The Hong Kong Polytechnic University
Department of Applied Mathematics

Seminar
on

Solution to an optimal control problem by Krotov method

by

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Abstract

In this talk, we study the problem on how to get an analytic solution to an optimal control problem. By use of Krotov extension method we find a new performance index by constructing an auxiliary function to get an extension problem which is equivalent to the original problem. By canonical differential flow we solve some convex and non-convex global optimization problems which is induced from the optimal control problem. As an example, we consider the following optimal control problem:

$$\begin{aligned}
&P_1 \;--\; \min J(u(\cdot)) = \frac{1}{2}\int_{t_0}^{t_f} u^T(t)Uu(t)dt \\
&s.t. \quad \dot{x}(t) = Ax(t) + Bu(t), \quad t \in [t_0, t_f] \\
&\qquad\; x(t_0) = x_0, x(t_f) = x_{1,} \\
&\qquad\; x_0, x_1 \in R^n, \\
&\qquad\; u(t) \in \sum = \{u \mid u^T u \le 1\}, \quad t \in [t_0, t_f].
\end{aligned} \tag{1}$$

For the problem above, an analytic expression of the optimal control is when $0 \le t < 1 + \ln \hat{c}$,

$$\hat{u}(t) = [e - 1 - (\sqrt{e(e-2)})]e^{1-t^{-1}}\hat{c}e^{1-t} = 1.$$

and when $1 + \ln \hat{c} \le t \le 1$,

$$\hat{u}(t) = [1+0]^{-1}\hat{c}e^{1-t} = [e - 1 - (\sqrt{e(e-2)})]e^{1-t}.$$

Date : **4 October 2011 (Tuesday)**

Time : **11:00 am – 12:00 noon**

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The Hong Kong Polytechnic University

*** * * ALL ARE WELCOME * * ***