Departmental Colloquia

Department of Mathematics
香港城市大學
City University of Hong Kong

DEPARTMENT OF MATHEMATICS

City University of Hong Kong

An enriched virtual element method for 2D-3C Generalized membrane shell model on surface

by

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ABSTRACT

Dealing with complex shell surface by finite element method, we are often limited with simple geometric mesh such as triangle and quadrangle and have to refine the meshes to meet the requirements of calculation accuracy, which greatly increases the calculation cost. The virtual element method (VEM), a new numerical method with high mesh flexibility, has been applied widely to solve many physical and mechanical problems. To the best of our knowledge, this method has not been studied for shell models so far. IN this appear, for the first time we provide an enriched conforming VEM discrete scheme for the two-dimensional three-component (2D-3C) generalized membrane shell (GMS) model proposed by Ciarlet et. al. It is very difficult to study in both theoretical analysis and numerical computation because the shell model itself is a complex variable coefficients system on the two-dimensional surface. We prove the existence, uniqueness, stability and convergence of the VEM discrete solution and provide corresponding error estimates for the GMS. Finally, we execute numerical examples involving a portion of a conical shell, a cylindrical shell and a hyperbolical shell to verify the convergence and stability of VEM. At the same time, we show the diversity of the grid subdivision. Thus, we develop successfully the VEM for the GMS model. In the future, we will continue to study the VEM for other shell models.

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