Some Linear-Quadratic Control Problems for Bilinear Evolution Equations Driven by Gauss-Volterra Processes

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Abstract

A stochastic linear-quadratic control problem is formulated and solved for some stochastic equations in an infinite dimensional Hilbert space for both finite and infinite time horizons. The equations are bilinear in the state and the noise process where the noise is a scalar Gauss-Volterra process. The Gauss-Volterra noise processes are defined from integrals of a Brownian motion with suitable kernel functions. These noise processes include fractional Brownian motions with the Hurst parameter $H \in (\frac{1}{2}, 1)$, Liouville fractional Brownian motions with $H \in (\frac{1}{2}, 1)$, and some multifractional Brownian motions. The family of admissible controls for the quadratic costs is a family of linear feedback controls. This restriction on the family of controls allows for a feasible implementation of the optimal controls though these feedback controls are not optimal in the larger class of adapted processes. The bilinear equations have drift terms that are linear evolution operators. These equations can model stochastic partial differential equations of parabolic and hyperbolic types. This is joint work with T. E. Duncan and B. Maslowski.