Parameter dependent systems, Averaged and simultaneous controllability

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Consider a linear finite dimensional control system depending on unknown parameters. The aim is to design controls, independent of the parameters, to control the system in some optimal sense.
I will discuss the notions of averaged control, according to which one aims to control only the average of the states with respect to the unknown parameters, and the notion of simultaneous control in which the goal is to control the system for all values of these parameters. This notion of averaged controllability has been introduced in [1] where a Kalman rank condition ensuring averaged controllability has been given.
I will show how these notions are connected through a penalization process. Roughly, averaged control is a relaxed version of the simultaneous control property, in which the differences of the states with respect to the various parameters are left free, while simultaneous control can be achieved by reinforcing the averaged control property by penalizing these differences. We show however that these two notions require of different rank conditions on the matrices determining the dynamics and the control. When the stronger conditions for simultaneous control are fulfilled, one can obtain the later as a limit, through this penalization process, out of the averaged control property.

The results presented in this talk are reported in [2].

Références

[1] E. Zuazua, *Averaged control*, Automatica, 50(12):3077 3087, 2014.

[2] J. Loh eac and E. Zuazua, *From averaged to simultaneous controllability of parameter dependent finite-dimensional systems*, preprint, 2015.

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