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Skeletal Reaction Model Generation with Optimally Time Dependent Modes ARASH NOURI, PEYMAN GIVI, HESSAM BABAEE, University of Pittsburgh, DANIEL LIVESCU, Los Alamos National Laboratory — Sensitivity analysis framework based on optimally time dependent (OTD) modes is introduced and demonstrated for generating skeletal kinetic models. This framework expands the sensitivity matrix into a finite-dimensional, time dependent, orthonormal basis which captures directions of the phase space associated with transient instabilities. These directions highlight the active reaction paths and active species at each time instance. Evolution equations for the orthonormal basis and the projections of sensitivity matrix into the basis are derived. For demonstration, sensitivity analysis is conducted of constant pressure hydrogen-air and ethylene-air burning in a zero-dimensional reactor and new skeletal models are generated. The flame speed, ignition delay and extinction curve of resulted skeletal models are compared with the same results from reaction networks.

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