Dokumenttyp: Zeitschriftenaufsatz
Autor(en) des Beitrags: Sudhakar, Y.; Moitinho de Almeida, J.P.; Wall, W.A.
Titel des Beitrags: An accurate, robust, and easy-to-implement method for integration over arbitrary polyhedra: application to Embedded Interface Methods
Abstract: We present an accurate method for the numerical integration of polynomials over arbitrary polyhedra. Using the divergence theorem, the method transforms the domain integral into integrals evaluated over the facets of the polyhedra. The necessity of performing symbolic computation during such transformation is eliminated by using one dimensional Gauss quadrature rule. The facet integrals are computed with the help of quadratures available for triangles and quadrilaterals. Numerical examples, in which the proposed method is used to integrate the weak form of the Navier-Stokes equations in an embedded interface method (EIM), are presented. The results show that our method is as accurate and generalized as the most widely used volume decomposition based methods. Moreover, since the method involves neither volume decomposition nor symbolic computations, it is much easier for computer implementation. Also, the present method is more efficient than other available integration methods based on the divergence theorem. Efficiency of the method is also compared with the volume decomposition
based methods and moment fitting methods. To our knowledge, this is the first article that compares both accuracy and computational efficiency of methods relying on volume decomposition and those based on the divergence theorem.

**Stichworte:**
Numerical integration, polyhedra, divergence theorem, enriched partition of unity method, complex volumes, extended finite element method, embedded interface method

**Dewey Dezimalklassifikation neu:**
620 Ingenieurwissenschaften

**Zeitschriftentitel:**
Journal of Computational Physics

**Jahr:**
2014

**Band:**
273

**Seiten:**
393-415

**Nachgewiesen in:**
Scopus

**Reviewed:**
ja

**Sprache:**
en

**Volltext / DOI:**
doi:10.1016/j.jcp.2014.05.019

**Status:**
Verlagsversion / published

**Semester (für SAP-Datenerfassung):**
SS 14

**Occurences:**
- Einrichtungen > Fakultäten > Fakultät für Maschinenwesen > Institut für Werkstoffe und Verarbeitung > Lehrstuhl für Numerische Mechanik (Prof. Wall) > Peer-Reviewed Publications > 2014

**Entries:**