Routing problems in maritime logistics

Truls Flatberg
SINTEF ICT, Department of Applied Mathematics
Truls.Flatberg@sintef.no

Maritime logistics is a rich source of new routing problems with variations and extensions to the classical routing problems. In the first part of the talk we will highlight two variations of the pickup and delivery problem (PDP) that arise in maritime transportation problems. The first variation is a PDP where pickups and deliveries are independent, i.e. a pickup can be counterpart to any matching delivery. These problems can arise in a spot market where the transporter buys product from different suppliers and sells it to consumers. The second variation involves PDPs with a set of pickup and delivery ports. For each port it is specified a minimum and maximum number of visits. The problem is to find a set of routes of minium cost that alternates between visits at pickup and delivery ports, with the number of visits being in the given interval. This problem can be seen as a simplified version of the Inventory Routing Problem, especially if we consider the generalization to multiple periods.

In the second part we will give a presentation of a general software library to solve maritime routing problems including the above mentioned problems as special cases. The library solves problem involving pickup and delivery orders in combination with inventory routing. In addition we handle a rich set of problem extensions including tank allocation and tank cleaning, and contractual requirements with volume limit constraints and destination restrictions. We present an overview of a construction algorithm used to solve the problem, and its combination with a guiding heuristic based on a genetic algorithm.

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