Strain Design as Multiobjective Network Interdiction Problem: A Preliminary Approach*

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***Abstract*—Computer-aided techniques have been widely applied to analyse the biological circuits of microorganisms and facilitate rational modification of metabolic networks for strain design in order to maximise the production of desired biochemicals for metabolic engineering. Most existing computational methods for strain design formulate the network redesign as a bilevel optimisation problem. While such methods have shown great promise for strain design, this paper employs the idea of network interdiction to fulfil the task. Strain design as a Multiobjective Network Interdiction Problem (MO-NIP) is proposed for which two objectives are optimised (biomass and bioengineering product) simultaneously in addition to the minimisation of the costs of genetic perturbations (design costs). An initial approach to solve the MO-NIP consists on a Nondominated Sorting Genetic Algorithm (NSGA-II). The shown examples demonstrate the usefulness of the proposed formulation for the MO-NIP and the feasibility of the NSGA-II as a problem solver.**

***Index Terms*—strain design, network interdiction, metabolic networks, multiobjective bilevel optimisation**