometer	Remove cap and move bottle	Switch sensors, recalibrate

February

March

April

May

Bottle Hardware

Feb 19
Test liquid identification - color

Feb 24
Test water temperature measurement

Mar 10
Test liquid identification - density

Mar 1
Test liquid identification capacitance

Mar 17
Measure assembly power consumption

Mar 10
20 battery calculations and mount a battery pack

Mar 13
MVP battery pack

Mar 12
Add on Raspberry Pi battery - LEDs

Apr 1
Add final power circuit

Apr 8
Create and waterproof final assembly

Apr 5
Add solar panels

Cadding

Feb 2
Set up beak app

Feb 26
Create Slack system

Mar 1
Receive A-10 process sensor data

Mar 14
Cad MVP

Apr 10
Cad final project

App Development

Feb 19
UI - filling water cup

Feb 26
Set up database system - local user data

Feb 28
Set up database system - general configuration

March 1
Set up water refilling reminders

Feb 25
Set up bluetooth communication between beak and app

March 8
Design architecture for package transport

March 8
Design architecture for package transport

Apr 10
Set up networking backend

Integration

March 22
Stack MVP

Course Milestones

March 1
Design review

Mar 31
Interim demo

Apr 15
Stack - Final delivery

4/23
Final presentation

Thanks for listening

