DETERMINISTIC IDENTIFICATION PROBLEMS IN THE BEHAVIORAL SETTING

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We consider deterministic identification problems for linear time-invariant (LTI) systems in the behavioral setting, i.e., we view the model as a set of legitimate trajectories that is not a priori linked to a particular representation in terms of equations. The model class, used in the identification problem, is defined as the set of LTI models with a bounded number of inputs and a bounded lag.

First we review the notion of the most powerful unfalsified model (MPUM). Its computation is an exact identification problem. Algorithms aiming at a kernel and input/state/output representation of the MPUM are described. The latter ones are the familiar class of deterministic subspace identification algorithms, however, we give alternative derivations from the point of view of our recent results [2, 3].

When the MPUM does not exist in the specified model class, e.g., because the data is not generated by a model in the model class or because it is noise corrupted, an approximation is needed. Without any a priories, a natural approximate identification problem is to look for the smallest possible modification of the data that makes the exact identification problem solvable. The resulting procedure has been studied in the literature under the name global total least squares.

We relate the global total least squares to another approximate modeling problem: the structured total least squares problem, for which efficient solutions methods exist [1]. We present a software package for solving the structured total least squares problem and show its performance on data sets from the data base for identification of systems (DAISY).

The aim of this talk is to show the coherent link between exact and approximate identification problems and review existing algorithms for their numerical solution.

The presented results are joint work with Jan C. WILLEMS, Sabine VAN HUFFEL, and Bart DE MOOR.

References

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