Optimal Control for a Controlled Sweeping Process with Applications to the Crowd Motion Model

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ABSTRACT

This talk concerns optimal control problems for a new class of dynamics systems governed by the (Moreau) sweeping process which arises in various problems of hysteresis, ferromagnetism, electric circuits, phase transitions, economics, etc. The dynamics of such system was introduced in the 1970's by J. J. Moreau to model quasi-static evolution processes subject to unilateral constraints, and it can be described by the normal cone mapping to moving polyhedral convex sets. The main attention is paid to deriving necessary optimality conditions for optimal control problems using the method of discrete approximations. It should be emphasized that the velocity mapping (described by the normal cone) in the differential inclusion is highly non-Lipschitz and unbounded, which cannot be treated by means of known results in optimal control for differential inclusions. Such challenging issues can be overcome by developing the method of discrete approximations married with appropriate generalized differential tools of modern variational analysis. We also discuss new applications to the controlled crowd motion model of traffic equilibria.

REFERENCES

1. T.H. Cao and B.S. Mordukhovich, Applications of optimal control of a nonconvex sweeping process to optimization of the planar crowd motion model, submitted (2018); arxiv.org/abs/1802.08083.
2. T.H. Cao and B.S. Mordukhovich, Optimal control of a nonconvex perturbed sweeping process, J. Diff. Eqs.; https://doi.org/10.1016/j.jde.2018.07.066.
3. T.H. Cao and B.S. Mordukhovich, Optimality conditions for a controlled sweeping process with applications to the crowd motion model, Disc. Cont. Dyn. Syst., Ser B, 21 (2017), 267-306; DOI:10.3934/dcdsb.2017014 http://www.aimsciences.org/journals/displayArticlesnew.jsp?paperID=13461.
4. T.H. Cao and B.S. Mordukhovich, Optimal control of a perturbed sweeping process via discrete approximations, Disc. Cont. Dyn. Syst. Ser. B, 21 (2016), No. 10; DOI 10.3934/dcdsb.2016100, http://www.aimsciences.org/journals/displayArticlesnew.jsp?paperID=13328.