A KERNEL APPROXIMATION TO THE KRIGING PREDICTOR OF A SPATIAL PROCESS

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Abstract. Suppose a two-dimensional spatial process $z(x)$ with generalized covariance function $G(x, x') \propto |x - x'|^2 \log |x - x'|$ (Matheron, 1973, *Adv. in Appl. Probab.*, **5**, 439–468) is observed with error at a number of locations. This paper gives a kernel approximation to the optimal linear predictor, or kriging predictor, of $z(x)$ under this model as the observations get increasingly dense. The approximation is in terms of a Kelvin function which itself can be easily approximated by series expansions. This generalized covariance function is of particular interest because the predictions it yields are identical to an order 2 thin plate smoothing spline. For moderate sample sizes, the kernel approximation is seen to work very well when the observations are on a square grid and fairly well when the observations come from a uniform random sample.

Key words and phrases: Thin plate spline, prediction of random fields, Kelvin function, nonparametric regression.