HSSC2-INF5

A 3-D Nautical GIS (summary of presentation)

Presentation at the IHO HSSC meeting in Rostock 28th October 2010 by Dr Thomas Porathe, MNI, assistant professor in information design at Mälardalen University, Sweden, and researcher at the maritime human factors group at Chalmers Technical University in Gothenburg, Dep. of Shipping and Maritime Technology.

The talk presents research conducted since 2001 on a new way of displaying navigational chart information: a 3D, egocentric view (see Figure 1).

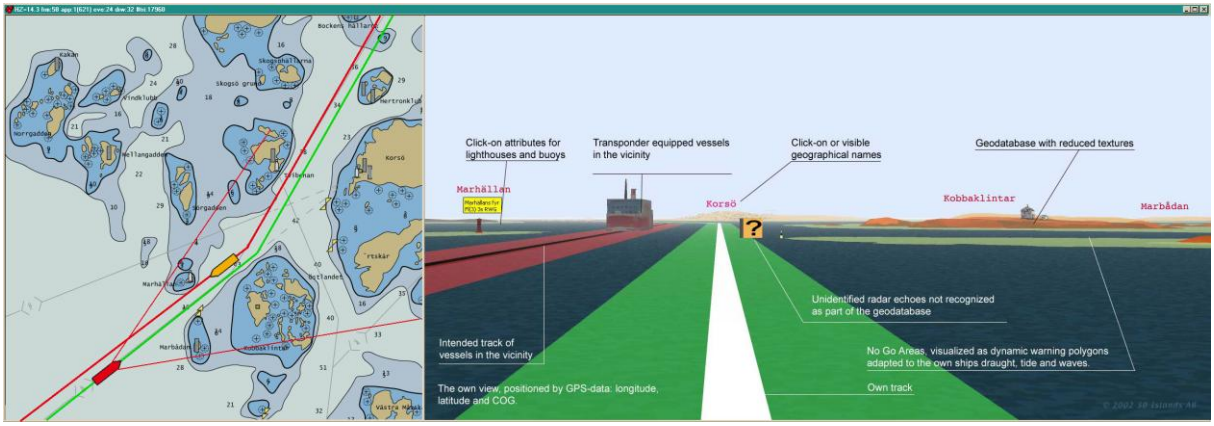

Figure 1. The entrance to Mariehamn on the Aland archipelago in the Baltic Sea. Left, the traditional north-up exocentric view and right, the 3D, egocentric view.

Problem

In this research a type of accidents at sea characterized by a sudden breakdown of situation awareness has been identified. The Exxon Valdez, accident 1989, the Norwegian high speed ferry Sleipner, 1999 and the Cosco Busans accident 2007 are used as examples.

The question was if navigational information could be presented in a more intuitive and unambiguous way that would facilitate decision making in stressful situations, as requested by SOLAS, chapter V/15. The hypothesis was that the cognitively demanding mental rotations could be a problem. Means of cognitive off-loading thus became the focus of the research.

Research

In a laboratory experiment using north-up, head-up and exocentric 3D maps were compared in a demanding navigational task. The results clearly showed faster decision making and fewer errors with the 3D type map.

Prototype development

Several prototypes have been developed during this project. Three kinds of cognitively off-loading features are suggested: a) the exocentric view, removing the need for mental rotations, b) the dynamic NoGo areas, showing NoGo areas for own ship continuously updated for tidal level, draught, squat, heave etc. and c) seaways, traffic separation in all fairways, showing lanes (like on the road) and also own track and other vessels intended track.

Features of the 3D chart are presently part of two EU projects (EfficenSea and BLAST). In the BLAST project a prototype of Zeebrugge in Belgien will be tested and evaluated both at sea and in simulator during the spring 2011. Both these project are to feed information into the IMO/IALA e-Navigation process.

Significance for IHO

The intention of the 3D egocentric view is to serve as a tactical conning display spanning into the next 10-15 minutes, and to be a complement to the traditional exocentric, north-up ECDIS. The vision is that both display types should be available from the same ENC database. To make this possible certain new types of data will have to be allowed into the ENC database in standardized format (e.g. topographic over-water data, 3D models of buildings).

The objective of this presentation is to inform IHO of ongoing research and possible benefits and problems of a 3D, egocentric view nautical chart.