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Adaptive Interpolatory MOR by Learning the Error Estimator in the Parameter Domain

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Interpolatory methods offer a powerful framework for generating reducedx2011;order models for nonx2011;parametric or parametric systems with timex2011;varying inputs. Choosing the interpolation points adaptively remains an area of active interest. A greedy framework has been introduced in [1, 2] to choose interpolation points automatically using a posteriori error estimators. Nevertheless, when the parameter range is large or if the parameter space dimension is larger than two, the greedy algorithm may take considerable time, since the training set needs to include a considerable number of parameters.

In this work, we introduce an adaptive training technique by learning an efficient a posteriori error estimator over the parameter domain. A fast learning process is created by interpolating the error estimator using radial basis functions over a fine parameter training set, representing the whole parameter domain. The error estimator is evaluated only on a coarse training set consisting of only a few parameter samples. The algorithm is an extension of the work in [3] to interpolatory model order reduction in the frequency domain. Possibilities exist to use other sophisticated machinex2011;learning techniques like artificial neural networks, etc. to learn the error estimator, based on data at a few parameter samples. However, we do not pursue this in the present work. Selected numerical examples demonstrate the efficiency of the proposed approach.

References

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