CLUMPS AND BUMPS – MEASURES OF SPATIAL AGGREGATION

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Ecological and environmental studies commonly include the collection of binary data denoting the presence or absence of some organism across a grid of sampling points. These data may represent the presence of fungal isolates in soil samples collected across a field, the presence of some weed species within a set of contiguous quadrats, or possibly the presence of some disease or pest on individual plants within a crop. Sometimes the presence of the organism appears to be spatially aggregated, and interest is often focussed on determining the extent of such clustering. This poster describes the development of a new measure for identifying areas of spatial association based on such grid-based, binary data collected at specific locations.

Numerous local and global measures have previously been developed to help identify non-random spatial patterns or clusters of binary responses. These measures usually use data collected at specific locations in a grid and generally consider both the number (proportion) of positive responses and the numbers of different types of first-neighbour "joins" (between each point and its four nearest neighbours) – negative/negative (where the organism is absent in both samples), positive/positive (where the organism is present in both samples) or positive/negative (where the organism is present in one sample but absent in the other). Most measures consider each type of join independently and the information is not incorporated into a single index.

The local index outlined in this poster combines information about positive/positive and positive/negative joins to give what we believe is a more robust measure. The measure is applied to rectangular regions across the fixed grid to enable the distribution of the level of local clustering to be viewed for the full area sampled. To identify sub-regions with a high (or low) level of clustering, a threshold value for the local measure is applied and simulations can be run to determine if the sub-regions identified can be considered significant.

Knowledge of the spatial distribution patterns shown by a weed, pest or disease can be important in devising sampling schemes to obtain reliable estimates of the overall level of infestation or infection, ensuring that the same cluster of infested or infected points is not over-sampled. Similarly, knowledge of the spatial pattern might provide the basis for improved approaches to the control of the organism.