Bifurcation of Streamline Patterns – Methods and Applications

Morten Brøns

Department of Mathematics

Technical University of Denmark

DK-2800 Kongens Lyngby

Denmark

`m.brons@mat.dtu.dk`

A qualitative (or topological) description of structures in fluid flows such as vortices and separated regions is of basic interest. We review some systematic methods to describe the creation and interaction of structures on the basis of bifurcation theory for low-dimensional dynamical systems, and how these topological bifurcations relate to dynamical bifurcations in the Navier-Stokes equations. We discuss the numerical implementation and some examples including vortex breakdown, the cylinder wake, and flow near walls with a Navier slip boundary condition.