Model Reduction via Time-Continuous Least-Squares Residual Minimization ERIC PARISH, Sandia National Labs — A time-continuous residual minimization approach for reduced-order models of dynamical systems is presented. The proposed approach, referred to as Time-Continuous Least-Squares Residual Minimization (TC-LSRM), sequentially minimizes the time-continuous full-order model residual within a low-dimensional trial space over a series of time slabs. The stationary conditions for the time-continuous minimization problems are obtained by deriving the associated Euler-Lagrange equations. Both direct (discretize then minimize) and indirect (minimize and then discretize) solution techniques are explored. The proposed approach displays commonalities with optimal control problems and can be viewed as a generalization of the popular Least-Squares Petrov-Galerkin (LSPG) method. By formulating the residual minimization problem from the time-continuous level, the TC-LSRM approach overcomes the time-step sensitivity and time-scheme dependence that LSPG is subject to. Numerical experiments demonstrate that the proposed approach can lead to more accurate and physically relevant solutions than existing model reduction approaches.

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