

# DYNAMIC MODE DECOMPOSITION: A NEW APPROACH FOR COMPUTING THE DMD MODES AND EIGENVALUES\*

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## Abstract

Dynamic mode decomposition is a relatively recent development in the field of modal decompositions, however, it is a commonly used technique for analyzing the dynamics of nonlinear systems. Its success is due to the fact that it is an equation-free, data-driven method capable of providing accurate assessments of the spatiotemporal coherent structures in a complex system, or short-time future estimates. The aim of this work is to present a new approach for computing the dynamic mode decomposition. We show that our algorithm is closely related to the currently accepted algorithm. In fact, the two approaches produce the same DMD eigenvalues, it is only the DMD modes that differ. We demonstrate the new approach on two examples model systems.

MSC: 65P02, 37M02, 37L65

**keywords:** Dynamic mode decomposition, Koopman operator, Frobenius companion matrix, Singular value decomposition, Equation-free.

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