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RECONSTRUCTION OF A STATIONARY SPATIAL PROCESS FROM A SYSTEMATIC SAMPLING

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Abstract

We consider the problem of predicting a spatial stationary process over a fixed unit region $[0,1]^d, d > 1$. We derive a linear nonparametric predictor using an extended linear interpolation formula based on a regular sampling design of size m^d. Under some appropriate assumption on the spectral density,we give the rate of convergence of the corresponding integrated mean squared error when the observations get dense in the whole region.

Key words: spatial process, linear interpolation, spectral density, rate of convergence.

1 Introduction and Results

The prediction of a spatial process from its observations at chosen sites is relevant to problems related to geology and environment, known as kriging. Parametric methods have been used to predict a process by means of a linear model. The best linear unbiased estimator of the underlying parameter was studied by many authors such as Cressie (1993), Matern (1986), Sacks, Welch and Mitchell (1989).We wish to predict the process $X(\mathbf{t}), \mathbf{t} \in [0,1]^d$ from observations based on a systematic (regular) sampling design in the unit region $[0,1]^d$ which is divided into m^d grids each of equal size $1/m$. The best linear predictor depends on the inverse of a covariance matrix generated by the m^d observations and thus this maybe subject to serious numerical unstabilities. We consider in this paper a nonparametric approach to predict