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SEMINÁRIO DE ANÁLISE E EQUAÇÕES DIFERENCIAIS

Dia 12 de Janeiro (terça-feira), às 15h, na Sala B3-01

"Existence results and applications for some non-linear optimal control problems"

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(CMAF)

Abstract:

Classical existence results for optimal control problems governed by systems of ordinary differential equations are based on typical convexity assumptions, which are quite often, very difficult to check. We present a general approach to prove existence of solutions for optimal control problems, based on several relaxations of the problem, where the convexity arises in an unexpected way. We isolate one sufficient condition for the existence of optimal solutions, which can be validated in various contexts. We end up with a main existence result for vector problems with a particular structure, motivated by underwater-vehicles-maneuvering problems. Alternatively, we recover the classical approach based on a purely variational reformulation, which can lead to existence results by using fine existence theorems for variational problems without convexity assumptions. In particular we prove the existence of solution for autonomous scalar optimal control problems. Finally, we apply our existence result for vector state and control variables, to prove the local existence of solution for an optimal control problem describing the control of an underwater vehicle. Additionally to the main work described above, we introduce some ideas for future work. We propose to implement a numerical method, based on steepest descent directions, to approximate the solutions of realistic optimal control problems. Some preliminary results for academic examples are shown.

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