

Models and Algorithms for Vehicle Routing Problems with Pickups and Deliveries

The simplest routing problem, but still quite challenging, is the Travelling Salesman Problem (TSP). It can be seen as the problem of finding the route for a single uncapacitated vehicle that must collect a product from each customer to close a routing delivering all the material in a depot. We revise several standard mathematical formulations including some based on flow variables. Another related problem of special interest is the "TSP with Precedence Constraints", which consists in finding a route for a single uncapacitated vehicle that moves commodities from sources to destinations. We will see how to adapt some TSP formulations to this variant. A further step appears when the vehicle is capacitated, in which case we face the TSP with Pickups and Deliveries. We will address several variants depending whether there is one or several commodities, and whether each commodity has a one or several sources and/or destinations. A different interesting step appears when considering several vehicles instead of a single one. The simplest case is the so-called Multiple TSP which occurs when the vehicles are uncapacitated. The well-known Vehicle Routing Problem (VRP) is the variant where the vehicles are capacitated, and it is still a pickup-and-delivery problem since the vehicles move a commodity from customers to the depot. We will analyse classical formulations for the VRP, but also some new and interesting ones. We will end with variants addressing several commodities in line of the so-called Dial-a-Ride Problems.

References:

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