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An Improved Non-dominated Sorting Genetic Algorithm-II (INSGA-II) Applied to the Design of DNA Codewords

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Abstract

DNA codewords design is critical for many research fields, from DNA computing, to DNA hybridization arrays, to DNA nanotechnology. Results in the literature rely on a wide variety of design criteria adapted to the particular requirements of each application. Since DNA codewords design can be regarded as a multi-objective optimization problem, and nondominated sorting genetic algorithm II (NSGA-II) has been demonstrated as one of the most efficient algorithms for multi-objective optimization problems, in this paper, we proposed an improved nondominated sorting genetic algorithm II (INSGA-II) for the design of DNA codewords. The novelty of our method is that introduced the constraints to the non-dominated sorting process. The performance of our method is compared with other DNA codewords design methods, and the experiment results in silico showed that the INSGA-II has a higher convergence speed and better population diversity than those of other algorithms, and can provide reliable and effective codewords for the controllable DNA computing.

Keywords: DNA Computing; DNA Codewords Design; Improved Nondominated Sorting Genetic Algorithm II (INSGA-II)

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