

ECE 476/676 - Homework #7

Temperature, Text Files, Speed Control of a DC Motor - Due Monday, October 21st

How Good is My Coffee Cup?

Determine the thermal time constant of your favorite cup (your pick) along with the 90% confidence interval.

1) Write a Python program to measure temperature using a DS18B20 digital thermometer

Use your program to determine the temperature of

- Ice water
- Cold water from the tap
- Hot water from the tap
- Room temperature (T_{amb})

2) Write a Python program to measure and record the temperature of a hot cup of water

- Sampling rate = 1 second
- Duration = 2 minutes (120 samples)

Plot your data vs. time on the graphics display.

3) Using your data from problem #2 and Matlab, determine the thermal time constant of your cup using least-squares curve fitting and

$$T = be^{-at} + T_{amb}$$

time constant = $1/a$

4) Write a Python program which uses recursive least squares to determine the thermal time constant of a coffee cup in real time

5) With this program, record the thermal time constant for a given cup three times

From your data, determine the 90% confidence interval for the actual thermal time constant

- student t-test