# IDENTIFICATION METHODS WITH PARAMETRIZATION AND PREFILTERING FOR LINEAR MULTIVARIABLE SYSTEMS

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In this dissertation, we present identification methods with parametrization and prefiltering for the linear time-invariant multivariable systems.

Up to 1990, the identification methods for discrete-time single-input single output system were established and were made a comprehensive survey within the framework of the prediction error method, whereas at that time, it was difficult to establish the identification methods for discrete-time multivariable systems in the framework of prediction error. After the mid-1980s, the methods which can completely bypass these problems has been researched actively until recent years, and are so-called as subspace methods. Although subspace methods have several advantages, there are some disadvantages. Therefore in this dissertation, we propose an identification method which solves these disadvantages in subspace identification methods. In our method, a maximum likelihood approach based on EM algorithms and the observable canonical formed state-space; one of canonical parametrizations, are employed. Furthermore our proposed identification method contains: AIC, a guaranteed stability method, and effective use of initial estimates based on subspace methods, for attempting very practical identification method. Finally, a solution of the overlapping parametrization problems is also proposed.

The orthogonal decomposition model used in ORT method, which is realized by the concept of Wold's decomposition, has the explicit advantage that can represent more general additive noise processes. However, the traditional identification methods such as MOESP, N4SID can not apply such general models with noise processes. For utilizing these traditional identification methods, therefore, we propose a prefiltering method based on the concept of Wold's decomposition.

Finally, we present an identification algorithm for continuous-time linear time-invariant multivariable systems via the sampled data. Namely, after obtaining the discrete-time models by the methods discussed in this dissertation, the discrete-time models are converted to continuous-time models; so-called the indirect approach is employed.