



Smart Coffee Maker

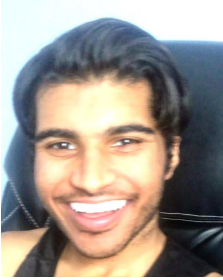
Senior Design Project Proposal

Group Members

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University of California Davis
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Team Members



Name: Tobin Joseph
Major: Computer Engineering



Name: Jennifer Hernandez
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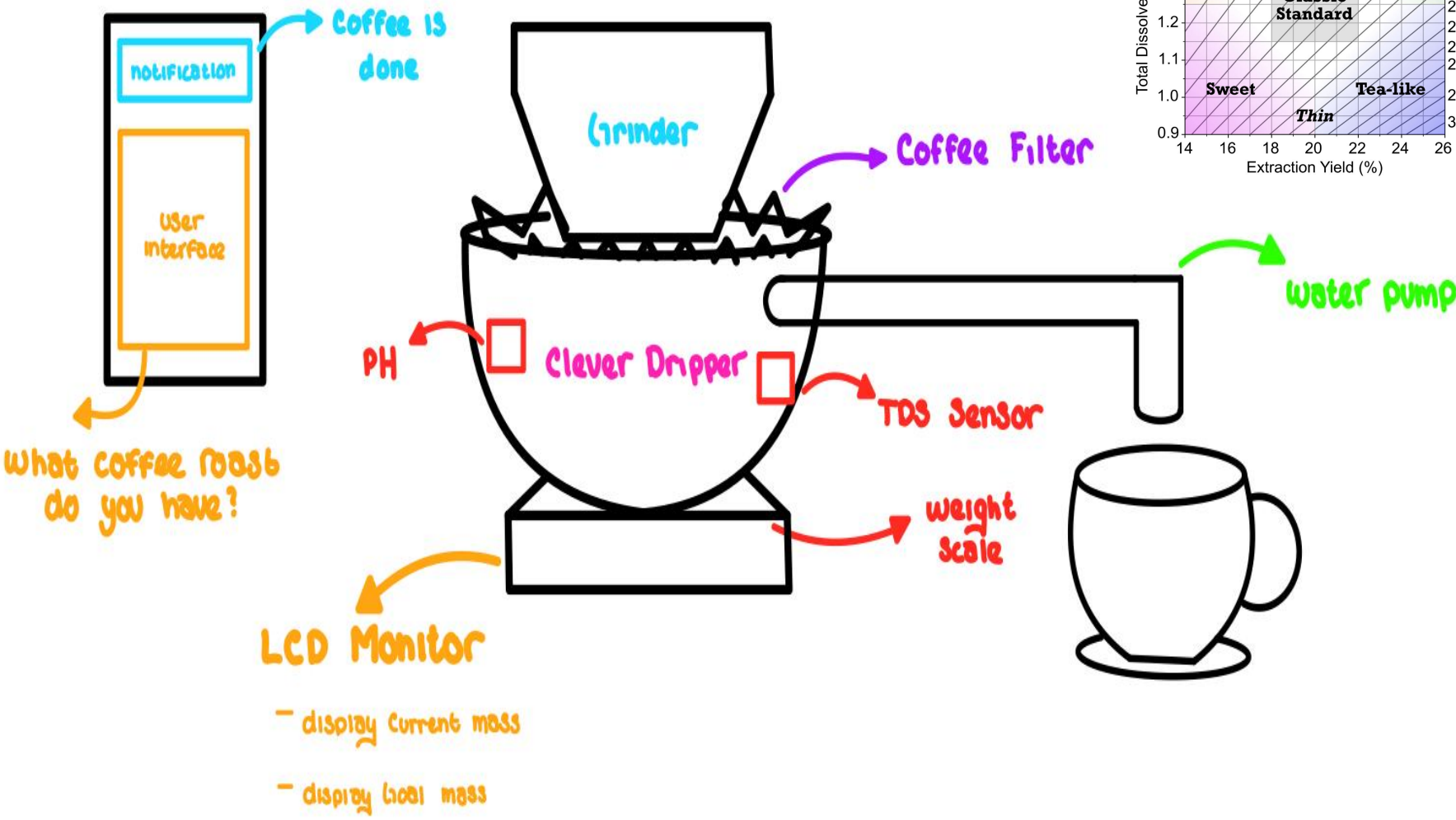
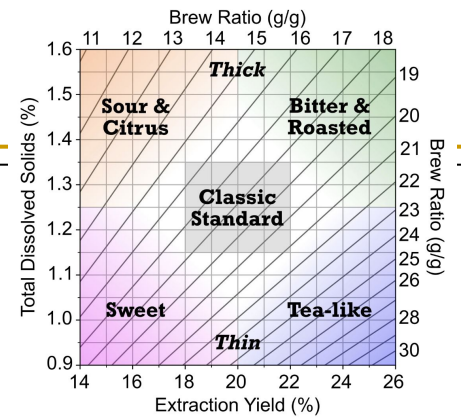


Name: Tejasv Anand
Major: Computer Engineering

Project Details: Coffee Maker

- Project Description:

We will make a device that makes the “ideal cup of coffee” perfectly every time using efficient electrical energy. We will accomplish this by making calculations to reach a user imputed desired taste based on the roast of the beans, the grind size, the brew ratio, the total dissolved solids, the pH, extraction time, etc.



Why is it an IOT Project?

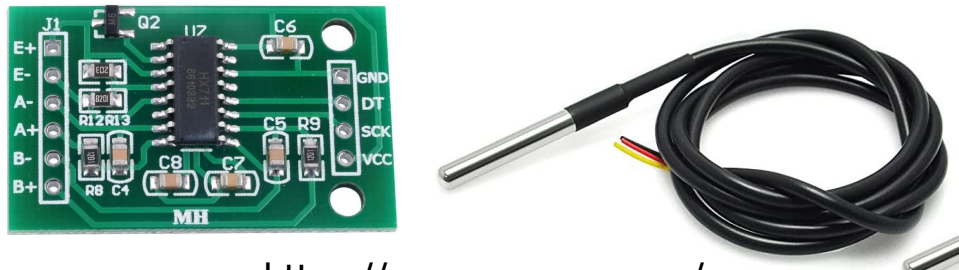
- How does it satisfy the sensing requirement?
- How does it satisfy the computing requirement?
- How does it satisfy the communication requirement?
- What is the plan for mobile interface?
- What sort of cloud computing and/or analytic services will be used?

Sensing

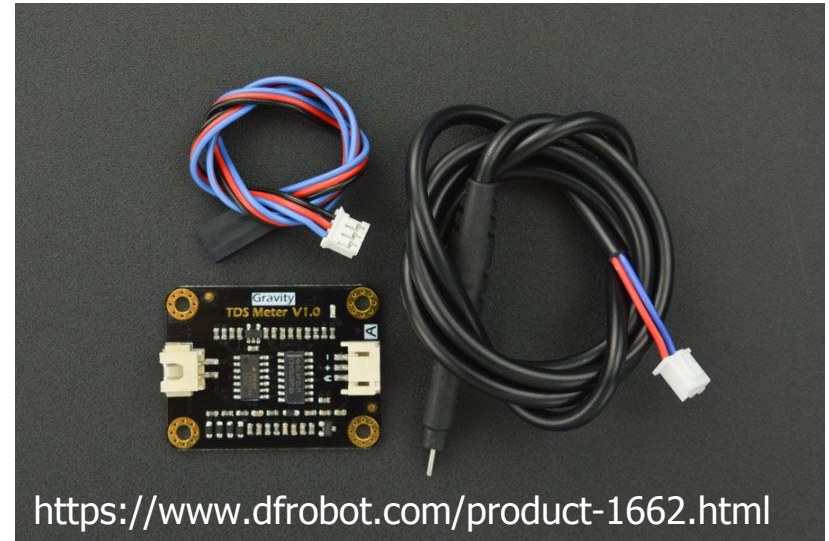
Sensors we would need

1. Liquid pH sensor
2. Waterproof temperature sensor
3. TDS
4. Weight sensor

Estimated cost: ~\$60



<https://www.amazon.com/>



<https://www.dfrobot.com/product-1662.html>



<https://www.dfrobot.com/product-1025.html>

Sensing Cont.

- Possibly automate the grinding process?
 - currently the only thing which requires the user's input
- Pros: would ensure we have uniform results
- Cons: More power consumption, increased complexity, more mechanical parts to include, \$\$\$



Sensing Cont.

TDS: Total dissolved solids inside the final coffee brew. This is basically the concentration of the coffee.

A higher TDS means more coffee particles, oils, sugars, etc. are dissolved inside the water which leads to a more sour and/or bitter taste.

A lower TDS means that there are fewer solids within the water which leads to a more sweet and/or tea like flavor.

PH: “potential of hydrogen” or “power of hydrogen” which corresponds to how acidic or basic a specific aqueous solution is.

A typical pH for coffee is around 5 and a lower pH increases the sour and bitterness of the taste and a higher pH increases the sweetness.

Computing requirement

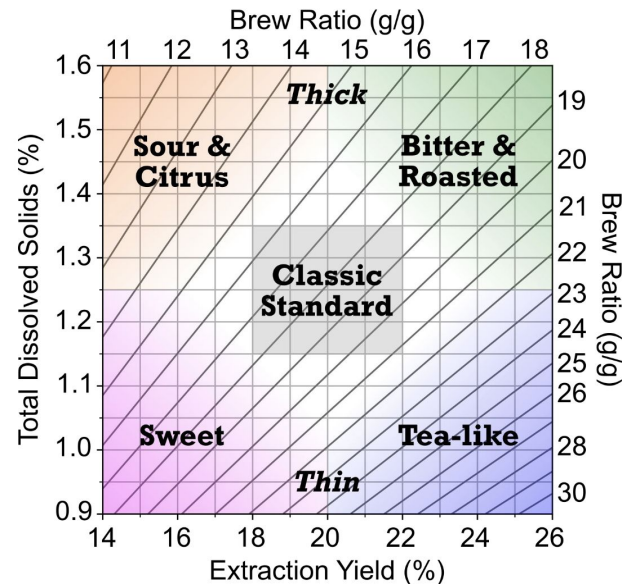
Things we would need to compute:

- . Temperature of the water
- . TDS(Total dissolved solids)
- . Percent Extraction
- . Brew Ratio
- . PH of the coffee



Computing requirement Cont.

- Based on that information the grind size, the mass of the coffee ground, and the mass and temperature of the water will be determined
- The coffee ground and hot water will then be placed in a clever dripper where the TDS, the pH, etc. will be sensed and extraction time will be calculated
- Once each parameter has met what the user has set the ideal cup of coffee to be, the brewed coffee will be pumped into the user's cup to slow down any changes in the taste of the coffee



Communication requirement

The device will communicate with the server to send a notification to the phone that the coffee is finished.

Example: Authenticate connections between sensors, a device and an application

1 An array of temperature sensors transmit data



2 The connection to AWS IoT is authenticated



AWS IoT



Only authenticated users can control the fan



4 The connection to the fan is authenticated



5 The fan receives a command and turns on



3 If the sensors agree the temperature is above a threshold they turn on the fan

Plan for mobile interface

- If the user enjoys the coffee they have selected, they can save the preferences within the app so that next time the coffee is being made we won't need to sense the status of the coffee, it will simply go back to process flow.
- Interface where user could change the settings of the coffee and then save that configuration for next time

Welcome!
How would you like
your coffee?

My Favorites

Customize

Recommendations


Customize

1. Grind size?
 - coarse
 - medium-coarse
 - medium
 - fine
 - extra fine
2. Type of bean
 - dark

working w/ what the
user has

Recommendations

1. What notes are you
looking for?
 - Sour
 - Citrus
 - Sweet
 - Tea-like
2. Set your intensity



gives user what they want
and grind size they need

Cloud Computing requirement

- Amazon web services
 - subscription service
- Can use it to log the information that is customized by each user
- Allows us register our Arduino and be able to configure, test, and analyze the data



Limitations

- Need to make sure the equipment is sterile as we are preparing something for human consumption
 - currently we don't have a system that does this automatically after each use, would have to be done manually
- A prototype model still requires further work to be configured into a full coffee machine
- Requires extensive testing since we need to make sure the configurations are working properly and correspond to the expected taste of the coffee
- Automation of grinding process would require additional complexity and more mechanical parts
 - lots of variability in coffee taste if left completely to the user

Questions

