Environmental Data Analysis using Isomap approach

Tai-Yi Liu (1) and Ming-Che Hu (2)

(1) Bioenvironmental System Engineering, National Taiwan University, Taipei, Taiwan (b01602046@g.ntu.edu.tw), (2) Bioenvironmental System Engineering, National Taiwan University, Taipei, Taiwan (mchu@ntu.edu.tw)

Linear methods of dimensionality reduction, such as Principal component analysis (PCA), are tools widely used to help us realize the structure of high-dimension data. However, linear methods are unable to preserve geometric features between neighbors. Nonlinear methods can maintain the structure of the manifold. In this study, Isometric feature mapping (Isomap) is applied to help us understand the nonlinear structure of environmental data. Instead of Euclidian distance, the geodesic distances on the manifold are calculated in this research. First, we collect environmental and hydrological data such as precipitation and temperature. Second, geodesic distances are calculated by using Dijkstra's shortest path algorithm. Finally, the distances are imported into multidimensional scaling to create a two-dimension map representing their dissimilarities in a higher dimension.