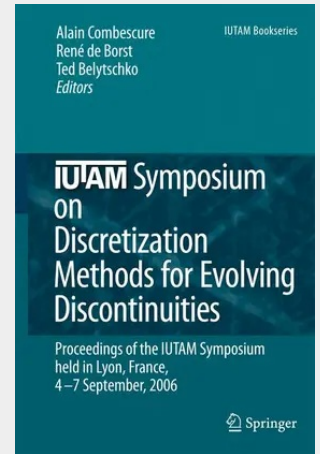


IUTAM Symposium on Discretization Methods for Evolving Discontinuities

Proceedings of the IUTAM Symposium held Lyon, France, 4 – 7 September, 2006

In recent years, discretization methods have been proposed which are more flexible and which have the potential of capturing (moving) discontinuities in a robust and efficient manner. This monograph assembles contributions of leading experts with the most recent developments in this rapidly evolving field. It provides the most comprehensive coverage of state-of-the art numerical methods for treating discontinuities in mechanics.

Discontinuities are an important domain in the mechanics of solids and fluids. With mechanics focusing on smaller and smaller length scales in order to understand the physics that underly many phenomena that hitherto were modelled in a phenomenological manner, the need to properly model discontinuities increases rapidly. Classical examples are cracks, shear bands and rock faults at a macroscopic level. However, the increase in computational power has made it possible to also analyse phenomena like delamination and debonding in composites (mesoscopic level) and phase boundaries and dislocation movements at the microscopic and nanoscopic level. While the above examples all pertain to solid mechanics, albeit at a wide range of scales, technically important (moving) fluid-solid interfaces appear in welding and casting processes and in aeroelasticity. Standard discretization methods such as finite element, finite difference or boundary element methods have been developed for continuous media and are less well suited for treating evolving discontinuities. Indeed, they are approximation methods for the solution of the partial differential equations, which are valid on a domain. Discontinuities divide this domain into two or more parts and at the interface special solution methods must be employed. This holds a fortiori for moving discontinuities such as Luder's–Pobert bands, Portevin–le Chatelier bands, solid-state phase boundaries, fluid-solid interfaces and dislocations.



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