

Issues in model reduction of large-scale dynamical systems

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Abstract: In many applications one is faced with the task of simulating or controlling complex dynamical systems. Such applications include for instance, weather prediction, air quality management, VLSI chip design, molecular dynamics, active noise reduction, chemical reactors, etc. In all these cases complexity manifests itself as the number of first order differential equations which arise. For the above examples, depending on the level of modeling detail required, complexity may range anywhere from a few thousand to a few million first order equations, and above. Simulating (controlling) systems of such complexity becomes a challenging problem, irrespective of the computational resources available. In this talk we will first briefly describe some motivating examples, we will then define the problem in mathematical terms and sketch a methodology for its solution. The talk will conclude with open problems and directions for future research.