Numerical simulation of spin distribution evolution for super-paramagnetic materials

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There are several ways to simulate magnetic materials. One of them is modeling the distribution function. It is convenient to use computational fluid dynamics methods in order to obtain numerical solution of kinetic equations. In our opinion modeling of spin distribution is of the most interest thus we chose Brown model that describes only the evolution of the spin distribution for the superparamagnetics system [1].

For this problem triangular mesh on sphere was constructed. It is based on dodecahedron. Recursive subdivision was applied to adjust cells scale. In our simulation we used DG framework and Runge-Kutta time integration [2]. It is worth to mention that our mesh consists of spherical triangles instead of planar ones. On such cells one should use special basis functions. In this work we took spherical Bezier-Bernstein polynomials [3]. The last part of numerical method reconstruction procedure is hierarchical WENO type [4]. A few tests on known problems were carried out. Our method produced rather good results and it proved to be second order.

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