

FUZZY CLUSTERING OF SPATIAL DATA

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The paper presents a method for clustering multivariate spatial data using a fuzzy membership process. Several authors have described clustering concepts which take into account the spatial correlation between samples. Hierarchical and centroid clustering methods can be characterised by the underlying distance measure and the linkage method by which groups or individual samples are fused. In traditional multivariate statistics the Euclidian distance or Mahalanobis distance is used as a measure of dissimilarity. This approach ignores the spatial information. For spatially dependent samples geostatistical tools can be applied to define similarity or dissimilarity of samples: The dissimilarity between spatial data can be measured by a generalised spatial Mahalanobis distance or by weighting the dissimilarity by a multivariate variogram function. It is well known that clustering based on these methods produces sharp boundaries between the groups which are inadequate for most practical problems in geoscience - especially when mixture processes dominate. Fuzzy set theory provides a membership concept which is more suitable for partitioning spatial data into classes which have no sharp boundary and each sample can be interpreted as a mixture of different classes. The combination of geostatistical methods and fuzzy set concept is realised by modifying a fuzzy clustering algorithms using spatially weighted measures of dissimilarity and tested with soil samples from a contaminated industrial site.