Bid Construction Problems in collaborative transportation services procurement auctions

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This research project focuses on the integration of two concepts :
Centralization and reputation in combinatorial auctions for the procurement of the truckload (TL) services. Centralization is presented as a form of collaboration between shippers who submit their requests in the same centralized auction. Each carrier submits combinatorial bids that may cover contracts from different shippers. Reputation encompasses attributes other than price used to judge a participant.

The main objective of this research project is to design and evaluate a Mathematical Modeling and solution approaches for a main decisional problem inherent to the design of combinatorial auctions : the combinatorial bid construction problem solved by each carrier.

The first objective is to adapt existing approches to account for reputation by adjusting the profit generated by a new contract and the price offered in the bid with the information the carrier has on :

1) The shippers' past performance (the reliability)

2) And based on their past commitments

We consider a bid construction problem (BCP) where the carrier aims to maximize its profit by bidding on new auctioned contracts. We consider a combinatorial auction implying that a carrier can bid on a package of contracts in the same bid.

In addition to the set of contracts that it covers, a bid must include an asked price, which is the price that must be paid to the carrier for serving all the contracts of the bid, if the bid is won. A BCP must be solved by each carrier participating to the auction. The BCP consists in determining for each carrier the number of bids to submit, the contracts covered by each bid, and the associated asked price. The novelty in considering reputation and centralization is that, in the centralized market, the carrier can submit bids on different contracts requested by different shippers. In other words, it is permitted that one bid covers contracts belonging to different shippers and these shippers do not have the same reputation for the carrie.

There is a tradeoff to be managed by the carrier when solving the BCP : may be a combination of contracts is very interesting on the cost level (adding these contracts to the carrier's existing network does not yield a very large cost and then it would be able to propose a relatively low asked price and then increases its chances of winning this bid) but less interesting on the reputation level (not all the contracts covered by the bid are requested by shippers with a good reputation as evaluated by the carrier).

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