

System Identification

Lab session #2 on System Identification

The file `SI_Lab2.mat` contains two input/output data sets (in Matlab format `iddata`), generated by two different linear systems \mathcal{S}_1 and \mathcal{S}_2 . In particular:

- `Z` contains data generated by the system \mathcal{S}_1 ;
 - `Z2` contains data generated by the system \mathcal{S}_2 .
1. Split the data record `Z` in two parts: the first one (`Ze`) for estimating the model, and the second one (`Zv`) to validate it. Identify an ARX model by using the following selection methods, evaluated on the validation data `Zv`:
 - the best FIT criterion;
 - the AIC criterion;
 - the MDL criterion.

For each estimated model, perform the residual correlation analysis and plot the pole-zero diagram, with the corresponding 3σ confidence intervals. Test the estimated models by comparing the simulated output $\hat{y}_s(t) = G(z; \hat{\theta})u(t)$ to the true output data $y(t)$.

2. By using again the data set `Z`, identify some ARMAX, OE and BJ models of different orders and evaluate if the model quality of such models is improved, with respect to that of the ARX models obtained at point 1. Estimate the variance σ_e^2 of the white process $e(t)$ of each model.
3. Repeat points 1 and 2 for the data set `Z2`.