Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Adaptive-Robust Dynamic Mode Decomposition (DMD) for Reduced-Order Modeling and Control ANIKETH KALUR, University of Minnesota, MOUHACINE BENOSMAN, SALEH NABI, Mitsubishi Electric Research Laboratory — We develop a data-driven reduced-order modeling framework that adapts to changing flow regimes. Such a framework ensures the reduced-order model (ROM) corrects itself to account for changing parameters. Generally, ROMs developed from the data-assimilation are built on specific flow parameters for which the data is available. However, it is ubiquitous that the flow regime is often changing in systems such as HVAC applications, wind farms, etc. Therefore, ROMs need to account for parameter variations to be useful in an off-design setting. In this work, we develop a data-driven ROM at a nominal parameter using Dynamic Mode Decomposition (DMD), following which the ROM is appended with a correction/closure term that adapts itself in an online manner to correct for varying parameters. First, we show that the correction term robustly stabilizes the system by guaranteeing stability. Secondly, we use an extremum seeking optimization approach to update the correction term parameters to adapt to the aforementioned variations. Lastly, we discuss the results of using our proposed framework on the viscous Burgers equation. We show that our framework can adapt and account for parametric uncertainties by self-correcting even though the ROM is developed in a flow regime “very far” from the gr

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Date submitted: 10 Aug 2020

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