Introduction

Smart cup aims to provide people a way to live a healthier life. With a special monitoring system, smart cup can track the water consumption of user and calculate the average water consumption in a specific period. If the average water consumption is below the recommended value, smart glass will gently remind user to drink more water. At the same time, smart cup can show the water temperature to make sure that user drinks the water with appropriate temperature. Besides, smart cup has a special liquid classification system to make sure user is drinking "real" water instead of unhealthy soft drink.

Motivation

- Health authorities commonly recommend eight 8-ounce glasses per day
- A typical adult naturally loses about 2-3 liters of water per day
- Benefits of drinking water:
  - Lubricates the joints
  - Forms saliva and mucus
  - Regulates body temperature
  - Helps maintain blood pressure
 - Prevents kidney damage

Goals

- Remind people to drink sufficient water
- Remind people to drink healthy water instead of soft drinks
- Remind people whether the water is ready to drink with appropriate temperature

For Progress Report

Current Progress

- Make sure the type of sensors that we need, including a pressure sensor (HX711, ordered through Amazon), a temperature sensor (in box), a light sensor (in box)

- Make a prototype "smart-glass" with only temperature sensor and light sensor (pressure sensor is on the way)
- Connect multiple sensors to Raspberry Pi, and organize the python code to show the output of sensors correctly
- With test, we make sure that the light sensor can detect the change of light density while changing the liquid above it from coffee into pure water. We also confirm that the temperature can detect the temperature of liquid in glass
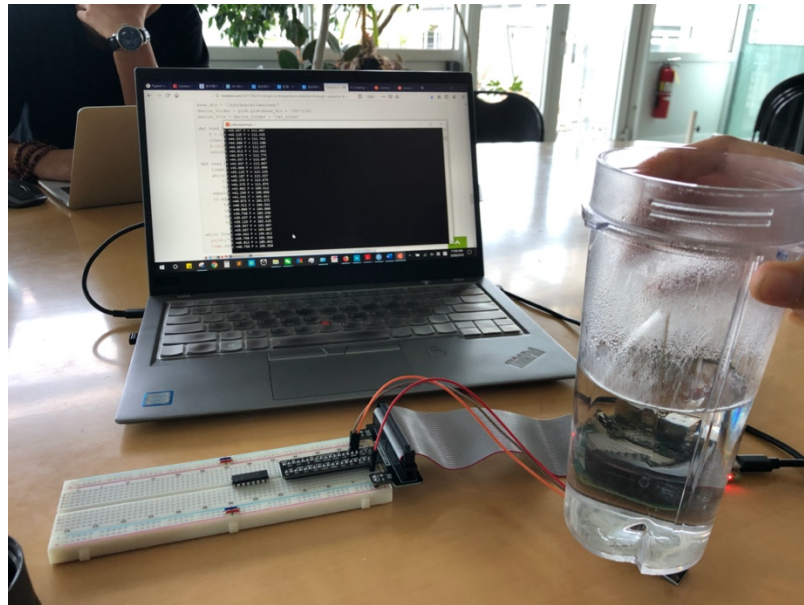
- Implement the design details of "smart-glass", including the placement of sensors, data that we need to set up a range for different types of liquid, method to prevent the effect of light outside the glass

Problems Encountered

- How to connect another sensor to Raspberry Pi? Using the same ADC or another one?
- Current experiments show the lighting sensor can differentiate cola and water with same ambient light level. However, ambient light can be a main noise that cannot be ignored in future experiments. How to eliminate the impact of ambient lighting?
- The measurement of temperature delays, which cannot indicate the real-time temperature of water in the glass.

Future Plan

- Connect the weight sensor to Raspberry Pi and obtain its measurement
- Appropriately configure all sensors in a container
- Conduct more experiments to figure out how to differentiate types of several common drinks, such as cola, orange juice, and coffee
- Solve the temperature measurement delay problem (by adding a light source and blocking the ambient light)
- Figure out the ways to remind people
- Complete all codes
- Test
- Connect all sensors to OpenChirp (if time allows)

Methodology

Phenomena of Interest

- Measure the weight of the glass to get the amount of liquid in the glass
- Measure the time to calculate the hourly water consumption
- Measure the light intensity at the bottom of the glass to get the types of liquid
- Measure the temperature of the water to make sure it is comfortable to drink

Sensors Used

- Weight Sensor: HX711
- Light Sensor: LM393
- Temperature Sensor: DS18B20

Signal Conditioning and Processing

Describe the signal conditioning and processing procedures