When feasibility of routes is difficult to determine: an example from maritime bulk shipping

Lars Magnus Hvattum

Department of Industrial Economics and Technology Management
The Norwegian University of Science and Technology, Trondheim, Norway
`lars.m.hvattum@iot.ntnu.no`

In maritime bulk shipping, the major decision is to plan vessel routes in order to service requests for the transportation of bulk cargos. However, in many real world applications, the subproblem of deciding whether a given vessel route is feasible with respect to stowage is of importance. There are various constraints that could possibly render a route infeasible, such as the physical capacity of the tanks onboard the vessel, specific regulations for transportation of hazardous materials, or requirements for the stability and strength of the vessel. A mixed integer programming model is formulated for this problem, and it can be shown that the problem is NP-hard even when some of the suggested constraints are relaxed.

Even though it is computationally intractable to determining whether a given route is feasible, this problem must potentially be solved repeatedly when designing the vessel routes. A study is presented in order to determine whether standard MIP-solvers can be used to this end, and specially tailored heuristics are discussed as an alternative.

(Joint work with Kjetil Fagerholt and Vinícius Amaral Armentano.)