Application Of Technology In The Analysis Of Spatially Dependent Data

Lyn Bloom, Ute Mueller and Bielin Shi
School of Engineering and Mathematics
Edith Cowan University, Perth, Australia
`l.bloom@cowan.edu.au`

Abstract

Spatial data are those where location as well as value is important. Such data arise naturally in the earth and environmental sciences. In addition, spatial data typically exhibit some degree of spatial dependence. This means that they are not amenable to analysis by most of the standard statistical techniques. Over the past thirty years many approaches have been made to the analysis of spatial data and this branch of mathematics is referred to as geostatistics. These methods include the modelling of the spatial dependence together with estimation and simulation algorithms. Modern technology has made possible the application of geostatistical techniques to real-world problems such as ore reserve estimation and contaminated sites rehabilitation.

In this paper we present a selection of these geostatistical methods, together with details of the software used in their implementation. We illustrate the outcomes by application to a permeability data set. We consider a sample data set, carry out the variography to model the spatial dependence, perform the estimation technique known as ordinary kriging, apply the simulation algorithm known as sequential Gaussian simulation and finally, compare our results with the full data set itself. In practice we use the technology detailed here in both our teaching and our research.