CSE 123A - Winter 2026

Group 8

Problem statement

Living with roommates can sometimes mean your filtered water device is empty when you need water. This can be very frustrating and leave you needing to drink tap water while other roommates get to drink cold refrigerated and filtered water.

Need Statement

We want a way to know if the container is out of water when we need water.

- Avoid having no water left in addition to everybody using the water filter, not knowing there is no water left.
- Need a way to know the current water level of the pitcher so that it isn't empty without everyone knowing it's empty.
- We need to know if the container is empty, in order to not run out of clean fresh water.

Goal

- Keeping water level known at all times, while informing to everybody in the household if the water level runs too low.
- Create a system to inform users if the container is empty.

If the container is empty, inform users.

Personas and Users

This is intended for shared households that rely on a shared filtration water container

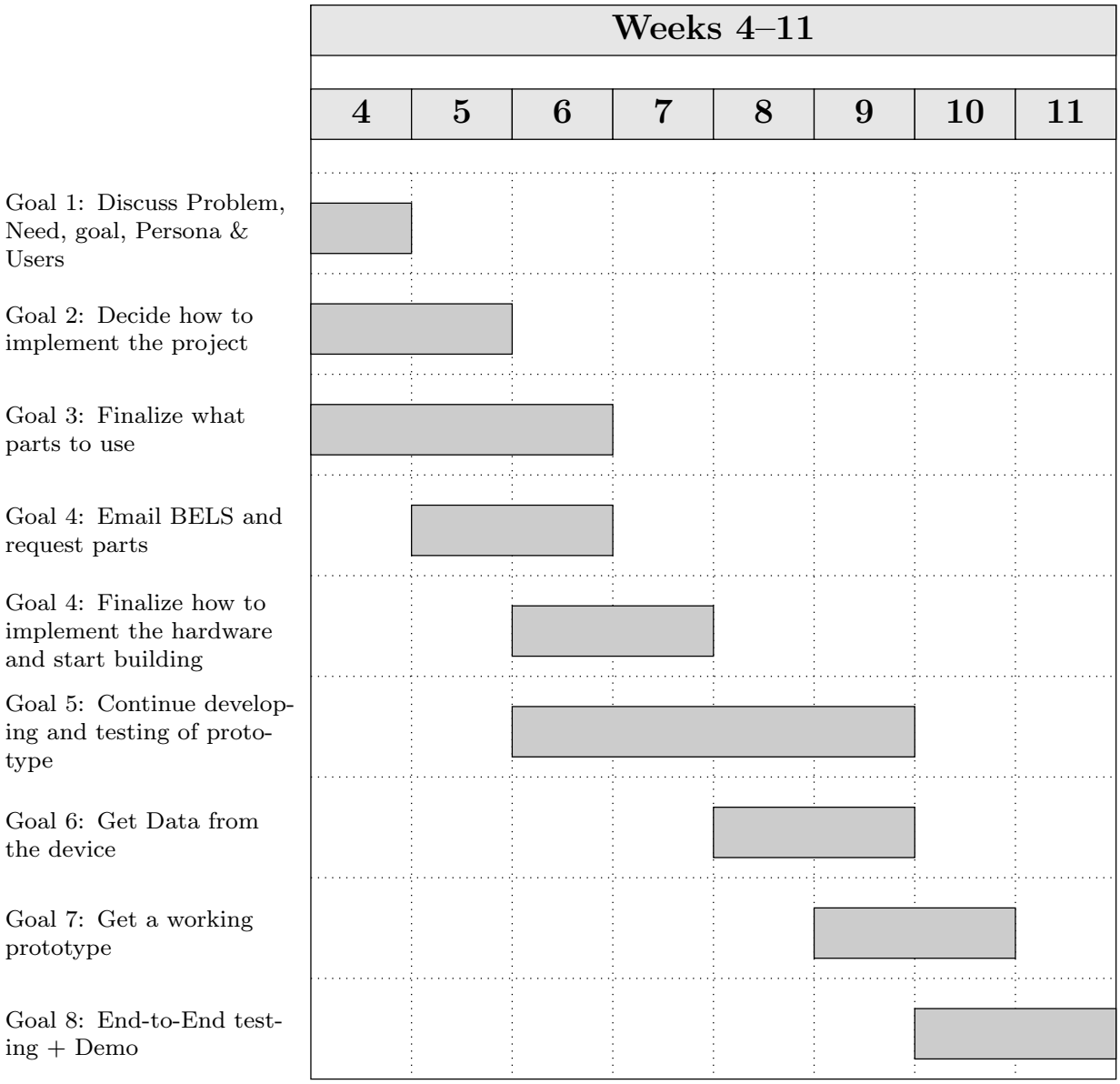
- College Roommates

  - John Doe, 20 years old, Student at UCSC. John lives in a dorm with two other roommates, and they all rely on a shared water filter for drinking water. Occasionally, John comes out to get water only to find that the water is empty. This creates frustration and delays as John has to choose between missing the bus to refill water or getting to class on time while being thirsty.

- Family
  - Jane Smith, 39 years old, working mother. Jane lives with her husband and two children. Jane gets home after a long, exhausting day of work and is feeling thirsty from the drive home. She goes to the shared water filter to find that it is completely empty. Jane feels frustrated with her stay-at-home husband and two children for not refilling the water filter. This causes her to lash out and yell at them until they all cry, creating a hostile environment in the household.

- Office
  - Joe Micheal, 30 years old, works with Excel spreadsheets. He has very limited time to refill his mug, and his boss, George, never refills the water filter. As a result, Joe's efficiency has substantially decreased at his desk.

Timeline



Decision Table

Items to decide on

- Micro controller
- Sensor
  - Ultrasonic: Pointed down from the lid onto a floating object
  - Load Cell: Place the container on the load cell to measure the weight and calculate the water level

  - Laser: Shoots a laser into the water from the lid, and the distance is sent back to the sensor
  - Camera: Setup to watch the water filter and measure the water level based on computer vision
  - Non-Contact Sensor: Patch that sits on the side, when water level goes below sensor it can alert the device
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Server

- HTTP
- AWS
- Vercel

Challenges

- Signal in the fridge
- Size limit
- Contact Vs No Contact
- Wifi connectivity
- Power source (battery, usb, ...)

Criteria (Weight)	**Capacitive**	**Weight**	**Laser**	**Ultrasonic**
Cost (0.30)	5	5	3	5
Power (0.20)	5	4	3	4
Complexity (0.25)	3	4	2	3
Measurement Data (0.25)	3	5	3	3
Weighted Total	**4**	**4.55**	**2.70**	**3.85**

Table 1: Decision matrix comparing feasible sensing approaches (1 = poor, 5 = excellent)

Based on the decision matrix, the weight sensor is the best sensing method because it has the highest weighted total score (4.55). It performs especially well in measurement quality while still keeping cost, power, and overall complexity at a strong level compared to the other options.