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IDENTIFICATION OF CONTINUOUS-TIME MIMO SYSTEMS VIA SAMPLED DATA

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Abstract. *In this paper, we present an identification algorithm for continuous-time multiple-input multiple-output (MIMO) state-space models and also for determining the order of models from the samples of the input-output data. In the algorithm, from the sampled data first an equivalent discrete-time model is identified, then the model is converted to the corresponding continuous-time model. The parametric discrete-time canonical-formed MIMO state-space model is identified based on maximum-likelihood and Akaike's information criterion. For obtaining the maximum-likelihood estimates of the model parameters, we apply expectation-maximization algorithms which are iterative methods that sensitive to the initial estimates. The initial estimates of parameters in canonical-formed state-space models are obtained by MOESP, N4SID or another subspace method where the similarity transformation plays a key role.*

Keywords: Continuous-time system identification, MIMO system, Sampled data, Subspace-methods, Canonical-form, EM algorithm, AIC

1. **Introduction.** Recently the identification problem of continuous-time systems via the sampled data is one of interested research subjects [1, 2], because many identification methods which have been proposed are performed by digital computer [3–5]. In order to identify a continuous-time model from the sampled data, two main approaches are possible. In the first, 'indirect' approach, a discrete-time model is identified first using discrete-time model identification methods, and this is then converted into a continuous-time model using a standard algorithm for discrete to continuous-time conversion. In the second, 'direct' approach the continuous-time model is identified directly from the sampled data.

This paper aims to present an identification algorithm for the continuous-time MIMO system via the sampled data, we employ the indirect approach in this paper. The reasons are that firstly the approach is simplicity way for identifying the continuous-time model, secondly the vast number of well-developed techniques available for identifying discrete-time models can be utilized in the main identification phase of the approach. In the indirect approach, it is most important to identify an equivalent discrete-time model