MASSIMO FRITTELLI

Dipartimento di Matematica e Fisica "E. de Giorgi", Università del Salento
massimo.frittelli@unisalento.it

VIRTUAL ELEMENT METHOD FOR THE LAPLACE-BELTRAMI EQUATION ON SURFACES

We present a Surface Virtual Element Method (SVEM) of arbitrary polynomial order $k \in \mathbb{N}$ for the Laplace-Beltrami equation on a surface in $\mathbb{R}^3$. The method combines the Surface Finite Element Method (SFEM) [Dziuk, Eliott, *Finite element methods for surface PDEs*, 2013] and the recent Virtual Element Method (VEM) [Beirão da Veiga et al, *Basic principles of VEMs*, 2013]. The proposed approach handles polygonal, possibly nonconforming approximations of the surface made of elements of arbitrary polygonal shape. As a consequence, the method is well posed on composite nonconforming meshes that naturally arise when two polygonal meshes are pasted along a straight line. This property implies a significant computational advantage in that, in contrast to many existing pasting algorithms for standard FEMs, the meshes to be pasted do not require any intermediate step, such as deformation or node matching. We prove existence and uniqueness of the numerical solution and, in the case $k = 1$ of linear Virtual Elements, we prove a first order H^1 error estimate for the numerical method. We provide numerical experiments to confirm the convergence result and to show the application of the method to mesh pasting.

Joint work with Ivonne Sgura from Università del Salento.