Online control of enumeration strategies via bat algorithm and black hole optimization

Soto R.

Crawford B.

Olivares R.

Niklander S.

Johnson F.

Paredes F.

Olguín E.

Constraint programming is an efficient and powerful paradigm for solving constraint satisfaction and optimization problems. Under this paradigm, problems are modeled as a sequence of variables and a set of constraints. The variables have a non-empty domain of candidate values and constraints restrict the values that variables can adopt. The solving process operates by assigning values to variables in order to produce potential solutions which are then evaluated. A main component in this process is the enumeration strategy, which decides the order in which variables and values are chosen to produce such potential solutions. There exist different ways to perform this selection, and depending on the quality of this decision, the efficiency of the solving process may dramatically vary. Unfortunately, selecting the proper strategy is known to be a hard task, as its behavior during search is generally unpredictable and certainly depends on the problem at hand. A recent trend to handle this concern, is to interleave a set of different strategies instead of using a single one during the whole process. The strategies are evaluated according to process indicators in order to use the most promising one on each part of the search process. This process is known as online control of enumeration strategies and its correct configuration can be seen itself as an optimization problem. In this paper, we present two new systems for online control of enumeration strategies based on recent nature-inspired metaheuristics: bat algorithm and black hole optimization. The bat algorithm mimics the location capabilities of bats that employ echoes to identify the objects in their surrounding areas,

while black hole optimization inspires its behavior on the gravitational pull of black holes in space. We perform different experimental results by using different enumeration strategies and well-known benchmarks, where the proposed approaches are able to noticeably outperform previous work on online control.

Autonomous search

Bat algorithm

Bio-inspired

Black hole

Constraint programming

Metaheuristics

Algorithms

Computer programming

Constraint satisfaction problems

Constraint theory

Gravitation

Heuristic algorithms

Online systems

Stars

Autonomous searches

Bat algorithms

Bio-inspired

Black holes

Constraint programming

Meta heuristics

Optimization

behavior

experimental model

online monitoring

satisfaction