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A Numerical Investigation of Two-Different *Drosophila* Forward Flight Modes MEHMET SAHIN, EZGI DILEK, Istanbul Technical University, BELKIS ERZINCANLI, Kocaeli University — The parallel large-scale unstructured finite volume method based on an Arbitrary Lagrangian-Eulerian (ALE) formulation has been applied in order to investigate the near wake structure of *Drosophila* in forward flight. DISTENE MeshGems-Hexa algorithm based on the octree method is used to generate the all hexahedral mesh for the wing-body combination. The mesh deformation algorithm is based on the indirect radial basis function (RBF) method at each time level while avoiding remeshing in order to enhance numerical robustness. The large-scale numerical simulations are carried out for a flapping *Drosophila* in forward flight. In the first case, the wing tip-path plane is tilted forward to generate forward force. In the second case, paddling wing motion is used to generate the forward fore. The λ_2-criterion proposed by Jeong and Hussain (1995) is used for investigating the time variation of the Eulerian coherent structures in the near wake. The present simulations reveal highly detailed near wake topology for a hovering *Drosophila*. This is very useful in terms of understanding physics in biological flights which can provide a very useful tool for designing bio-inspired MAVs.

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