Block kriging for lognormal spatial processes

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Abstract

Lognormal spatial data are common in mining and soil-science applications. Modeling the underlying spatial process as normal on the log scale is sensible; point kriging allows the whole region of interest to be mapped. However, mining and precision agriculture is carried out selectively and is based on block averages of the process on the original scale. Finding spatial predictions of the blocks assuming a lognormal spatial process has a long history in geostatistics. In this paper, we make the case that an approach overlooked in past times of low computing power deserves to be reconsidered. In fact, for known mean, it is optimal. We also consider the predictor based on the "law" of permanence of lognormality. Mean squared prediction errors of both are derived and compared both theoretically and via simulation; the predictor based on permanence is seen to be less efficient. Our methodology is applied to block kriging of phosphorous to guide precision-agriculture treatment of soil on Broom's Barn Farm, UK.