

ID1

Introduction



1.5 IDENTIFICATION STEPS



The identification of a dynamical system can be partitioned, from a logical standpoint, into the following steps:

Collecting the data (observing the system)

The purpose of identification exercises is to substitute collections of data with a data-generating mechanism (the model). Since this operation is exclusively based on the information contained in the data, it is useless to carry out the procedure when the data is garbage. The first step in identification consists thus, in collecting observations of the process variables (inputs and outputs if a partition of this kind has been introduced) and, when possible, in applying to the system inputs particularly suitable for identification purposes.

Selecting a model set

A specific model can be selected, on the basis of observations, only inside an assumed family of models. These *a priori* assumptions on the set of admissible models can be guided by the modeller's experience and result even improper.

Choosing a selection criterion

Any model only approximates the true system behavior; the planned use of the model will thus determine the selection criterion in order to optimize its desired features. Different models can thus be extracted from the same data.

Computing model parameters

The computation of the model parameters can be seen as an optimization problem (the selection of the "best" model in the considered class) or, equivalently, as a way of "tuning" a model on the data.

Validating the model

Validation is a trial to falsify the model, better by using collections of data different from those used for identification. If the model remains unfalsified, it is considered validated, i.e. acceptable for the planned purposes.

These choices are never univocal and can also involve some degree of *a priori* knowledge on the system, for instance in the choice of class of models or in the design of the experiments required to collect the input–output sequences. When the model does not pass the final validation step, it is necessary to reconsider the choices that have been made and to restart the identification procedure from the beginning or from an intermediate step.

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