

SSY 230, System Identification

Project 1: Estimating functions from noisy data

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1 Flexible Robot Arm

The system we have chosen to identify is a mechanical system, where a flexible robot arm have been installed on an electrical motor. It is a SISO system where the input $u(t)$ is measured reaction torque and the output $y(t)$ is the acceleration of the flexible robot arm. The experimental set-up was performed using a periodic sinusoidal sweep.

1.1 Data

As mentioned previously the input data is a periodic sinusoidal sweep (see top plot of Figure 1). Due to the fact that the data was obtained using a periodic sinusoidal sweep we split the data in half and use the first part as training data and the second part as validation data.

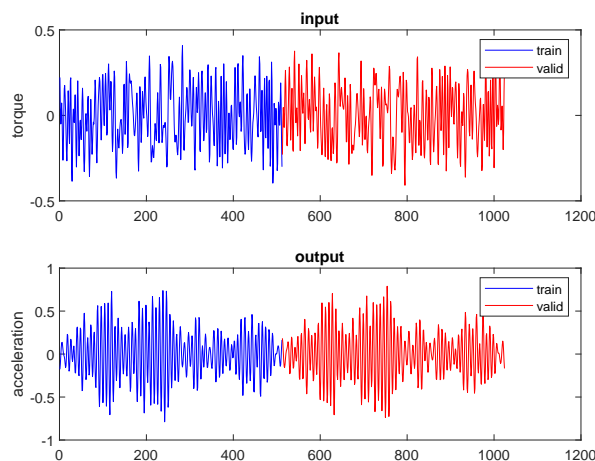


Figure 1: System data, input $u(t)$ (top) and output $y(t)$ (bottom).

To make sure that the frequency content in both the training and validation data are similar we use the *etfe* in MATLAB to find the Empirical Transfer Function Estimate of training- and validation data. The resulting bode-plot is shown in Figure 2.

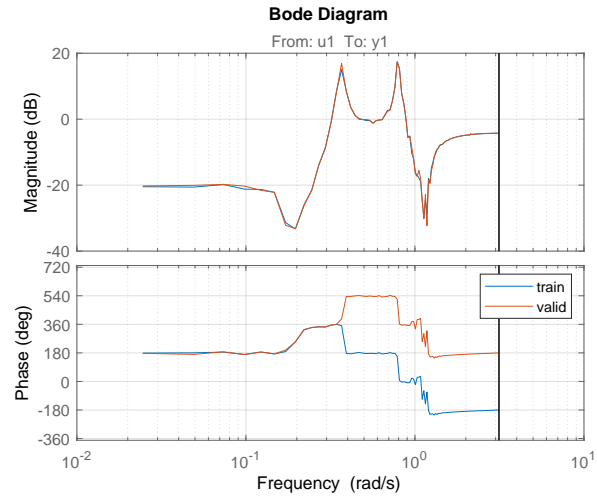


Figure 2: Bode-plot of training and validation data.

From analysing Figure 2 it is clear that the amplitude of the frequency content in both training- and validation data is very similar, while there is a phase shift for frequencies > 0.35 rad/s.

1.2 Pre-Processing