


Abstract

In this work, five new multi-objective evolutionary algorithms are constructed and programmed by using Matlab. They are designed to search for a Pareto optimum of a multi-objective optimization problem. These algorithms are based on modified NSGA-II, hybrid algorithms, big population and multi-tasking. We use the DSC algorithm that is exploring similarities and dissimilarities between solutions (chromosomes represented as binary strings). Then, a special way to discover a schema of a binary string (the DSDSC algorithm) is used. Also, the effect of a big initial population is applied.

To prove the efficiency of these algorithms, fourteen test functions were used. We used nine test functions without constraint, and five test functions with constraint. One of them is with one variable, five functions with two variables, one function with three variables, one with four variables, one function with six variables, two functions with ten variables, and three functions with 30 variables. The results showed, in most cases, the superiority of the algorithms proposed in this thesis in run time.

This thesis consists of six chapters. Chapter one is a general introduction to optimization. Chapter two contains a literature review and the discussion of performance measures for multi-objective optimization algorithms. In the third chapter, an algorithm called NSDSC is described, which combines using the dissimilarity operator and the similarity operator with random generation of a part of each new population, and building Pareto fronts. Also, a modification of NSDSC, called NS-DSDSC, is presented. The fourth chapter introduces two new algorithms, first Hybrid NSDSC with NSGA-II algorithm, second the First Big population Hybrid NSDSC with NSGA-II algorithm. The fifth chapter contains evolutionary multi-tasking algorithm, finally, chapter six contains some conclusions of this work.



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