Generalised Particle Filters with Gaussian Measures

Kai Li *

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Abstract

The stochastic filtering problem deals with the estimation of the posterior distribution of the current state of a signal process $X = \{X_t\}_{t\geq 0}$ given the information supplied by an associate process $Y = \{Y_t\}_{t\geq 0}$. It has many applications in finance, especially volatility estimation in financial markets. A massive scientific and computational effort is dedicated to the development of viable tools for approximating the solution of the filtering problem. In higher dimensions, a class of numerical methods called particle filters have proved the most successful methods to-date. These methods produce an approximations of the posterior distribution by using the empirical distribution of a cloud of particles that explore the signal's state space. In this talk, we discuss a more general class of numerical methods which involve *generalised* particles, that is, particles that evolve through larger spaces. Such generalised particles include Gaussian measures, wavelets, and finite elements in addition to the classical particle methods. We will construct the approximating particle system under the Gaussian measure framework and prove the corresponding convergence result. This is joint work with Prof. Dan Crisan.

*Department of Mathematics, Imperial College London, email: kai.li08@imperial.ac.uk