

Data-driven soft sensor design with multiple-rate sampled data - DTU Orbit (08/11/2017)

Data-driven soft sensor design with multiple-rate sampled data: A comparative study

Multi-rate systems are common in industrial processes where quality measurements have slower sampling rate than other process variables. Since inter-sample information is desirable for effective quality control, different approaches have been reported to estimate the quality between samples, including numerical interpolation, polynomial transformation, data lifting and weighted partial least squares (WPLS). Two modifications to the original data lifting approach are proposed in this paper: reformulating the extraction of a fast model as an optimization problem and ensuring the desired model properties through Tikhonov Regularization. A comparative investigation of the four approaches is performed in this paper. Their applicability, accuracy and robustness to process noise are evaluated on a single-input single output (SISO) system. The regularized data lifting and WPLS approaches are implemented to design quality soft sensors for cement kiln processes using data collected from a plant log system. Preliminary results reveal that the WPLS approach is able to provide accurate one-step-ahead prediction. The regularized data lifting technique predicts the product quality of cement kiln systems reasonably well, demonstrating the potential to be used for effective quality control.

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