Intrinsic Shape Analysis

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Two geometrical objects are said to have the same shape if they are identical up to
a similarity transform. We are interested in statistically analysing shapes where we view
the set of these equivalence classes as a metric space with a natural topology and metric.
Extrinsic shape analysis applies classical multivariate analysis by a suitable embedding
in a Euclidean space, often projecting to the tangent space at some mean shape. We
will discuss the drawbacks of this approach if the statistical descriptors of the dataset
cannot be well represented in a single tangent space. Recently, intrinsic methods have
been developed which do not require such an embedding. We will present two such
approaches: principal components geodesics as an intrinsic generalisation of PCA, as
well as intrinsic MANOVA. The difficulties faced by intrinsic analyses, and in fact by
shape analysis in general, will be highlighted.