CONFORMING AND NONCONFORMING VIRTUAL ELEMENT METHODS FOR ELLIPTIC EIGENVALUE PROBLEMS

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Abstract. We analyse the conforming and nonconforming Virtual Element Method (VEM) [1, 2] for the approximation of elliptic eigenvalue problems. As a model problem we consider the Laplace eigenvalue problem. We present two possible formulations of the discrete problem, derived respectively by the nonstabilized and stabilized approximation of the L^2-inner product, and we study the convergence properties of the corresponding discrete eigenvalue problem. The proposed schemes provide a correct approximation of the spectrum, in particular we prove optimal-order error estimates for the eigenfunctions and the usual double order of convergence of the eigenvalues. Moreover, we show a large set of numerical tests supporting the theoretical results, including a comparison between the conforming and the nonconforming schemes and present some possible applications of the theory.

Keywords: eigenvalue problem, conforming and nonconforming virtual element, polytopal meshes

Mathematics Subject Classifications (2010): 65N30, 65N25, 65N12, 65N15

References

[1] F. Gardini, G. Vacca. Virtual Element Method for Second Order Elliptic Eigenvalue Problems. IMA *Journal of Numerical Analysis*, 38 (4): 2026-2054, 2018.

[2] F. Gardini, G. Manzini, G. Vacca. The Nonconforming Virtual Element Method for Eigenvalue Problems. arXiv:1802.02942v1, 2018.

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