SCV 2008: December 1-3, Taipei, Taiwan (Abstract)

Shape Analysis for pre-aligned, star-shaped objects - what PCA can tell about the evolution of tree rings

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Abstract

We discuss different shape spaces for analysing pre-aligned, star-shaped objects where landmarks have been placed at fixed angles. In particular, we look for Euclidean shape spaces which render standard methodology of multivariate analysis applicable. The application that initiated this research lies in forestry where one is interested in the temporal evolution of tree rings. We compare the results of principal components analysis applied to a data set of stem disks which we performed in the different shape spaces. We demonstrate that essential features of a tree's growth are contained in the first two principal components which capture major events in the tree's lifetime.