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Turnpike properties for fractional control problems

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Abstract

In this talk we consider averages convergence as the time-horizon goes to infinity of optimal solutions of time-dependent control problems to optimal solutions of the corresponding stationary optimal control problems. Control problems play a key role in engineering, economics, and sciences. To be more precise, in climate sciences, often times, relevant problems are formulated in long time scales, so that, the problem of possible asymptotic behaviors when the time-horizon goes to infinity becomes natural. Assuming that the controlled dynamics under consideration are stabilizable towards a stationary solution, the following natural question arises: Do time averages of optimal controls and trajectories converge to the stationary optimal controls and states as the time-horizon goes to infinity? This question is very closely related to the so-called turnpike property that shows that, often times, the optimal trajectory joining two points that are far apart, consists in, departing from the point of origin, rapidly getting close to the steady-state (the turnpike) to stay there most of the time, to quit it only very close to the final destination and time. In the present talk we are dealing with control problems of fractional parabolic equations with non-zero Dirichlet exterior data associated with the fractional Laplace operator. We prove the turnpike property for the non-local Dirichlet control problem. The talk is for a large audience avoiding unnecessary technicalities.

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