

## Group 2 - Visualizing Covariance: Minutes of the Discussion

19th June 2014

Discussion began with an enumeration of the methods for presenting or displaying covariance that had been seen thus far in the conference, they were:

- The Iso-Elliptical display to show directionality of the covariance
- Choosing a single point and then displaying a plot of the covariance for that point with all others. Several of these may be used for a selection of points
- Plot a field of parameter values by location
- interactive display as seen in Jaouin's slider interface using TCLTK
- Chicken wire plots showing spatial distortion

The discussion next turned to an attempt to list exactly what information a visualization of covariance must impart in order to be effective. We felt that such a visualization should show how these elements vary spatially;

- Directionality
- Range
- Process variance
- Nugget

It was generally agreed that displaying this much information on a single plot was an ambitious goal. While no-one was able to propose an example or suggested format to do this it was felt that a thorough review of other fields or disciplines seeking data displays suited to simultaneously displaying multiple variables in an easily interpretable way was one avenue to pursue. Chernov faces were mentioned as an example of this type of display goal, but were not felt to be suitable in this instance.

There was some discussion of static displays of covariance versus interactive displays. Interactive suggestions included the use of displays similar to the slider

driven TCATK example we saw or the use of plot allowing the user to interrogate the plot, that is, by scrolling over or clicking on the plot one would reveal more detail or information about the chosen point. Static display dicussion centered on trying to settle upon some standard plot format such as we saw in the geoR plot. A four panel display showing direction, range, process variance and nugget, eaxh with the data locations overlaid was proposed. It was also suggested that grey scaling or colour transparency could be incorporated to show the certitude of any plotted value with very cetain estimates being dark and uncertain ones being near transparent.

Discussion closed with the suggestion that by treating the plots of parameter values varying across the domain as marked patterns, with the set of coordinates of the grid as locations and the parameter value at each location as a mark, one could use the mark characteration tools present in R packages like **spatstat** such as the mark correlation function or mark table feature.