

Adaptive Grey-Box Model Identification

Learning systems are often a key feature in automation of complex processes. Learning of the process behavior can be done by utilizing measured data of the process. With machine learning powerful tools for automatic learning from data is available. It uses the information contained in the data to model the process behavior.

Usually, this is done in an offline manner from previously collected data. When not enough data of the process are available or the process is changing during the operation, online learning is used which continuously adapts the model parameters with the current data. This procedure is extremely powerful, since it allows to adapt controllers or decision schemes to the current circumstances based on the learned model.

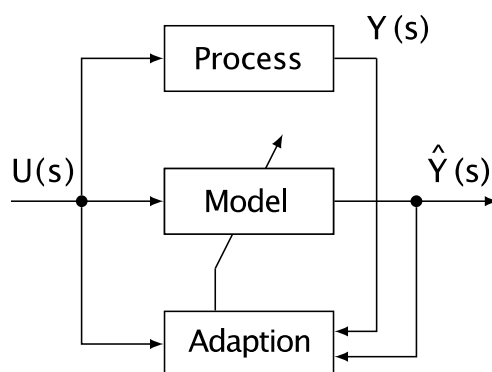


Figure 1: Block diagram of adaptive model identification

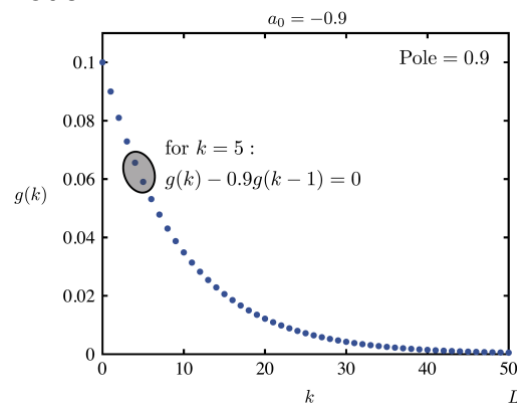


Figure 2: Finite Impulse Response (FIR) with Regularization penalty term

In this work the behavior of a linear dynamical process should be learned online. For this purpose, an FIR model should be used. To overcome the problem of high variance error of FIR models regularization is applied during the online learning procedure. An important property for accurate online learning is a well excited process. However, this is not always possible since process optimization goals contradict permanent excitation. Therefore, the performance and robustness of online learning with regularized FIR models should be investigated in this work. Additionally, possibilities to overcome performance and robustness issues should be investigated and implemented.

Work Packages:

- Literature research on model adaption with relaxed excitation conditions
- Investigation of adaption behavior of regularized FIR models on different excitations
- Implementation and investigation of variable forgetting factor and variable regularization strength
- Documentation

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