
An new bidding process for combinatorial transportation auctions

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Abstract

In horizontal collaborations, carriers form coalitions in order to perform parts of their logistics operations jointly. By exchanging transportation requests among each other, they can operate more efficiently and in a more sustainable way. This exchange of requests can be organized through combinatorial auctions, where collaborators submit requests for exchange to a common pool. The requests in the pool can be grouped into bundles either by the auctioneer or by the carriers themselves. While in the literature it is mostly assumed that bundling and bidding is done by the carriers, our computational study shows that bundles built by the auctioneer can yield significantly higher collaboration profits, while the number of traded bundles can be decreased. The gap in solution quality gets even more obvious, as the pool of offered requests is increased. However, even if the number of traded bundles is decreased by offering auctioneer bundles, the carriers have to give their bids for the offered bundles. Typically, a bid is based on the carrier's marginal profit, which is the difference of the profits including and excluding the bundle in the tour. Hence, for each bid, an NP-hard routing problem has to be solved. To decrease this enormous computational effort, we develop two approximate bidding strategies. Each of them is assessed in regard of solution quality and computational time. One of the strategies decreases the average computational time by 20%, while only little loss in solution quality can be observed.

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