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Long-time existence of Brownian motion on configurations of two landmarks

In computational anatomy and, more generally, shape analysis, the Large Deformation Diffeomorphic Metric Mapping framework models shape variations as diffeomorphic deformations. An important shape space within this framework is the space consisting of shapes characterised by $n \geq 2$ distinct landmark points in $\mathbb{R}^d$. In diffeomorphic landmark matching, two landmark configurations are compared by solving an optimisation problem which minimises a suitable energy functional associated with flows of compactly supported diffeomorphisms transforming one landmark configuration into the other one. The landmark manifold Q of n distinct landmark points in $\mathbb{R}^d$ can be endowed with a Riemannian metric g such that the above optimisation problem is equivalent to the geodesic boundary value problem for g on Q. Despite its importance for modelling stochastic shape evolutions, no general result concerning long-time existence of Brownian motion on the Riemannian manifold (Q,g) is known. I will present joint work with Philipp Harms and Stefan Sommer on first progress in this direction which provides a full characterisation of long-time existence of Brownian motion for configurations of exactly two landmarks, governed by a radial kernel.