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Numerical simulation of flow generated noise of a hydrofoil at Re = 1.9M[1] YASER KHALIGHI, PARVIZ MOIN, FRANK HAM, Center for Turbulence Research, Stanford University — The goal of present work is to study the nature of broadband noise generated by flow of practical interest. With this objective, flow over trailing of a hydrofoil at chord Reynolds number of 1.9 Million is considered. This flow configuration includes practical complexities such as turbulent boundary layers with pressure gradients, turbulent wake and irregular geometry. An incompressible formulation with 2nd order, non-dissipative numerical scheme is applied to calculate the hydrodynamic noise sources. Flow scales are fully resolved in the boundary layers and in the vicinity of the trailing edge resulting in a 100M grid point unstructured computational domain. Lighthill's acoustics analogy with a boundary element formulation is applied to accurately predict the propagation and scattering of acoustics waves. The large unstructured grid is generated by the recursive refinement of a coarser grid, facilitating solution verification of both the flow and noise calculation by a grid convergence study. The results will be validated by comparison to hot-wire flow measurements from Michigan State University as well as acoustics measurements from an anechoic chamber at Notre Dame University.

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