Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Numerical Simulation of *Drophila* Flight Based on Arbitrary Langrangian-Eulerian Method[1] BELKIS ERZINCANLI, MEHMET SAHIN, Istanbul Technical University — A parallel unstructured finite volume algorithm based on Arbitrary Lagrangian Eulerian (ALE) method has been developed in order to investigate the wake structure around a pair of flapping *Drosophila* wings. The numerical method uses a side-centered arrangement of the primitive variables that does not require any *ad-hoc* modifications in order to enhance pressure coupling. A radial basis function (RBF) interpolation method is also implemented in order to achieve large mesh deformations. For the parallel solution of resulting large-scale algebraic equations, a matrix factorization is introduced similar to that of the projection method for the whole coupled system and two-cycle of BoomerAMG solver is used for the scaled discrete Laplacian provided by the HYPRE library which we access through the PETSc library. The present numerical algorithm is initially validated for the flow past an oscillating circular cylinder in a channel and the flow induced by an oscillating sphere in a cubic cavity. Then the numerical algorithm is applied to the numerical simulation of flow field around a pair of flapping *Drosophila* wing in hover flight. The time variation of the near wake structure is shown along with the aerodynamic loads and particle traces.

[1]The authors acknowledge financial support from Turkish National Scientific and Technical Research Council (TUBITAK) through project number 111M332. The authors would like to thank Michael Dickinson and Michael Elzinga for providing the experimental data.

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Date submitted: 28 Jul 2012 Electronic form version 1.4