1131-65-74 **Jue Yan*** (jyan@iastate.edu), Department of Math, 396 Carver Hall, Iowa State University, Ames, IA 50010. *Direct discontinuous Galerkin methods for Keller-Segel Chemotaxis equations.* Preliminary report.

We develop a new direct discontinuous Galerkin (DDG) methods to solve Keller-Segel Chemotaxis equations. Different to available DG methods or other numerical methods in literature, we introduce no extra variable to approximate the chemical density gradients but solve the system directly. With P^k polynomial approximations, we observe no order loss and optimal (k+1)th order convergence is obtained. The reason that DDG methods is convergent with optimal orders is that DDG methods have the super convergence property on its approximating to solution gradients. With Fourier (Von Neumann) analysis technique, we prove the DDG solution's spatial derivative is super convergent with at least (k+1)th order under moment norm. We show the cell density approximations are strictly positive with at least third order of accuracy. We also carry out second order finite difference schemes to simulate the liquid and semi-solid models of chemotaxis. The pattern formations observed are consistent to those in literature. (Received July 02, 2017)