Abstract

Advancement of powerful biological technology has caused to achievement to numerous omic data that possibility of using algorithmic methods in analysis and optimizing of biological system.
has provided beside advancement of calculative biology. In this study, optimizing calculative instrument of microbial metabolism is extended on base of differential evolutionary algorithm with vision from bi-level optimizing functions. The outcome algorithm has been used for optimizing of succinic acid microbial production. The result shows the algorithm can reproduce scenario of metabolic engineer in less calculative time which were previously produced by other bi-level microbial optimizing methods, on the base of linear programming. Also the algorithm has adjusting parameters so that user has the capability of collation and adjustment with studying problem. In addition, it provided possibility of using non-linear goal function in optimizing on base of differential evolutionary algorithm and also possibility of finding strategy of metabolic engineer that cause to efficiency of optimizing production in microbial system.

References

- Schilling CH, Letscher D, Palsson BO: Theory for the systemic definition of metabolic pathways and their use in interpreting metabolic function from a pathway-oriented perspective.
- Schuster S, Fell DA, Dandekar T: A general definition of metabolic pathways useful for systematic organization and analysis of complex metabolic networks.
- Ibarra RU, Edwards JS, Palsson BO: Escherichia coli K-12 undergoes adaptive evolution to achieve in silico predicted optimal growth.
- Edwards JS, Ibarra RU, Palsson BO: In silico predictions of Escherichia coli metabolic capabilities are consistent with experimental data.
- Burgard AP, Maranas CD: Optimization-based framework for inferring and testing hypothesized metabolic objective functions.
- Famili I, Forster J, Nielsen J, Palsson BO: Saccharomyces cerevisiae phenotypes can be predicted by using constraint-based analysis of a genome-scale reconstructed metabolic network. PNAS 2003, 100:13134-13139.
Development of a Differential Evolutionary Algorithm Application in Optimizing Microbial Metabolic Systems


Nathan D. Price1, Jennifer L. Reed1 & Bernhard Ø. Palsson, Genome-scale models of microbial cells: evaluating the consequences of constraints. Nature Reviews Microbiology 2, 886-897.


Index Terms

Computer Science

Bio-sciences

Keywords

Differential evolutionary algorithm

Optimizing microbial metabolism

Metabolic modeling