A higher order virtual element method for the Cahn-Hilliard equation

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Abstract

In this talk we discuss nonconforming virtual element methods (VEMs) for fourth-order problems. At present, the available VEM literature on fourth-order problems only includes defining projection operators based on the underlying variational problem. This approach involves constructing only one projection which depends on the local contribution to the bilinear form. Instead, we follow the approach of defining a hierarchy of projection operators for the necessary derivatives with the starting point being a constraint least squares problem. By defining the projection operators in this way, we show that we can directly apply our method to nonlinear fourth-order problems. This approach can also be easily included into existing software frameworks.

This talk showcases the application of our generalised method to the Cahn-Hilliard equation. As a consequence of our approach, we do not require any special treatment of the nonlinearity. Our method is shown to converge with optimal order also in the higher order setting. The theoretical convergence result is verified numerically with standard benchmark tests from the literature.

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