

PREFACE

Several problems in modern genome mapping analysis belong to the field of discrete optimization on a set of all possible orders. Here we describe formulations, mathematical models and algorithms for genetic/genomic mapping problem, that can be presented in TSP-like terms. These include: ordering of marker loci (or genes) in multilocus genetic mapping (MGM), multilocus consensus mapping (MCGM), and physical mapping problem (PMP). All these problems are considered as computationally challenging because of noisy marker scores, large-size data sets, specific constraints on certain classes of orders, and other complications. The presence of specific constraints on ordering of some elements in these problems does not allow applying effectively the well-known powerful discrete optimization algorithms like Cutting-plane, Genetic algorithm with EAX crossover and famous Lin-Kernighan. In the paper we demonstrate that developed by us Guided Evolution Strategy algorithms successfully solves this class of discrete constrained optimization problems. The efficiency of the proposed algorithm is demonstrated on standard TSP problems and on three genetic/genomic problems with up to 2,500 points.