Project Deliverable K: **User and Product Manual**

GNG 1103 – Engineering Design

Faculty of Engineering – University of Ottawa

BOM

- 3D prints of the models provided(scale up to 1000%)
    - Laser holder (2 pieces)
    - Everything holder (1 piece)
    - Mirror holders (2 pieces)
- Laser cut the mirror holder track (1 piece)
- Cut 2 4x6cm mirrors
- Screws and nuts 6 – 6/32 x 1 in with respective nuts
- Get Arduino
    - Laser
    - Complementary accessories (cables, breadboard, etc.)
    - Temperature sensor
    - Display
    - CCD sensor (TCD1201D)

In order to complete the project, the following components need to be finished

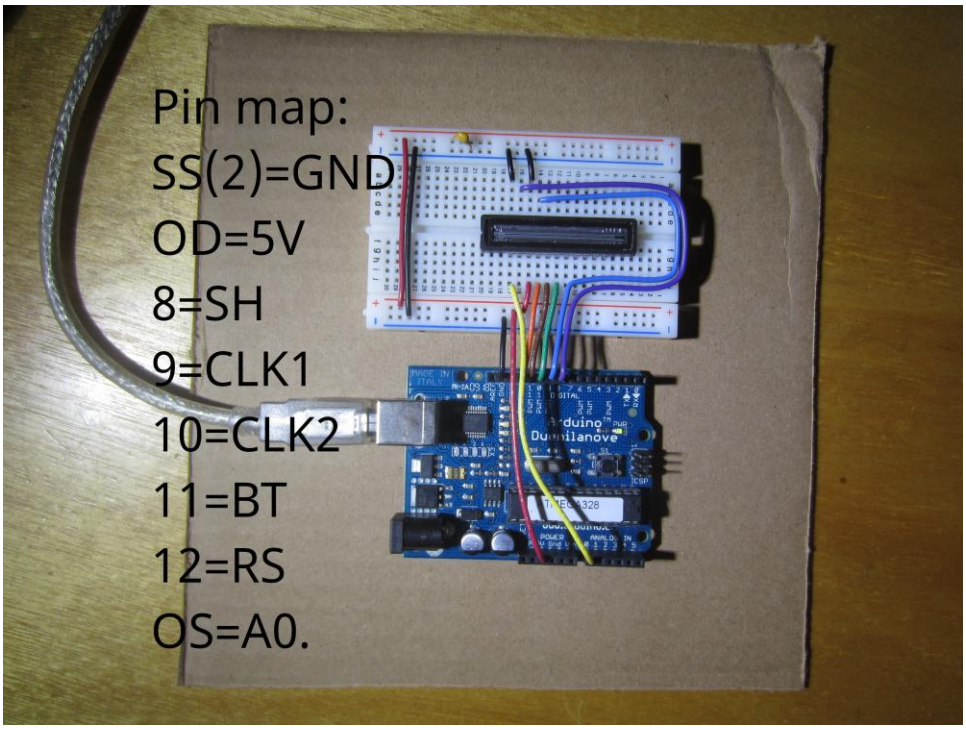
- Code needs to be completed to include a lcd display and button interactions
- Code needs to be updated because the sensor readings aren't being picked up by the arduino
- Design needs to be updated to shield device from light
- Design needs to be updated to clamp on securely to the sight glass
- Different laser has to be used, current laser is unreliable

Lessons learned

- The correlation between the refractive index of wort and sensor reading are linear
- There is a lot of light diffusion when light passes through wort
- A lot of light is absorbed by mirrors
- Precise component placement is crucial for design to work

https://www.desmos.com/calculator/7eag9ar5cn

https://www.desmos.com/calculator/gjxq6b3zlz



TCD1201D data sheet: https://www.effemm2.de/hardware/TCD1201D.pdf