An Indirect Pseudospectral Method for the Solution of Infinite Horizon Optimal Control Problems

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Abstract: We consider a class of infinite horizon optimal control problems in Lagrange form involving the Lebesgue integral in the objective.

This special class of problems arises in the theory of economic growth and in processes where the time T is an exponentially distributed random variable.

The problem is formulated as optimization problem in Hilbert Spaces. The remarkable on this statement is the choice of Weighted Sobolev- and Weighted Lebesgue spaces as state and control spaces respectively. These considerations give us the possibility to extend the admissible set and simultaneously to be sure that the adjoint variable belongs to a Hilbert space.

For the class of problems proposed, we can proof an existence result as well as a Pontryagin type Maximum Principle.

Based on this principle we develop a Galerkin method, coupled with the Gauss-Laguerre quadrature formulas as discretization scheme, to solve the problem numerically. Numerical results are presented for a quadratic regulator model.

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