

Laboratory #5:
parameter convergence analysis in ARX identification;
model identification using the Graphical User Interface of MATLAB Toolbox

Introduction to the first part (24/05/2021 videotape on Teaching Portal: 0:00 – 14:00):

Exercise 1 – parameter convergence in ARX model identification

First part (with your PC and MATLAB R2014a, 30 minutes):

- Definition of the ARX parameters
- System simulation:
 - Computation of the ARX output
 - Plot of the ARX output
- System identification:
 - Estimation of the ARX parameters using the Least Squares
 - Plot of the estimated parameters versus the actual ones

Comments on the first part (videotape: 14:00 – 28:00)

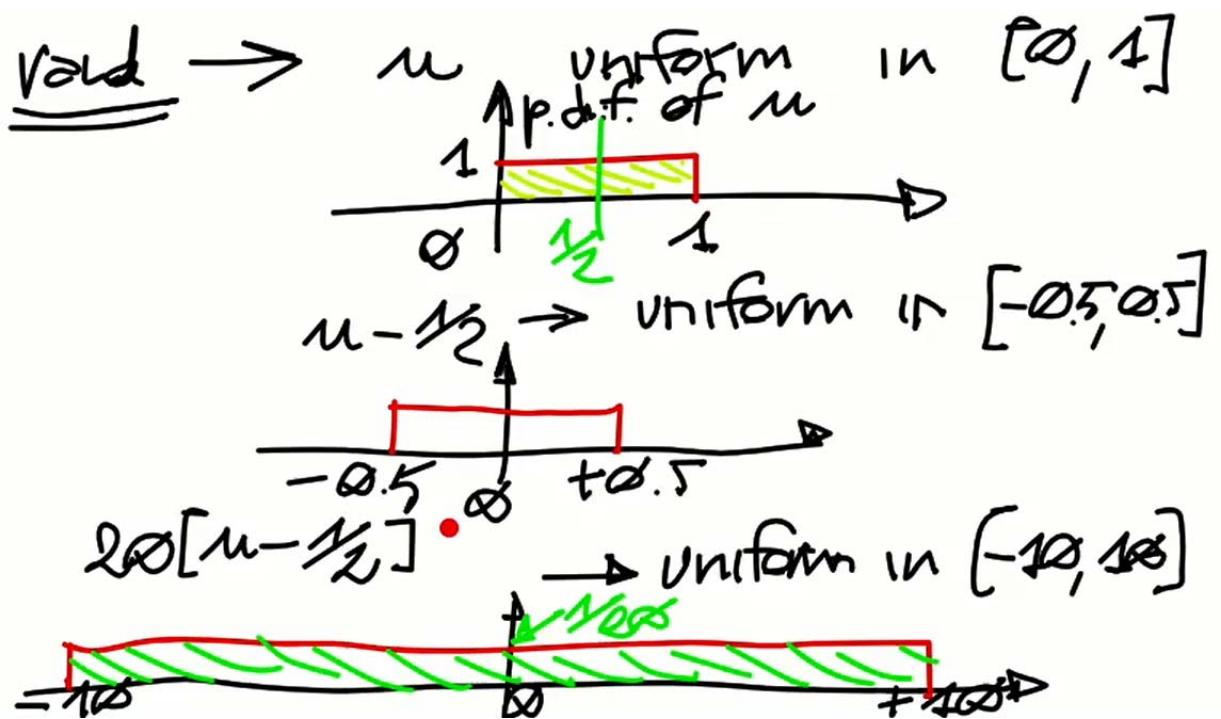
Introduction to the second part (videotape: 28:00 – 36:30):

Exercise 1 – parameter convergence in ARX model identification

Second part (with your PC and MATLAB R2014a, 20 minutes):

- System validation:
 - Computation of the prediction error using the final estimated parameters
 - Anderson's whiteness test using the xcorr function
(hint: use the command `[r,lag] = xcorr(pred_error, 'coeff')`)

Comments on the second part (videotape: 36:30 – 51:00)



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Introduction to the third part (24/05/2021 Teaching Portal videotape: 51:00 – 01:03:30):

Exercise 2 – hair dryer model identification using the MATLAB GUI

Third part (with your PC and MATLAB R2014a, 20 minutes):

0) Self guided tour on Matlab Graphical User Interface (GUI):

 type **iddemo**, then enter **1**, then select option **1** only

1) Open the System Identification Toolbox GUI typing **ident**

2) Import the dryer data from "Example" => Dryer window will appear

3) Remove the mean value form the data => Dryerd window will appear

4) Make the data without mean as current working dataset

5) Partition the whole dataset in two subsets:

 - the estimation dataset (ES: data from 1 to 500) => **Dryerde**

 - the validation dataset (VS: data from 501 to 1000) => **Dryerdv**

Introduction to the fourth part (videotape: 01:03:30 – 01:13:30)

Fourth part (with your PC and MATLAB R2014a, 25 minutes):

6) Set **Dryerde** as working dataset and **Dryerdv** as validation dataset

7) Perform the order selection for an ARX structure comparing AIC, MDL and Best Fit criteria

8) Identify several models of different orders and delays:

 - ARX(**na,nb,nk**), using **na=nb=1,...,4** and **nk=1,...,3**

 - ARMAX(**na,nb,nc,nk**), using **na=nb=nc=1,...,4** and **nk=1,...,3**

 - OE(**nb,nf,nk**), using **nb=nf=1,...,4** and **nk=1,...,3**

9) Compare the identified models on the VS dataset considering residual analysis and Best Fit index

10) Select the “best” model

Comments on the fourth part (videotape: 01:13:30 – 01:21:00)