The Workflow Framework for Metaheuristic Search on Grid Environment

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Abstract: Metaheuristic is widely used in solving combinatorial optimization problems because it could find the solutions in acceptable computation time. However, the quality of the solutions depends on search space and search strategy. We could improve the results by widening the search space, and running with different strategies. Therefore, with more computing power supporting the search diversification, the solutions might get better. The research aims to develop a facility to support users in developing metaheuristic-based search applications on grid which certainly provides huge amount of computing resource.

However, when developing applications on grid environment, users meet many problems on grid programming models and application testing. To support the development of metaheuristic-based search applications on grid environment, we introduce a framework to help users define their search in workflow model. The workflow nodes are some basic metaheuristics provided by the framework, or user-defined metaheuristics. With the framework, users just focus on develop main components of a metaheuristic-based search algorithms. Furthermore, the framework has a sequential workflow to test and debug the implementation, and a parallel workflow to run large search on distributed systems, including grid.

Using this framework, we successfully deploy a sequential circuit optimization application on distributed environment. The process of integrating circuit optimization components into metaheuristic-based algorithms and combining them in a workflow is performed easily in the viewpoint of application developers. With the broadened search diversification in space and strategy, the experimental results on well-known test cases show much improvement on solution quality.

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