Monte-Carlo Methods for High Dimensional Forward Backward SDEs and Quasilinear PDEs

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A Forward Backward SDE is associated with a quasilinear parabolic PDE. Due to its importance in many applications such as mathematical finance and stochastic control, numerical methods for FBSDEs have received strong attention in recent years. There are typically two approaches: the PDE approach and the Monte-Carlo approach. The PDE approach faces the so called "curse of dimensionality" and usually works only for problems with dimension up to 3. The Monte-Carlo approach, however, is relatively insensitive to the dimension. In this talk we will first give a brief introduction to FBSDEs, and then review the recent results for decoupled FBSDEs. Finally we introduce a new algorithm for coupled FBSDEs. We obtain the rate of convergence of our new algorithm and show by an example that it indeed works for 10-dimensional problems.