

High dimensional model representation

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Keywords: nonlinear function approximation, HDMR

Abstract:

We present an effective approximation technique for system model representation. It is called High dimensional model representation (HDMR) and comes from physics. Its main advantages are finite order of expansion and rapid convergence for "well-defined" systems. System model is "well-defined" if higher-order variable correlations are weak, permitting the model to be captured by the first few low-order terms of expansion. In fact, this is the only assumption for meaningful application of HDMR. Provided it is satisfied, HDMR could play a role similar to neural networks. However it has clear mathematical background, which offers more opportunities for theoretical research.

In practical applications of the control theory there is lack of approximation techniques owing to its intractable optimality equations. HDMR expansion of Bellman function is tempting. It separates original high dimensional input–output mapping into sum of low-order (possibly non-linear) mappings acting on orthogonal subspaces. One exemplary application is presented.

References

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