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**Low Dimensional Modeling And Computational Analysis of Dragonfly Wing Aerodynamics**[1] YAN REN, HUI WAN, HAIBO DONG, Wright State University, FLOW SIMULATION RESEARCH GROUP TEAM — High-fidelity numerical simulations are being used to examine the key aerodynamic features and lift production of insect wings. However, the kinematics of the insect's wing and the resulting aerodynamics is highly complex, and does not lend itself easily to analysis based on simple notions of pitching/heaving kinematics or lift/drag based propulsive mechanisms. A more inventive approach is therefore needed to dissect the wing gait and gain insight into the remarkable aerodynamic performance of the insect's wing. The focus of the current investigation is on the aerodynamics of the wing of a dragonfly (Erythemis Simplicicollis) in hovering motion. The three-dimensional, time-dependent wing kinematics is obtained via a high-speed photogrammetry system. Singular Value Decomposition (SVD) is then applied to extract the essential features of the wing gait. The SVD spectrum shows that the first four modes capture more than 80% of the motion. Aerodynamics of wings flapping with kinematics synthesized from SVD modes will be discussed in detail.

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