

Hybrid Metaheuristics for QoS-Aware Service Composition: A Systematic Mapping Study

ABSTRACT

With the advent of Service-Oriented Architecture (SOA), services can be registered, invoked, and combined by their identical Quality of Services (QoS) attributes to create a new value-added application that fulfils user requirements. Efficient QoS-aware service composition has been a challenging task in cloud computing. This challenge becomes more formidable in emerging resource-constrained computing paradigms, such as the Internet of Things and Fog. Service composition has regarded as a multi-objective combinatorial optimization problem that falls in the category of NP-hard. Historically, the proliferation of services added to problem complexity and navigated solutions from exact (none-heuristics) approaches to near-optimal heuristics and metaheuristics. Although metaheuristics have fulfilled some expectations, the quest for finding a high-quality, near-optimal solution has led researchers to devise hybrid methods. As a result, research on service composition shifts towards the hybridization of metaheuristics. Hybrid metaheuristics have been promising efforts to transcend the boundaries of metaheuristics by leveraging the strength of complementary methods to overcome base algorithm shortcomings. Despite the significance and frontier position of hybrid metaheuristics, to the best of our knowledge, there is no systematic research and survey in this field with a particular focus on strategies to hybridize traditional metaheuristics. This study's core contribution is to infer a framework for hybridization strategies by conducting a mapping study that analyses 71 papers between 2008 and 2020. Moreover, it provides a panoramic view of hybrid methods and their experiment setting in respect to the problem domain as the main outcome of this mapping study. Finally, research trends, directions and challenges are discussed to benefit future endeavors.