GLOBAL INSTABILITY ANALYSIS IN FLUID MECHANICS

Leo Gonzalez

Escuela Técnica Superior de Ingeniería Naval,
Departamento de Ciencias Aplicadas a la Ingeniería Naval, Universidad Politécnica de Madrid

Abstract. A general overview about linear instability analysis of flows on complex two-dimensional (2D) and 3D geometries will be presented. In the three decades since it first appeared in the literature, global instability analysis, based on the solution of the multidimensional eigenvalue and/or initial value problem, is continuously broadening both in scope and in depth. To date it has dealt successfully with a wide range of applications arising in aerospace engineering and physiological flows. In recent years, nonmodal analysis has complemented the more traditional modal approach and increased knowledge of flow instability physics. Recent highlights delivered by the application of either modal or non-modal global analysis are briefly discussed. Hopefully this will provide new impulses for the creation of next-generation algorithms capable of coping with the main open research areas in which step-change progress can be expected by the application of the theory: instability analysis of fully inhomogeneous, 3D flows and control thereof.