# Computing Sea Routes for Ships

**A. Hall[1], E. Köhler[2], H. Schilling[3], and A. Telle[4]**

**Abstract:** We discuss the problem of computing routes for ships. Depending on the weather situation and the sea state we try to find a route that minimizes the fuel consumption of a ship. Additionally, parameters such as the rolling angle of a ship have to be kept below a given bound on the route to be computed.

We distinguish two scenarios: the common routing and the disaster scenario. In the first case, there is a fixed point in time up to which the destination has to be reached. In the case of a ship disaster, we have to solve the problem of reaching the nearest refuge in the shortest possible time and coping with limited manoeuvring capabilities.

To solve the problem, we suggest a discretized network which models turning possibilities of ships on the sea. In this network, nodes are associated with costs. The costs vary with the turning angle and the following three parameters: wave height, wave period, wave direction. These parameters are time-dependent and can be derived from the weather forecast. Obviously, the forecast is less reliable when the point in time to which it refers is further away in the future.

We present routing algorithms for this dynamic network setting. The algorithms will be part of a weather and sea routing advice decision support system for ships.

[1] Institut für Theoretische Informatik
Eidgenössische Technische Hochschule Zürich
ETH Zentrum, CAB H 39.2, CH - 8092 Zürich, Switzerland
*alex.hall@gmail.com*

[2] Institut für Mathematik
Brandenburgische Technische Universität Cottbus
Lehrstuhl für Mathematische Grundlagen der Informatik
Postfach 10 13 44, D - 03013 Cottbus, Germany
*ekoehler@math.tu-cottbus.de*

[3,4] Institut für Mathematik
Technische Universität Berlin
Sekr. MA 6-1, Straße des 17. Juni 136, D - 10623 Berlin, Germany
*schillin@math.tu-berlin.de, telle@math.tu-berlin.de*