Digital Signal Processing

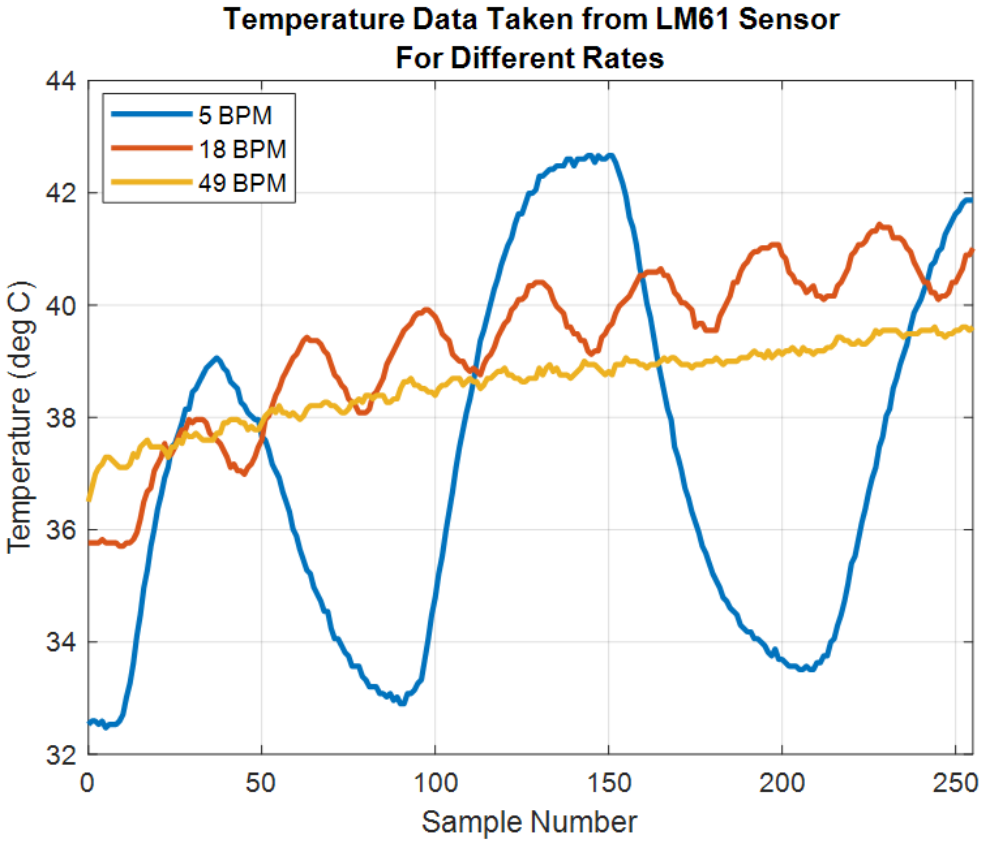
Lab 08 Introduction
The Equalizer

Lab 08 Objectives

- Use an equalizing filter to compensate for the performance of the LM61 temperature sensor
- Use the DFT (in the form of the FFT) to plot frequency response given an impulse response
- Use the FFT to perform convolution of two filter impulse responses.

LM61 Performance

- The temperature sensor acts as a low pass filter to temperature changes
- Model this as a “leaky integrator”



“Breathing_Data.mat” on myCourses

Equalization

- Filters can be used to separate signals
- Filters can be used to compensate distortion
  - This is what the equalizer does
- The temperature sensor is an integrator
- Compensate this with a differentiator

Lab 08 Steps

- Find the frequency response of the “leaky integrator”
  - Use the FFT and plot the magnitude
- Find the response of a proposed equalizer using the FFT
- Convolve the responses in the frequency domain
  - Pad the sequences to avoid circular convolution
  - See lecture slides Week10 DFT Properties Session 01

Lab 08 Steps

- Apply the equalizer to the breathing data
- Capture your own breathing data with the Arduino and apply the equalizer in C-code.
  - This is done using time domain convolution

Lab 08 Duration and Write Up

- This lab is a 1-week lab
- It does not require an IEEE format write up
- Answer all questions in the Live Script. Include a complete concluding paragraph
- Export your file to a PDF and submit to myCourses Assignments

Preventing Serial Port Overload

- The “CaptureArduinoData.m” routine includes a parameter “GraphDelay”
  - Prevents serial port overload from occurring
  - Add “GraphDelay”, N to the function call

```
>> data = CaptureArduinoData('ComPort',3,'BaudRate',115200,'NumActivePlots',4,'GraphDelay',100);
```

  - N=100 samples works well