Project 3: Identification of a Real System

SSY 230, System Identification
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In this project you will identify models of at least one real system. The purpose of this project is to gain experience of using commercial software tools for doing system identification on logged data, to identify and validate models of real world plants. You can choose the system and the data yourselves with the constraint that the choice must make sense as a project in this course. Invest some time to search for possible data systems and data sets and consider why a data set would be to be prefered. Also, discuss your choice with one of the teachers before you make the final choice of data and system.

For Ph.D students, if you have data from your research project that might be a very good oportunity to use them. The project could be the start of a research paper.

You should work in groups of two students so that you can discuss your result. You can very well work on two different systems, but still work together so that you discuss your results and give feedback to each other.

Matlab and System Identification Toolbox is the recommended tool.

- Select system and data for your project. Search for possibilities on internet. You can search for a system from your domain of interest, eg, mechanical or electrical system. Some possible places to find data:

  https://homes.esat.kuleuven.be/~smc/daisy/

  http://www.nonlinearbenchmark.org/

- Spend some time investigating System Identification Toolbox. Use the GUI and play around so that you get a bit familar with the available functions. You should recognize most of the functions from the methods discussed in the course. There are demo scripts you can look at where they go through the system identification workflow.

- Start by investigating the data and data properties.

- Consider data preprocessing. Trends? Should you filter the data?

- Try to identify good models describing the systems generating the data. Compare different models and point out advantages and dissadvantages of the different models.

- Make conclusions both on the data and on the system from the results of your work.

- Make sure you explore most of the tools available in the System Identification Toolbox. You should present the results and give comments about it.

- Try both linear and nonlinear models. Compare and validate the models.

- Up to here, the purpuse has mainly been to get to know the System Identification Toolbox. Now you should do a systematic identification of your data set and reflect the features of the models you identified.

- Write your report. Think how you build up the report so that it is possible to give feedback. Don't just submit result of a large set of models you have tried. Instead, present each step in teh identification procedure and write your conclusions after each step. Include figures illustrating the result of something you test, then, briefly describe what your conclusion is from the figure, and how that motivates you to choose the next step.

- Make a small Matlab demo illustrating the identification. Show a preliminar version of the demo for one of the teachers. Prepare a 10-minutes presentation, it can consist of your demo file you execute.

- There are several example demos available in Matlab. Write "demo toolbox system" in the Matlab window to access them. A good start is to look through a demo to see how the commands are used, and what conclusions are made in each step of the system identification process. Try, for example, the Glass Tube Manufacturing Process example.

- At the last meeting you present and we discuss the results and suggest some additional ideas. After all presentations, you are given an hour to realize the suggestions, and you show yours results at the end of the lecture.