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Modelling and parameter estimation of gene expression and cell growth in batch cultures

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ABSTRACT

Experimental procedure of CI857ts-controlled recombinant gene expression in bacterial batch cultures is mathematically modelled, and the corresponding minimum variance parameters are estimated from specific statistical or numerical methods, basically by using a global and recursive weighted least squares procedure under some constraints induced by the model. Moreover the numerical techniques proposed in this work act by accumulation of data coming from several runs of the experiment, so that more accuracy is obtained in the parameter estimation. In particular, for the production process, an extra-model parameter depending on an indicator vector is introduced for each run of the experiment in order to globalize the data. The analysis of obtained data leads to an integrated model for both cell growth and gene expression, which describes an asymmetric dynamics between culture growth and protein yield, and can serve to predict the maximal value of accumulated protein and the time required for it to be achieved at any stage of the preinducing cell growth.

Keywords: *mathematical modelling, parameter estimation, constrained least squares*

Mathematics Subject Classification: *62, 65, 92*

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