Symmetric Direct DG (DDG) Method for Elliptic Interface Problems

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We first review recent development of DDG method and its variations, the DDGIC and symmetric DDG methods. Under the topic of maximum principle, we prove the DDG methods satisfy strict maximum principle with at least third order of accuracy. Recent application to Chemotaxis Keller-Segel equations shows that the DDGIC method have the hidden super convergence property on its approximation to the solution's gradients. We then discuss our studies of symmetric DDG method on second order elliptic problems, especially on elliptic interface problems.