Design and optimization of airfoils in non-stalling incompressible flow with a prescribed range of the angle of attack

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Abstract

A simple and reliable method of aerodynamic design of airfoils is proposed for a given range of the angle of attack. The method is based on the solution of a new inverse boundary-value problem of aerohydrodynamics. In the problem the initial velocity distributions are given along the contour of the required airfoil as a function of the arc co-ordinate for extreme values of the angle of attack from a fixed range. We justify a method of choice of these distributions which guarantees a non-stalling flow around the airfoil. The problem of airfoil optimization is also considered. Results of numerical calculations are presented.