Real-time Realization-based System Identification Techniques Implemented in Matlab Simulink

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Existing control systems rarely use tools for automatically tuning and updating the controllers of data filters. The primary objective of this work is to improve control systems with new techniques and methodologies through the use of tools for in-situ identification, control adaptation, and feed-forward algorithms. These tools shall be made accessible as an embedded software package in the form of a Matlab Simulink library.

This work is comprised of block-sets for the purpose of generating state-space models, utilizing two different identification methods: step-based identification and correlation-function based identification. The software, in the form of a Simulink library in Matlab, accepts step-response data or input-output data (subject to which method is being used) from a given system as input. This data is run through the corresponding algorithm in order to create a state-space model of the system which is available to the user as an output.

The software provides the user various options such as the ability to collect multiple sets (the number of sets being specified by the user) of data in order to perform averaging (to mitigate effects due to noise) before it creates a state-space model. The user selects the amount of data to be collected and used to generate the model – the software warns the user if the data size is too small. In case correlation-identification is used, correlation data size may be specified in order to use a specific segment of the correlation data rather than the entire set. The user also specifies the order of the state space model that is output by the block – a larger order is likely to increase accuracy, but more time will be required to collect enough data and then generate the model.