Séminaire du CIRRELT

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«Annual planning of harvesting resource »

Abstract

The Forest Research Institute of Sweden has together with the forest company SCA developed an annual planning tool for harvesting planning. The planning is based on solving an optimization model. The input data to the model is a detailed description of all the aspects of the annual planning. The description for harvest teams includes home base, maximum travel distance, and target values for thinning and final felling operations. For each machine, we have information on machine type (harvester, forwarder or harwarder), machine size (small, medium, large and very large), hourly operational price, available working hours and connection to a harvest team. For each harvest area, we have information on ownership, average tree diameter, forwarding distance, volume and possible harvest periods. We use performance functions describing how much time each machine requires to harvest or forward each harvest area. We also have information on distances between harvest areas so we can compute moving costs, and between home bases and harvest areas to compute daily traveling costs. There are also a set of specific parameters to compute detailed costs and resource usage.

The objective of the optimization model is to minimize the total cost while harvesting all harvest areas. The total cost is based on three parts; production cost, traveling cost and moving cost. The production cost is the cost for the harvesting and the forwarding. The travelling cost is the cost for driving back and forward (daily) to the harvest area from the home base. Moving cost is associated with moving the machines and equipment between harvest areas. In the modeling we also include a penalty cost in case the harvesting or forwarding capacity is not enough for all harvest areas.

The problem is an integrated allocation and routing problem. We have developed a solution approach which solves the problem in two phases. In the first phase we make an allocation between machines and harvest areas. In this part we include production and travelling costs but not the moving cost. In the second phase we make a routing of the harvest areas assigned to each harvest team. In order to have a connection between the models we include an approximate moving which measures the geographical spread of the harvest areas in the first phase. We have tested the software on a case comprising of about 1,000 harvest areas and 25 harvest teams (50 machines). Typical solution times are within ten minutes.

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Bienvenue à tous
et à toutes!

Professeur hôte:
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