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Empirical Resolution Length and Point Spread Width for Kriging, Spline Interpolation and Other General Estimation Problems

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Resolution analysis is a crucial component to general estimation problems especially for appraising the results of spatial analysis schemes. Conventionally, it is carried out only for linearized inverse problems with limited degrees of freedom while the inverse operator is explicitly available. Stochastic simulation schemes have been proposed recently to build empirical resolution information for sizeable inverse problems. We generalize the formulation for the empirical resolution length as well as the scale length of the point spread function for general estimation problems, including especially the task of spatial analysis such as the method of kriging and spline interpolation that do not have the resolving kernels or resolution matrices explicitly accessible. These information have not been accessible in the past and we show that the implementation for the general resolution appraisal helps to further investigate the advantages and limitations of some of these widely invoked practices of general estimation problems. Furthermore, the multiscale spatiotemporal interpolation algorithm that we recently proposed is compared with these popular schemes based on the resolution appraisal.