Asymptotic Controllability and Optimal Control - A Hilbert Space Approach

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Abstract

Optimal control problems with infinite horizon arise from different points of view. On the one hand, considering a control problem with a long, but not bounded, finite horizon T leads to the limiting process $T \to \infty$ and to the infinite horizon $T = \infty$ as the idealization of this limiting procedure. In this sense, most economic applications are studied and most of the theoretical results follow from these ideas. On the other hand, the problem of asymptotic controllability leads to a infinite horizon control problem. For both problem classes the integration over an unbounded time interval indicates some difficulties which are specific to this class of problems, see [1]. Such problematic features contain, for instance, the lack of standard transversality condition which results in a missing boundary condition in the system of necessary optimality conditions. For this reason, one needs other techniques to cope with typical difficulties arising in infinite horizon control problems. The suggestion of introducing Weighted Sobolev spaces as state spaces (and Hilbert spaces) holds many interesting effects and advantages both for the modeling itself and the theoretical and numerical treatment of the control problem. The systematic analysis and discussion of these effects is demonstrated by means of examples.

References

[1] Lykina, V. and S. Pickenhain: Weighted functional spaces approach in infinite horizon optimal control problems: a systematic analysis of hidden opportunities and advantages. (to appear) JMAA, Springer 2017, DOI 10.1016/j.jmaa.2017.04.069.

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