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Critical Point Matching and Distance Metrics of Unsteady Flow Separation from a Pitching Plate[1] FAEGHEH HOOMAN, PAUL KRUEGER, SMU — Unsteady flow separation is of interest for force and moment generation by flapping airfoils, but it is often difficult to determine how small differences in the motion lead to differences in the flow field and resulting forces. To better understand the flow evolution during unsteady separation in pitching maneuvers, analysis was performed of two numerical data sets for the pitch-up of a two-dimensional flat plate in a free stream flow with Re=1000 (data provided by Prof. J.D. Eldredge at UCLA). Flow fields were compared by finding the best match of first order critical points according to weighted physical location and topological characteristics. Weighting and smoothing helped eliminate outliers, especially after adding noise, and made the method robust. A total distant metric for matched critical points was defined to provide a global metric for identifying similarities and differences between flow fields. Comparisons of the flow evolution for the two data sets using the distance metric will be presented.

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