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Computational Analysis of Wake Field Flow between Multiple Identical Spheres WESLEY BRAND, MORTON GREENSLIT, ZACH KLASSEN, JAY HASTINGS, WILLIAM MATSON[1], University of Minnesota, Morris — It is well understood both that objects moving through a fluid perturb the motion of nearby objects in the same fluid and that some configurations of objects moving through a fluid have little inter-object perturbation, such as a flock of birds flying in a V-formation. However, there is presently no known method for predicting what configurations of objects will be stable while moving through a fluid. Previous work has failed to find such stable configurations because of the computational complexity of finding individual solutions. In this research, the motions of two spheres in water were simulated and combinations of those simulations were used to extrapolate the motions of multiple spheres and to find configurations where the lateral forces on each sphere were negligible and the vertical forces on each sphere were equivalent. Two and three sphere arrangements were simulated in COMSOL Multiphysics and Mathematica was used both to demonstrate that combinations of two sphere cases are identical to three sphere cases and to identify stable configurations of three or more spheres. This new approach is expected to simplify optimization of aerodynamic configurations and applications such as naval and aerospace architecture and racecar driving.

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