ID2

Equation error Identification

2.4 THE MULTIVARIABLE IDENTIFICATION PROBLEM

Denote with

$$\theta = \big[\,\alpha_{111}\ldots\alpha_{11\nu_1}|\ldots|\alpha_{1m1}\ldots\alpha_{1m\nu_{1m}}|\ldots|\alpha_{mm1}\ldots\alpha_{mm\nu_m}| \\ |\beta_{111}\ldots\beta_{11\nu_1}|\ldots|\,\beta_{1r1}\ldots\beta_{1r\nu_1}|\ldots|\beta_{mr1}\ldots\beta_{mr\nu_m}\,\big]^T \tag{2.4.1}$$

the parameters of models (2.3.13) and (2.3.17), with ν the multi–index $\nu = (\nu_1, \ldots, \nu_m)$, with $\mathcal{M}$ an assumed family of multivariable equation error models and with $J(\theta, \nu)$ a selected cost function; the problem of identifying a multivariable model can be defined as follows:

Problem 2.4.1 – Determine, on the basis of given input–output sequences, the element of $\mathcal{M}$ minimizing $J(\theta, \nu)$.

This formulation of the multivariable identification problem relies on cost functions depending on the structure of the model; also in this case it is possible to reformulate the problem making reference to cost functions, $J(\theta)$, that do not take into account the structure of the model, as follows:

Problem 2.4.2 – Determine a suitable structure, ν, compatible with an acceptable performance of the model (in terms of $J(\theta)$ and/or other criteria) and, inside the subclass, $\mathcal{M}_\nu$, of models with structure ν, the model minimizing $J(\theta)$.