ON HIGHER ORDER
DYNAMIC MODE DECOMPOSITION*

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Abstract

This paper introduces an alternative variant of Higher Order Dynamic Mode Decomposition (HODMD), which improves the standard approach from a computational point of view. In the new scheme, time-delayed snapshots are used along with the special form of the Koopman operator. An algorithm is derived that allows the calculation of novel decomposition in a stable and efficient way. This method is suitable in cases where standard Dynamic Mode Decomposition (DMD) is not applicable. These are dynamics that show limited spatial complexity, and a very large number of included frequencies. We illustrate and explain the new method using some classical and sample dynamics.

1 Introduction

Dynamic Mode Decomposition (DMD) is an equation-free technique suitable for analyzing flow structures in numerical and experimental data, which has become very popular since it was first introduced in a paper by Schmid [1].