Feature-Based Analysis of Time-Dependent Flow Fields

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Visualization of fluid flows can be divided in different areas of research. First, direct visualization uses advanced tools from computer graphics to depict the flow in an easily comprehensible image. In contrast, feature-based analysis helps to focus on the important structures of the flow. For time-dependent flow fields, the concept of Lagrangian coherent structures (LCSs) became famous in the recent years. Typically, these structures are associated with the Finite-time Lyapnuov Exponent (FTLE). This feature indicator connects LCSs to manifolds of strong particle separation and convergence. However, also other structures such as vortices are often connected to LCSs. Here, the acceleration magnitude can help to identify areas of strong swirling motion. In my talk, I will present methods to extract both features. A special focus is placed on using robust combinatorial methods for feature extraction [1,2,3]. I will present applications to different time-dependent two-dimensional flow fields. An overview of the presented tools can be found in [4].

Bibliography:

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