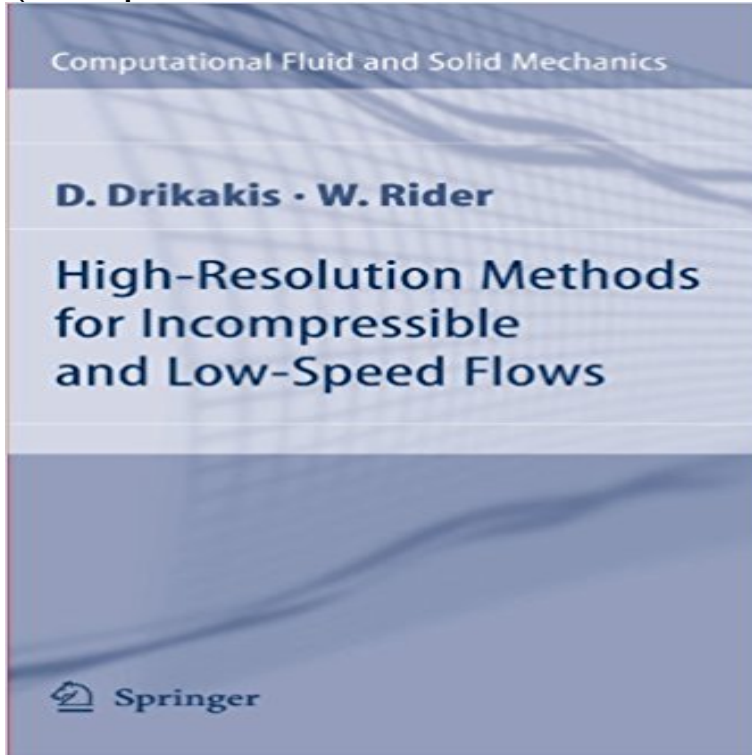


High-Resolution Methods for Incompressible and Low-Speed Flows (Computational Fluid and Solid Mechanics)



The study of incompressible flows is vital to many areas of science and technology. This includes most of the fluid dynamics that one finds in everyday life from the flow of air in a room to most weather phenomena.

In undertaking the simulation of incompressible fluid flows, one often takes many issues for granted. As these flows become more realistic, the problems encountered become more vexing from a computational point-of-view. These range from the benign to the profound. At once, one must contend with the basic character of incompressible flows where sound waves have been analytically removed from the flow. As a consequence vortical flows have been analytically preconditioned, but the flow has a certain non-physical character (sound waves of infinite velocity). At low speeds the flow will be deterministic and ordered, i.e., laminar. Laminar flows are governed by a balance between the inertial and viscous forces in the flow that provides the stability. Flows are often characterized by a dimensionless number known as the Reynolds number, which is the ratio of inertial to viscous forces in a flow. Laminar flows correspond to smaller Reynolds numbers. Even though laminar flows are organized in an orderly manner, the flows may exhibit instabilities and bifurcation phenomena which may eventually lead to transition and turbulence. Numerical modelling of such phenomena requires high accuracy and most importantly to gain greater insight into the relationship of the numerical methods with the flow physics.

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