1143-65-207 **Fanchen He*** (wzfche@umich.edu), Department of Mathematics, University of Michigan, Ann Arbor, MI 48109. *Recovery-based discontinuous Galerkin method for the Cahn-Hilliard equation.* Preliminary report.

Handling high-order derivatives, say, the diffusion terms in the Navier-Stokes equations, with discontinuous Galerkin (DG) method is a nontrivial task, because the numerical solutions are represented by discontinuous piecewise polynomials of degree p. In 2005, a novel recovery-based discontinuous Galerkin method (RDG) was introduced by van Leer and Nomura for diffusion, where a polynomial of degree $2p+1$ is reconstructed on the two adjacent elements. It achieved a surprising order of accuracy of $3p+1$ for odd p and $3p+2$ for even p in terms of cell-average error for the heat equation. Here we illustrate how to apply the idea of recovery to solving partial differential equations with high-order derivatives. We developed a RDG method for the Cahn-Hilliard equation. To enable analysis of RDG schemes designed for non-linear problems, we suggested a new way to analyze the accuracy of RDG schemes via Taylor expansion. The new form of analysis explains the accuracy of the RDG scheme developed for the Cahn-Hilliard equation in one space dimension. Numerical experiments show that the new RDG scheme has property of superconvergence. Furthermore, it's demonstrated that the new RDG scheme is more accurate than the established local discontinuous Galerkin (LDG) approach. (Received August 13, 2018)