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**Analysis of coherent dynamical processes through computer vision** M. J. PHILIPP HACK, Center for Turbulence Research, Stanford University — Visualizations of turbulent boundary layers show an abundance of characteristic arc-shaped structures whose apparent similarity suggests a common origin in a coherent dynamical process. While the structures have been likened to the hairpin vortices observed in the late stages of transitional flow, a consistent description of the underlying mechanism has remained elusive. Detailed studies are complicated by the chaotic nature of turbulence which modulates each manifestation of the process and which renders the isolation of individual structures a challenging task. The present study applies methods from the field of computer vision to capture the time evolution of turbulent flow features and explore the associated physical mechanisms. The algorithm uses morphological operations to condense the structure of the turbulent flow field into a graph described by nodes and links. The low-dimensional geometric information is stored in a database and allows the identification and analysis of equivalent dynamical processes across multiple scales. The framework is not limited to turbulent boundary layers and can also be applied to different types of flows as well as problems from other fields of science.

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