An Improved Ant Colony Algorithm for Genome Rearrangements

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Abstract : Genome rearrangement is an important area in computational biology and bioinformatics. The basic problem in genome rearrangements is to compute the edit distance, i.e., the minimum number of operations needed to transform one genome into another. Unfortunately, unsigned genome rearrangement problem is NP-hard. In this study an improved ant colony optimization algorithm to approximate the edit distance is proposed. The main idea is to convert the unsigned permutation to signed permutation and evaluate the ants by using Kaplan algorithm. Two new operations are added to the standard ant colony algorithm: Replacing the worst ants by re-sampling the ants from a new probability distribution and applying the crossover operations on the best ants. The proposed algorithm is tested and compared with the improved breakpoint reversal sort algorithm by using three datasets. The results indicate that the proposed algorithm achieves better accuracy ratio than the previous methods.