**Title**: Auctions for task and resource allocation in package delivery services.

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**Description**:  
This master thesis will study auction protocols as the basic means for coordination in a decentralized solution to the Pickup-and-Delivery Problem (PDP).

**Context/Goal/Details**:  
Many large-scale optimization problems are more and more being studied as distributed problems - the large scale of the problems and the constant dynamics in the problem domain make centralized solutions infeasible. Such problems include vehicle routing problems, traffic management, manufacturing control, pickup-and-delivery problems. Multi-agent systems provide concepts and mechanisms that can support building decentralized solutions. Agents represent distributed, autonomous entities, which need to cooperate in order to obtain the system objectives.

The work in this master thesis will focus on the pickup-and-delivery problem [5], for which a simulation environment is available [4] (for a preview, see [distrinet.cs.kuleuven.be/software/agentwise/mas-discosim/]). One strategy to manage the complex interactions between the agents (e.g. for task allocation and traffic management) is to use market-based mechanisms, in particular auctions. Auctions are well-known from on-line sales (using so-called 'English auctions'), yet their potential reaches far beyond this application.

This master thesis will study a variety of auction mechanisms (including single-good and multiunit auctions, and combinatorial auctions, see [1,2]) and will propose various ways on how particular mechanisms could be used to solve a PDP in a distributed fashion. Two solutions will be selected for further implementation and evaluation in the MAS-DisCoSim simulation environment. Results will be compared with other known solutions (e.g. based on 'delegate MAS' [3]).

**Literature study**: 25%  
**Design/implementation**: 45%  
**Simulation experiments/evaluation**: 30%

**References**


Remark

We are looking for motivated students with a good knowledge of object-oriented design and programming (Java). Having knowledge of MAS is not strictly mandatory. If you are interested in this thesis, we invite you to contact us for an informal chat on the subject.