Geometric Methods in Pattern and Shape Matching

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Matching of point patterns and of shapes is a central problem in comuter vision and image processing. Geometric methods for this task have been investigated within computational geometry.

The first decision to be made is which *distance measure* should be used to measure the resemblance of patterns and shapes. Here mostly the Hausdorff distance has been considered but also other metrics like the Fréchet disctance or the area of the symmetric difference.

The next question is what are allowable *transformations* in oder to match the input figures. The easiest version of the problem is that only *translations* are allowed, but some applications require more complicated matching transformations, like *Euclidean motions* (translation and rotation), *similarities* (translation, rotation, and scaling), or even arbitrary *affine transformations.*

Techniques and structures from computational geometry that have been used are, for example, Voronoi diagrams, parametric search, and so called referene points which are points within the objects that are matched first, so that the complete matching task becomes easier.

There are several papers concerned with *applications* of these methods, for example to find a given object within a given scene in computer vision or to identify a given constellation taken by a camera aboard a satellite by finding it within a star catalogue.

The lecture will give a survey of all these ideas and algorithms.