Polygonal Staggered Discontinuous Galerkin methods for the Heat Equation

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In this poster, we present Staggered discontinuous Galerkin (SDG) methods for time-dependent problem on general polygonal meshes. The methodologies can preserve the physical laws of mathematical models such as local mass conservation due to the special construction of the finite element spaces. We consider expanded SDG method by introducing a new variable in our first order system. This new variable plays important role to avoid the inversion of the diffusion coefficient.

We consider the heat equation as a model problem in the two-dimensional space. The problem is formulated in a weak form based on the expanded mixed form for space discretizations. Our goal is to apply the arbitrary order polynomial Staggered discontinuous Galerkin method on general polygonal meshes and to use theta-scheme in time discretization. The obtained result shows the optimal convergence for all variables. Numerical experiments are provided to validate the theory developed in this work.

References

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