

Abstract Submitted
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Machine learning for classification of vortex patterns generated by pitching and plunging plates JONATHAN H. TU, Naval Surface Warfare Center Carderock Division — The motion of a flat plate in an oncoming flow can generate a number of different vortex patterns. These include the familiar 2S, P+S, and 2P vortex streets, among others. Such flows are often used as models for studying how fish or other animals swim. Because the particular shape and kinematics of a moving body lead to subtle differences in the vortical structures observed downstream, there is great interest in being able to accurately classify different vortex patterns. In this work, we use machine learning techniques to distinguish between similar vortex patterns generated by different flat plate motions. Specifically, we numerically simulate 2S vortex streets generated by pitching and plunging plates, respectively, at low Reynolds numbers. We look to identify downstream features of the vortex patterns that encode the upstream flat plate motions. Initial results show that using only point measurements of velocity, standard methods such as linear discriminant analysis can accurately distinguish a 2S vortex street generated by a pitching plate from a 2S vortex street generated by a plunging plate.

Jonathan H. Tu
Naval Surface Warfare Center Carderock Division

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