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Interaction of multiple solid objects and vortices in a two-dimensional potential flow J.T. WU, Department of Civil Engineering, National Taiwan University, F.L. YANG, D.L. YOUNG — The generalized Lagally theorem states that the unsteady hydrodynamic force acting on a rigid body exhibiting arbitrary motion in an inviscid and incompressible fluid can be expressed explicitly in terms of singularities such as sources and dipoles which generate the flow field. This work extends the theorem by considering the presence of point vortices in the flow, which results in additional force components when formulating the equation of motion for the solid bodies. The present model has been applied to describe the motion of a circular cylinder that interacts with a vortex. The obtained result is in exact agreement with the result derived by other researchers considering the conservation of the sum of the solid momentum and the fluid impulse. The current model is further applied to study a moving cylinder towards a fixed one, while the former motion is coupled with two tail vortices with designated strength and initial configurations, which are prescribed by the solution to the Föppl's problem. It is found that the configuration and the velocity of the tail vortices change due to the fixed cylinder, which in turns generates a hydrodynamic force affecting the approach of the moving cylinder.

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