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Optimal ballistic transport problems and applications to PDE in mechanics and physics

Optimal ballistic transport problems are somewhat similar to the shortest path (geodesic) problems. In the finite-dimensional setting, say, on a Lie group with a Riemannian metric, we minimize the kinetic energy along all curves with prescribed final point and initial velocity. Remarkably, such problems naturally arise in the infinite-dimensional setting from a certain dual formulation of nonlinear evolutionary systems of PDE. We propose a systematic approach to such problems and a related construction of a generalized solution to the corresponding PDE. Various examples of such systems (both integrable and non-integrable) from fluid dynamics and other areas of physics will be presented.