

Necessary conditions in stochastic optimal control

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Abstract

We present a variational approach to the first and second order necessary optimality conditions for stochastic optimal control problems with control and initial-final states constraints. The control system is governed by a stochastic differential equation, in which both drift and diffusion terms may contain the control variable, the set of controls is allowed to be nonconvex and the final state constraints are defined by finitely many inequality constraints. In the difference with the existing literatures, the second order variations of the control set are used to derive the second order necessary conditions. Only one adjoint equation is introduced to derive the first order necessary condition; while only two adjoint equations are needed to state the second order necessary conditions. This leads to stronger results under less restrictive, than usual, assumptions.

References

- [1] H. Frankowska, H. Zhang and X. Zhang (submitted) Stochastic optimal control problems with control and initial-final states constraints.
- [2] H. Frankowska, H. Zhang and X. Zhang (2017) First and second order necessary conditions for stochastic optimal controls, 262, J. of Diff. Eqs., 3689–3736

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