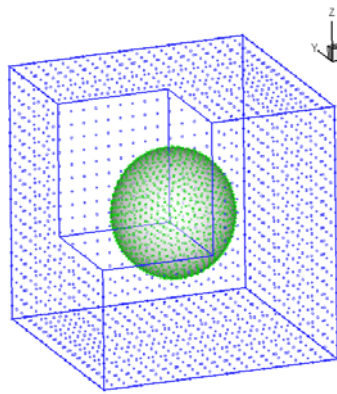


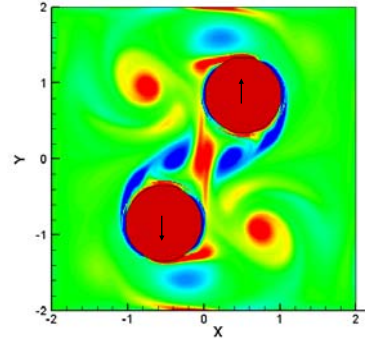
Hybrid meshfree-Cartesian grid scheme for moving body/boundary flow problems

The computational scheme solves incompressible viscous flow problems with complex geometry and moving boundaries on a hybrid meshfree-Cartesian grid. Spatial discretization is carried out by a combination of standard finite difference and singular value decomposition generalized finite difference (SVD-GFD) approximations. Convecting nodes are treated by an arbitrary Lagrangian-Eulerian formulation of the Navier-Stokes equations.



Hybrid meshfree cum Cartesian grid

Three-dimensional (3D) vortex shedding in flow past a toroidal ring at $Re=480$.

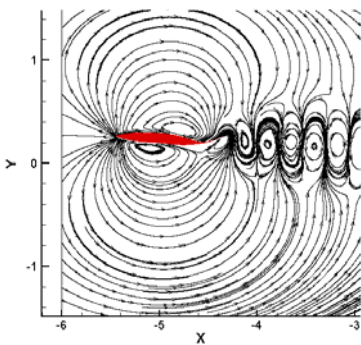


Two cylinders in close proximity bypass interaction in a box: smallest gap at $0.04D$, $Re=500$. A nodal selection scheme is used. Vorticity field.

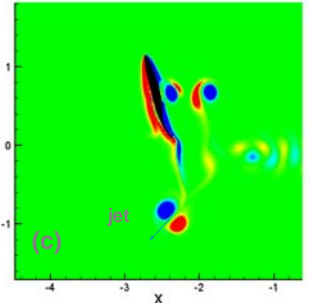
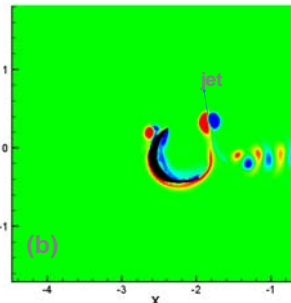
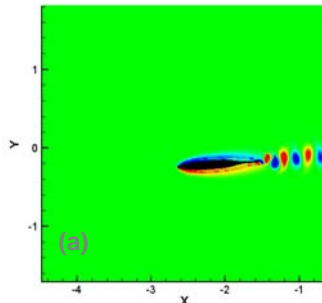
Fluid-Structure Interaction

Fish swimming and maneuvering are simulated in accordance with Newton's laws.

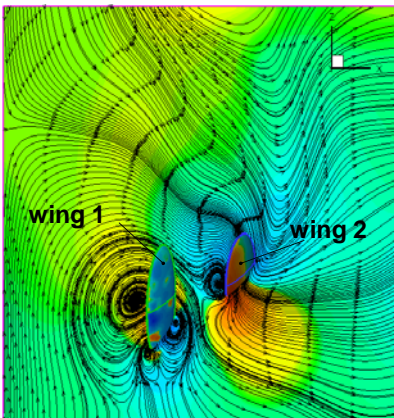
Fish Swimming: Dynamic sequence of a fish turning through about 70° from straight cruising ($Re_f=2000$): (a) Coasting, (b) Bending body into the turn and (c) Turning completed. Vorticity fields shown.



Flow field for a fish in steady swimming at $Re_f=5000$. $U_f \approx 0.5$.

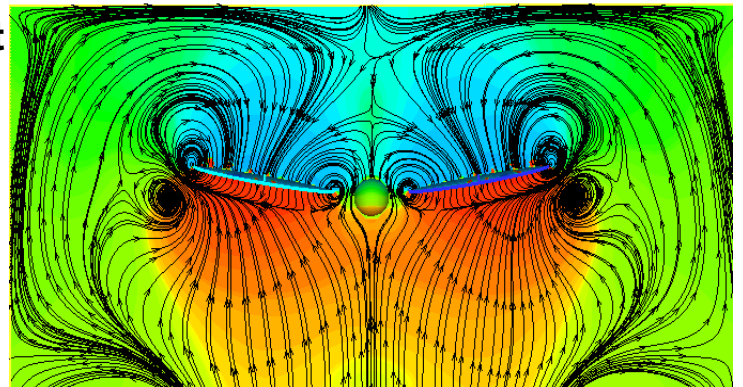


Insect Flight



Insect flight 1 : A section of 3D flow around a pair of flapping wings with body.

Insect flight 2 : Sectional flow field around two independent flapping wings.



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