Scheduling resource-constrained projects with transportation constraints

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Abstract

In this paper, the traditional resource-constrained project scheduling problem (RCPSP) is extended with transportation constraints on the resources between activities. The assignment of resources problem and the routing scheduling problem (which involves the strategic (*i.e.*, assignment of resources) and tactical/operational (i.e., routing scheduling) decision levels in supply chain management) are interdependent problems. Assuming that the project structure (location, duration and demand of activities) is provided it is also considered that decisions are known at the strategic level of the transportation problem. The routing of resources from a production facility to another is achieved by a heterogeneous fleet of vehicles. To solve the scheduling resource-constrained project with transportation constraints, we take advantage of a flow network model. By starting with a flow structure for the RCPSP with an insertion algorithm, we can propose a giant trip representation for the routing problem. This approach falls into the indirect split resolution scheme and a new splitting algorithm is introduced to obtain the routing solution of the specific pickup and delivery problem (PDP) which can be extended to the dial-a-ride problem (DARP). To improve this solution a local search is defined on the flow structure. A new set of instances is introduced and numerical experiments prove the efficiency of the approach. This work is the first step to solve problems with more than one resource and to minimize several objectives simultaneously.

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