Parameter tuning of a choice-function based hyperheuristic using Particle Swarm Optimization

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A Constraint Satisfaction Problem is defined by a set of variables and a set of constraints, each variable has a nonempty domain of possible values. Each constraint involves some subset of the variables and specifies the allowable combinations of values for that subset. A solution of the problem is defined by an assignment of values to some or all of the variables that does not violate any constraints. To solve an instance, a search tree is created and each node in the tree represents a variable of the instance. The order in which the variables are selected for instantiation changes the form of the search tree and affects the cost of finding a solution. In this paper we explore the use of a Choice Function to dynamically select from a set of variable ordering heuristics the one that best matches the current problem state in order to show an acceptable performance over a wide range of instances. The Choice Function is defined as a weighted sum of process indicators expressing the recent improvement produced by the heuristic recently used. The weights are determined by a Particle Swarm Optimization algorithm in a multilevel approach. We report results where our combination of strategies outperforms the use of individual strategies.

Combinatorial optimization

Constraints satisfaction

Hyperheuristics

Particle Swarm

Best match

Choice function

Constraint satisfaction problems

Constraints satisfaction

Hyper-heuristics

Hyperheuristic

Multilevel approach

Parameter-tuning

Particle swarm

Particle swarm optimization algorithm

Process indicators

Search trees

Variable ordering heuristics

Weighted Sum

Algorithms

Combinatorial optimization

Forestry

Genetic programming

Particle swarm optimization (PSO)

Algorithms

Genetic Engineering

Heuristic Methods

Optimization

Problem Solving

Restraints