ECE 2045: Statistical Signal Processing

Lab 1: Remove High-Frequency Noise in Measured Data

Read Data

The ThingSpeak™ channel 12397 contains data from the MathWorks® weather station, located in Natick, Massachusetts. The data is collected and posted to ThingSpeak once per minute. Field 3 of the channel contains relative humidity data. Read the data using the `thingSpeakRead` function.

```
[humidity,time] = thingSpeakRead(12397,'NumPoints',8000,'Fields',3);
```

```
filtertype = 'FIR';
Fs = 1/60;
N = 3;
Fpass = 1/(24*60*60);
Fstop = 1/(2*60*60);
Rp = 0.5;
Astop = 50;

LPF = dsp.LowpassFilter('SampleRate',Fs,...
                        'FilterType',filtertype,...
                        'PassbandFrequency',Fpass,...
                        'StopbandFrequency',Fstop,...
                        'PassbandRipple',Rp,...
                        'StopbandAttenuation',Astop);
```

Process and Send the Data to ThingSpeak

Process the relative humidity data using the low-pass filter, and send the filtered humidity data to a ThingSpeak channel using the `thingSpeakWrite` function.

```
Output = step(LPF, humidity);
```

Using the MATLAB Analysis app, you can write the data to a channel. If you are using the MATLAB Visualizations app, you can also add a plot of the data. Change the `channelID` and the `writeAPIKey` to send data to your channel.

```
channelID = 17504;
writeAPIKey='23ZLGOBBU9TWHG2H';
thingSpeakWrite(channelID,Output,'Timestamps',time,'WriteKey',writeAPIKey);
plot(time,humidity,time,Output);
ylabel('Relative Humidity');
legend('Raw Data', 'Filtered Data');
```