Variational design of rigid body motions in the presence of obstacles

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We present a solution for variational design of rigid body motions in the presence of obstacles that fully employs the available degrees of freedom in the design process. This question remained open in our paper [2] on energy-minimizing splines in manifolds. For the numerical solution we use a geometric optimization algorithm that minimizes an energy of curves on surfaces of arbitrary dimension and codimension. In the unconstrained case the surface we work with is the group of Euclidean congruence transformations embedded in the group of affine transformations. For the avoidance of obstacles we use an appropriate barrier surface in our computations.

[1] M. Hofer and H. Pottmann: *Designing energy-minimizing rigid body motions in the presence of obstacles*, Geometry Preprint 142, Vienna University of Technology, 2005

[2] M. Hofer and H. Pottmann: *Energy-minimizing splines in manifolds*, Transactions on Graphics 23(3):284-293, 2004. (Proceedings of ACM SIGGRAPH 2004)

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