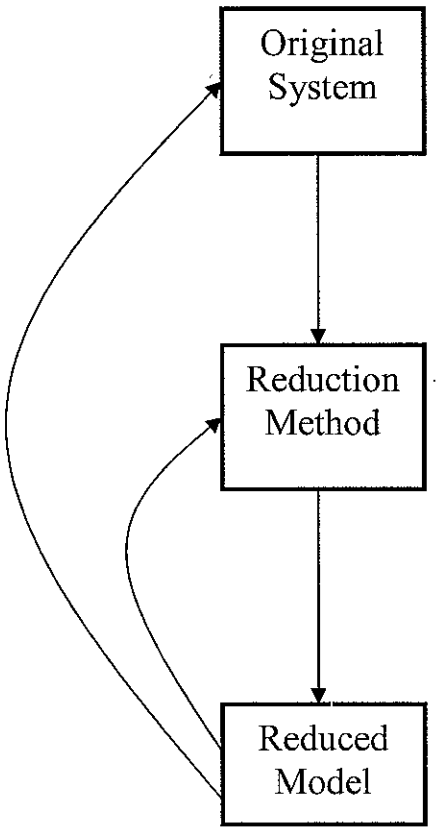
Overview and classification of model reduction challenges



Original model properties (application driven challenges)

- Nonlinear models - both weakly and strongly nonlinear
- Parameters – large numbers of parameters, widely ranging parameter values, large number of input or output ports
- Uncertainty in the model
- Incomplete information – exact system not known, only have access to e.g. input-output data pairs

Reduction Methods

- Projection – selection of basis for linear, nonlinear, time-varying
- Fitting / System ID approaches
- Formulating model reduction problems
- Approximation / elimination methods
- Iterative / Feedback methods

Reduced model properties

- Interpretability – what can the reduced model tell us about the original system
- Control applications
- Error bounds – a priori, a posteriori, global, local, …
- Interconnection of model into larger system

Other

- Benchmarks – I/O data pairs or state-space descriptions corresponding for comparing various techniques
- Prepackaged tools – Matlab functions or other software implementations of classical reduction / identification schemes