

Hamiltonian Dynamics and Computer Vision

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A problem in Computer Vision is statistical analysis of variations in shapes. For example, given a statistical sample of, say, images of a brain structure such as corpus callosum or hippocampus, what is the average shape and what is the standard deviation? The root of the difficulty is the fact that shape spaces are not vector spaces, but infinite dimensional manifolds.

The starting point for statistical analysis on a manifold is to compute distances between shapes. The standard machinery of Differential Geometry, suitably extended to infinite dimensional manifold is a straight-forward approach, but from a computational point of view, it is better to have different formulations and pick the most efficient. I will describe a Hamiltonian version due to Peter Michor and David Mumford for the case of smooth planar loops and discuss a specific Sobolev metric.