

MOVING INTERFACES BY ARBITRARY MOVING DISCONTINUITIES IN FINITE ELEMENTS

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Methods for treating arbitrary discontinuities in finite elements are applied to fluid-structure interaction problems, free surface problems and crack propagation problems. The discontinuities are treated by a local partition of unity where the discontinuity in the function or its derivatives are introduced as an enrichment. The fluid-structure interaction problems are solved by new methods in which the interface between the fluid and the structure is described by a zero isolevel of an implicit description of the curve or surface. In most cases, the implicit function is the signed distance function. It can be updated either by level set methods or by vector level set methods. The fluid is treated by an Eulerian mesh. Interfaces between both Eulerian and Lagrangian discretizations of the structure are considered. In some of the applications, a new vector level set method that does not involve the solution of any partial differential equations are used. Similar techniques applied to the free surface problems. In crack problems, the vector level set method is particularly attractive since it requires no special freezing of the existing crack surface. Several examples of these types of problems are described.

References

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