A C^1 VIRTUAL ELEMENT METHOD ON POLYHEDRAL MESHES

LOURENÇO BEIRÃO DA VEIGA, FRANCO DASSI, AND ALESSANDRO RUSSO

ABSTRACT. In this talk we are interested in H^2-conforming solution of three dimensional linear elliptic problems. If we consider a standard Finite Element framework, the construction of such high regular solution requires high approximation degrees and the discrete functional space becomes really involved.

To avoid these issues and preserve the H^2-conformity, we consider the Virtual Element Method. One of the advantages of such method is a more flexibility in the definition of the discrete spaces. This fact was already exploited to develop C^1 conforming elements in 2d keeping the accuracy order and the number of degrees of freedom at a reasonable level [1, 2]

In this talk we will extend such theory to the three dimensional space. More specifically, we will focus on the lowest order case to better understand the idea behind a Virtual Element discretization. We will show that the number of degrees of freedom is limited with respect to Finite Element indeed they are only 4 per mesh vertex representing function and gradient values. Finally, we will provide some numerical examples on classical fourth order elliptic problems, but also on standard second order elliptic problem where we look for a more regular solution.

Keywords: Virtual Element Method, polyhedral meshes, bi-Laplacian problem, C^1 regularity

Mathematics Subject Classifications (2010): 65N30

REFERENCES

[1] L. Beirão da Veiga and G. Manzini. A virtual element method with arbitrary regularity. *IMA J. Numer. Anal.*, 34(2):759–781, 2014.

[2] P. F. Antonietti, L. Beirão da Veiga, S. Scacchi, and M. Verani. A C^1 virtual element method for the Cahn-Hilliard equation with polygonal meshes. *SIAM J. Numer. Anal.*, 54(1):34–57, 2016.

DEPARTMENT OF MATHEMATICS AND APPLICATIONS, UNIVERSITY OF MILANO - BICOCCA,, VIA COZZI 53, I-20153, MILANO (ITALY), IMATI-CNR, 27100 PAVIA (ITALY)

Email address: lourenco.beirao@unimib.it

DEPARTMENT OF MATHEMATICS AND APPLICATIONS, UNIVERSITY OF MILANO - BICOCCA,, VIA COZZI 53, I-20153, MILANO (ITALY)

Email address: franco.dassi@unimib.it

DEPARTMENT OF MATHEMATICS AND APPLICATIONS, UNIVERSITY OF MILANO - BICOCCA,, VIA COZZI 53, I-20153, MILANO (ITALY), IMATI-CNR, 27100 PAVIA (ITALY)

Email address: alessandro.russo@unimib.it