Simulation model to improve safety and efficiency of port traffic

May 3 2011

TU Delft in the Netherlands is set to conduct a joint research project with the Jiaotong University in Shanghai. Their aim will be to develop a traffic model for shipping in congested port areas. It is hoped that the model will provide increased understanding of the ports' capacity and safety.

There is a growing need for a model that can effectively simulate the traffic in ports. This is because ships are increasing in size and travelling faster and congestion is becoming a growing problem in the ports. Prof. Han Ligteringen: 'More efficient processing of the traffic flow can help improve the capacity of the ports. In addition, the model will also increase our understanding of port safety. The issue of safety is growing in importance because of the increasing threat of collisions between ships, caused in part by the increased congestion and its effects on both the environment and the local area.'

'Traffic modelling for ports remains relatively uncharted territory', explains Ligteringen. 'The simulation models that do exist do not accurately describe interactions between ships. They also fail to correctly predict the course variations of individual ships caused by human factors and changing external conditions, such as fog and wind. In terms of safety (and preventing collisions), it is extremely important to take account of the human factor.'

In the development of the 'port model', the researchers will take advantage of previous experience acquired at TU Delft with models that

simulate normal traffic, for example for flows of pedestrians. This is an area in which Dr Winnie Daamen already specialises. 'Although their method of propulsion is completely different, just like pedestrians ships have a great deal of flexibility in terms of the route they can select and how they interact with other ships.' In addition, research at TU Delft and the MARIN research institute has shown that detailed data from the ships' on-board Automatic Identification System (AIS) is ideal for studying the navigation of ships under varying conditions.

By using an innovative approach based on game theory, it will soon be possible to accurately predict the behaviour of individual ships and their interactions under varying conditions (wind, waves, current, visibility), according to the researchers at TU Delft. The cooperation between the Dutch and Chinese will also make it possible for the practical application of the model to be extensively tested using data both from the port of Rotterdam and from the port of Shanghai.

The joint project is part of a programme coordinated by the Netherlands Organisation for Scientific Research (NWO) and its Chinese counterpart the NSFC (National Natural Science Foundation of China) to promote international cooperation between researchers. The research will be conducted by the School of Naval Architecture, Ocean and Civil Engineering in Jiaotong and TU Delft's Faculty of Civil Engineering & Geosciences.

Provided by Delft University of Technology