The 8th European Congress on Computational Methods in Applied Sciences and Engineering
ECCOMAS Congress 2022
5-9 June 2022, Oslo, Norway

Analysis of high-order interpolation schemes for the finite-volume resolution of linear problems on unstructured meshes

P. Castrillo*[1,3], E. Schillaci[2] and J. Rigola[1]

[1] Heat and Mass Transfer Technological Centre (CTTC), Polytechnic University of Catalonia (UPC), ESEIAAT, Colom 11, 08222, Terrassa (Barcelona), Spain. pablo.castrillo@upc.edu, joaquim.rigola@upc.edu. URL: www.cttc.upc.edu

[2] Termofluids Av. Jacquard 97-E 08227 Terrassa (Barcelona), Spain. eugenio@termofluids.com. URL: www.termofluids.com

[3]Instituto de Estructuras y Transporte, Facultad de Ingeniería, Universidad de la República, Julio Herrera Y Reissig 565, 11300 Montevideo, Uruguay. pabloc@fing.edu.uy

Keywords: *Finite Volume Method, High-order Interpolation, Unstructured Meshes, Linear Elasticity.*

In bending-dominant problems, the phenomenon of shear blocking appears [1]. To solve this problem, it is possible to either increase the number of elements or increase the interpolation order of the main variable. Increasing the number of elements does not always yield good results and implies a very high computational cost that in real problems is inadmissible. For this reason, the development of high-order models is essential.

This work presents a high-order model using finite volumes for linear elasticity on unstructured meshes. The use of unstructured meshes is also vital because they are necessary for real problems where the geometries are complex and depart from canonical rectangular or regular shapes [2]. The high-order interpolation will be performed using popular schemes such as the Moving Least Squares (MLS) and the Local Regression Estimators (LRE) methods, among others. The reliability of the method for solving 2D and 3D problems will be verified by solving some known test cases with an analytical solution such as a thin beam or problems where stress concentrations are developed.

REFERENCES

[1] I. Demirdžić, A fourth-order finite volume method for structural analysis, *Applied Mathematical Modelling* 40 (4) (2016) 3104–3114. doi:10.1016/j.apm.2015.09.098.

[2] P. Cardiff, Ž. Tuković, H. Jasak, A. Ivanković, A block-coupled Finite Volume methodology for linear elasticity and 435 unstructured meshes, *Computers & Structures* 175 (2016) 100–122. doi:10.1016/j.compstruc.2016.07.004.