Optimal control of bioprocesses

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A number of colleagues have already indicated their interest in this session.

1 Abstract

Control of bioprocesses has attracted lots of attention these last years. In a number of situations, stabilizing controllers (such as feedbacks that do not minimize any objective function) is sufficient to propose new management strategies and closed loop controls able to increase significantly process productivity or product quality. However, in a world submitted to global changes where environmental constraints are more and more stringent, the necessity of further optimizing processes functioning become a priority. In biotechnology, more than ever, new algorithms are needed to maximize product quality while minimizing energy requirements and environmental impacts. Optimal control theory can then be used to propose specific strategies to be evaluated and confronted to classical control approaches. In a number of situations, optimal techniques present many advantages and, as long as their application is possible with respect to technical requirements (presence of appropriate sensors/actuators), allow a significance improvement of processes functioning when compared to "classical" industrial practices. Nevertheless, positivity constraints and non-linearity in the dynamics, that are inherent and typical to biological systems, make the application of optimal control techniques not straightforward at all (for instance: presence of singular arcs, pre-saturation phenomena...). Moreover, previous literature has shown that these particularities make the optimal paths far to be intuitive, reinforcing the interests of optimal control theory for practitioners. In this framework, this invited session entitled "Optimal Control of Bioprocesses" will report on the latest developments of optimal control for bioprocesses.

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