



Departamento
de Matemática
Aplicada



Seminario

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On optimal strategies for feeding in minimal time a Sequential Batch Reactors with several species

Abstract: In this talk we consider the optimal control problem consisting of feeding in minimal time a Sequential Batch Reactors where several species compete for a single substrate. This is done with the objective being to reach a given (low) level of the substrate. We allow controls to be bounded measurable functions of time plus possible impulses. A suitable modification of the dynamics leads to a slightly different optimal control problem, without impulsive controls, for which we apply different optimality conditions derived from the Pontryagin principle and the Hamilton-Jacobi-Bellman equation. We thus characterize the singular arcs of our problem as the extremal trajectories keeping the substrate at a constant level. This approach also allows to fully solve our problem when one or two species are considered. For the case when an arbitrary number of species is considered, we establish sufficient conditions to ensure that the “immediate one impulse” (IOI) strategy is optimal. This result and some ad-hoc numerical experiences show that there is a strong and surprising relation between the optimality of the IOI strategy and the two-species case.

References:

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2. P. Gajardo, J. Harmand, H. Ramírez C., A. Rapaport, Minimal time bioremediation of natural water resources. *Automatica*, vol. 47, pp. 1764-1769. (2011).
3. P. Gajardo, H. Ramírez C., A. Rapaport, Minimal Time Sequential Batch Reactors with Bounded and Impulse Controls for One or More Species. *SIAM Journal on Control and Optimization*, vol. 47, Issue 6, pp. 2827-2856. (2008).

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