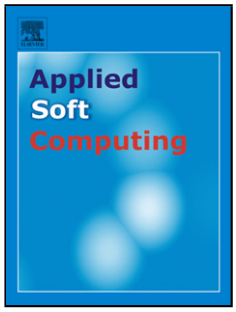

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PII: S1568-4946(17)30383-6
DOI: http://dx.doi.org/doi:10.1016/j.asoc.2017.06.040
Reference: ASOC 4309

To appear in: *Applied Soft Computing*

Received date: 20-12-2016
Revised date: 11-5-2017
Accepted date: 19-6-2017

Please cite this article as: Péricles B.C. Miranda, Ricardo B.C. Prudêncio, Generation of Particle Swarm Optimization algorithms: An experimental study using Grammar-Guided Genetic Programming, *<![CDATA[Applied Soft Computing Journal]]>* (2017), http://dx.doi.org/10.1016/j.asoc.2017.06.040

Generation of Particle Swarm Optimization algorithms: An experimental study using Grammar-Guided Genetic Programming

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Abstract

Particle Swarm Optimization (PSO) is largely used to solve optimization problems effectively. Nonetheless, the PSO performance depends on the fine tuning of different parameters. To make the algorithm design process more independent from human intervention, some researchers have treated this task as an optimization problem. Grammar-Guided Genetic Programming (GGGP) algorithms, in particular, have been widely studied and applied in the context of algorithm optimization. GGGP algorithms produce customized designs based on a set of production rules defined in the grammar, differently from methods that simply select designs in a pre-defined limited search space. Although GGGP algorithms have been largely used in other contexts, they have not been deeply investigated in the generation of PSO algorithms. Thus, this work applies GGGP algorithms in the context of PSO algorithm design problem. Herein, we performed an experimental study comparing different GGGP approaches for the generation of PSO algorithms. The main goal is to perform a deep investigation aiming to identify pros and cons of each approach in the current task. In the experiments, a comparison between a tree-based GGGP approach and commonly used linear GGGP approaches for the generation of PSO algorithms was performed. The results showed that the tree-based GGGP produced better algorithms than the counterparts. We also compared the algorithms generated by the tree-based technique to state-of-the-art optimization algorithms, and it achieved competitive results.

Keywords: generation hyper-heuristics, grammar-guided genetic programming, algorithm design, particle swarm optimization