Hyper-heuristics: Raising the Level of Generality

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Abstract

Hyper-heuristics are easy-to-implement emerging search and optimisation strategies which have been used instead of meta-heuristics for providing higher level generalized structures to solve mainly combinatorial optimisation problems. The motivation behind them is generally expressed as *raising the level of generality.* That is, they are the answers to the following question: How can we create or design a system that can solve as many problems as possible? Actually, meta-heuristics have been proposed as higher level approaches other than problem specific algorithms, but, they do not have enough capability to cover the extended problem domain idea that is about solving problems from different problem domains efficiently as hyper-heuristics do. Extending application domains is achieved by adding a higher level that consists of a (meta-) heuristic onto a set of low-level (meta-) heuristics. This underlying mechanism generates a system which builds collaboration between the low-level heuristics via managing their strength and weaknesses in an efficient way by selecting the most appropriate heuristic at each optimisation step.

We will present a detailed hyper-heuristic survey. Within this context, available hyper-heuristic approaches with their internal structures and their application areas will be explained. Besides that, the performance of hyper-heuristics and the effect of using learning will be investigated. Finally, future research directions concerning hyper-heuristics will be discussed.

Keywords: Hyper-heuristics, Meta-heuristics, Combinatorial Optimisation