Estimation of a discretely observed parabolic SPDE with small noise

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Abstract:

We deal with estimation of unknown parameters for a parabolic linear second order stochastic partial differential equation (SPDE) with small noise based on high frequency data. The data are discretely observed in time and space. Recently, Bibinger and Trabs (2017, arXiv:1710.03519; 2020, SPA) and Hildebrandt and Trabs (2019, arXiv:1910.01004) proved asymptotic normality of the minimum contrast estimators for coefficient parameter of the SPDE model based on high frequency data observed on a fixed region [0,1] X [0,1], see also Kaino and Uchida (2020, JSPI) for parametric estimation of SPDE model on the region [0,T] X [0,1] with a long time T. In this talk, we introduce the minimum contrast estimators of the diffusivity parameter and the curvature parameter in a parabolic linear SPDE with small noise by using the thinned data in space based on the high frequency data. The approximate coordinate process is derived from the minimum contrast estimators and the high frequency data. The adaptive estimator of the rest of coefficient parameters in the SPDE with small noise is constructed by using the thinned data in time obtained from the approximate coordinate process. It is shown that the adaptive estimator has consistency and asymptotic normality. Furthermore, we give some examples and simulation results of the estimators of coefficient parameters in the SPDE with small noise based on high frequency data.

Keywords:

asymptotic normality; diffusion process; high frequency data; parametric estimation; spatio-temporal data analysis