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Computationally Efficient Aerodynamic Shape Optimization Using Physics-Based Modeling

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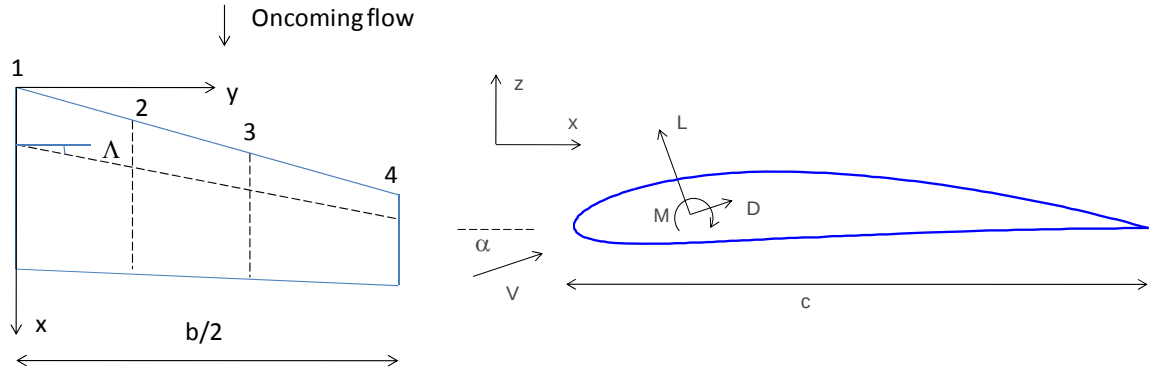
Aerodynamic and hydrodynamic design and optimization is of primary importance in several disciplines, such as in the design of aircraft, ships and turbines. The fundamental design problem, common to all these disciplines, is to design a wing shape (or a blade shape) that provides the desired lift for a given operating conditions, while at the same time minimizing drag and fulfilling design constraints



The main objective of the project is the development of computationally efficient, numerically validated, state-of-the-art procedures for aerodynamic and hydrodynamic shape optimization. The project will involve working with computational fluid dynamics software for subsonic and transonic fluid flow, e.g., XFOIL, TSFOIL, FLUENT, and numerical optimization techniques using Matlab. The developed procedures will be applied to the design of conventional transport aircraft wings, a bird-like flapping-wing unmanned air vehicle, and an unmanned underwater vehicle conning tower fairing.