Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Input-output dynamic mode decomposition[1] JENNIFER ANNONI, MIHAILO JOVANOVIC, JOSEPH NICHOLS, PETER SEILER, Univ of Minn - Minneapolis — The objective of this work is to obtain reduced-order models for fluid flows that can be used for control design. High-fidelity computational fluid dynamic models provide accurate characterizations of complex flow dynamics but are not suitable for control design due to their prohibitive computational complexity. A variety of methods, including proper orthogonal decomposition (POD) and dynamic mode decomposition (DMD), can be used to extract the dominant flow structures and obtain reduced-order models. In this presentation, we introduce an extension to DMD that can handle problems with inputs and outputs. The proposed method, termed input-output dynamic mode decomposition (IODMD), utilizes a subspace identification technique to obtain models of low-complexity. We show that, relative to standard DMD, the introduction of the external forcing in IODMD provides robustness with respect to small disturbances and noise. We use the linearized Navier-Stokes equations in a channel flow to demonstrate the utility of the proposed approach and to provide a comparison with standard techniques for obtaining reduced-order dynamical representations.

[1]NSF Career Grant No. NSFCMMI-1254129

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Date submitted: 01 Aug 2015 Electronic form version 1.4