

Virtual Measurement System GUI Assignment

The VMS GUI will be used to generate plots of signals with various contaminants. Similar signals will later be generated in the Integration-Differentiation GUI, so it will be clear how these contaminants affect the numerical processing of the data.

SET-UP

1. Open the Virtual Measurement System GUI.
2. Change the system characteristics to:

| | |
|-----------------------|--------|
| Mass: | 50 |
| Damping: | 100 |
| Stiffness: | 10,000 |
| Initial displacement: | -4 |
| LVDT sensitivity: | 30 |

Keep the default values for everything else.

These values will produce an output that will mostly damp out within the 5 second plot window.

Run the simulation, and view the displacement plot to confirm this.

ACCELEROMETER

1. The accelerometer will be examined first. Add a drift of 0.03 V/sec to the accelerometer, run the simulation, and plot both the ideal accelerometer output and the real-world accelerometer output. Make sure that you un-check the displacement plot box, to simplify the plot. Examine the output.
2. Add a bias of 0.2V to the signal, in addition to the drift. Re-run the simulation, and examine the same two accelerometer output plots. Can you clearly identify both the drift, and the bias?
3. Uncheck the ideal accelerometer output box, and plot just the real-world accelerometer output. This is what you would see in an actual test. Would you still be able to identify both the drift and the bias?
4. Try varying the amounts of bias and drift, and examining the resulting output.

LVDT

1. Increase the amplitude of the sinusoidal noise on the LVDT signal to 0.3 V, with a frequency of 60 Hz. Run the simulation, and plot the ideal LVDT signal along with the real-world LVDT signal. Observe the results. You can zoom in on the plot if needed, to better see the noise.
2. Increase the noise amplitude to 1 V, run the simulation, and observe the results. Again, zoom in if needed.
3. The signal will now be filtered, using the RC circuit low-pass filter. Keeping the default RC value of 0.025, run the simulation. Plot the filtered and unfiltered real-world LVDT signals together. Zoom in on the plot to examine it more closely.

Has all of the noise been filtered out? What other effect has the filter had on the signal? What is the cut-off frequency of the filter, and how does this relate to the frequency of the noise? Try varying the cut-off frequency of the filter, or the frequency of the noise, and examine the result.