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A novel Clustering based Genetic Algorithm for route optimization

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Abstract

Genetic Algorithm (GA), a random universal evolutionary search technique that imitates the principle of biological evolution has been applied in solving various problems in different fields of human endeavor. Despite its strength and wide range of applications, optimal solution may not be feasible in situations where reproduction processes which involve chromosomes selection for mating and regeneration are not properly done. In addition, difficulty is often encountered when there are significant differences in the fitness values of chromosomes while using probabilistic based selection approach.

In this work, clustering based GA with polygamy and dynamic population control mechanism have been proposed. Fitness value obtained from chromosomes in each generation were clustered into two-non-overlapping clusters. The surviving chromosomes in the selected cluster were subjected to polygamy crossover mating process while the population of the offsprings which would form the next generation were subjected to dynamic population control mechanisms. The process was repeated until convergence to global solution was achieved or number of generation elapsed. The proposed algorithm has been applied to route optimization problem. Results obtained showed that the proposed algorithm outperforms some of the existing techniques. Furthermore, the proposed algorithm converged to global solution within few iterations (generations) thus favoring its acceptability for online-realtime applications. It was also observed that the introduction of clustering based selection algorithm guaranteed the selection of cluster with the optimal solution in every generation. In addition, the introduction of dynamic population control with polygamy selection processes enabled fast convergence to optimal solution and diversity in the population respectively. (C) 2016 Karabuk University. Publishing services by Elsevier B.V.

Keywords

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