VARIATIONAL OBSTACLE AVOIDANCE WITH APPLICATIONS TO INTERPOLATION PROBLEMS IN HYBRID SYSTEMS

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ABSTRACT. In this talk we present variational obstacle avoidance problems on complete Riemannian manifolds and apply the results to the construction of piecewise smooth curves interpolating a set of knot points in systems with impulse effects. We derive the dynamical equations for extrema in the variational problem, and show the existence of minimizers by using lower-continuity arguments for weak convergence on an infinite-dimensional Hilbert manifold. We then provide conditions under which it is possible to ensure that the extrema will safely avoid a given obstacle within some desired tolerance.

REFERENCES

[1] A. Bloch, M. Camarinha, L. Colombo. Variational obstacle avoidance problem on Riemannian manifolds. in Proceedings of the IEEE International Conference on Decision and Control, 2017, pp. 146-150.

[2] A. Bloch, M. Camarinha, L. Colombo. Dynamic interpolation for obstacle avoidance on Riemannian manifolds. International Journal of Control, 94(3), 588-600, 2019.

[3] J. Goodman, L. Colombo. Variational Obstacle Avoidance with Applications to Interpolation Problems in Hybrid Systems. Proceedings of the 7th IFAC Workshop on Lagrangian and Hamiltonian Methods in Nonlinear Control, 2021. IFACPapersOnLine 54.19 (2021): 82-87.

[4] J. Goodman, L. Colombo. Collision Avoidance of Multiagent Systems on Riemannian Manifolds. SIAM Journal on Control and Optimization, 60(1), 168-188, 2022.

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