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Autonomous ships are guided safely across the sea by day and night

INNOVATIVE SOLUTIONS FOR
AUTONOMOUS SHIPPING

Autonomous Navigation System

The Autonomous Navigation System (ANS) is designed to provide ship navigators with all information needed to safely and efficiently guide a ship across the ocean. Its core idea is to combine information from various sources into one holistic system to make autonomous ship navigation possible. By integrating assistance modules for weather routing, storm navigation and collision avoidance, the ANS is capable to relieve navigators from watchkeeping tasks with optimized results. Also, one multi-touch screen enables the access to all relevant data for ship navigation, to directly command the ship and also to define the threshold values in which the autonomous assistance modules are operating. The system consists of the following three modules:

Harsh Weather Controller

Should the ship navigate in a storm, huge stresses are induced by environmental forces such as wind and waves. These can lead to severe damages of ship and cargo. Based on the route of the ship, the present meteorological conditions and the ship's motion, the harsh weather controller continuously determines the ship stability status. Should a critical limit be reached, the system will take control of the ship. By changing the course or speed, risks of parametric rolling, surf-riding and broaching can be avoided.

Strategic Weather Routing
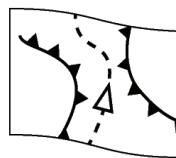
To draft a ship's route from one pilot point to another, a navigator has many factors to account for. Above all, the route needs to be safe, but also the expected travel time matters. The strategic weather routing optimizes this given route with regards to fuel consumption. Based on meteorological forecasts for wind, waves and current as well as the ship's specific characteristics, a tailor-made route is calculated. This route consists of a number of waypoints with an individual speed profile for every route segment. This decreases operational expenses and increases the ship's safety.

Collision Avoidance Controller
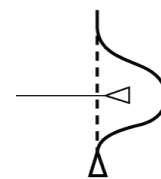
On the open sea, a ship experiences encounter situations with other ships. The collision avoidance controller automatically determines the obligations between the ships in the area according to COLREG rules. The nautical officer defines the threshold values for the system. If a collision risk exists with another ship, the collision avoidance controller will take action. A deviation course is autonomously calculated and executed by the system. Afterwards, the ship returns to its original track.

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Shore control enables permanent supervision and interaction capabilities
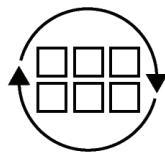
Shore Control System

The Shore Control System (SCS) is designed to provide a shore control operator with all information a mariner needs to monitor and to control a fleet of up to six ships from land. This shore-based supervisory entity displays ship information, both on a highly aggregated level and in detail. This enables the watchkeeper to easily understand where the ships are and what situations they are navigating in. The shore control operator is able to edit voyage plans, command new courses and speeds and directly control the ships' rudders and engines. The following six user interfaces enable these functionalities:

Chart Overview

This tool is necessary for ship navigation. The position and course are shown on an electronic sea chart along with further information such as other ship traffic in the area. Additionally, it is possible to control the ship by changing the course and the speed.

Ship Indicator

The human operator is able to monitor and control more than one ship at the same time. At a glance, the ship indicator provides the shore control operator a high-level overview about the present state and condition of the supervised fleet.

Harsh Weather Controller

When a ship is navigating in a storm, extreme forces act on it. To prevent damage from the ship and its cargo, the harsh weather controller will command a new course or speed to reduce the weather impact.
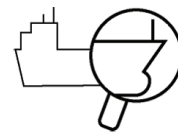
Conning Console

The conning is a primary tool for ship control and remote navigation. Here, the operator can directly command the ship's course, rudder and engine. It also combines information about the ship as well as about the route and the environmental conditions.

Functional Area Analyzer

On the object detection screen all relevant information about ship traffic and other targets in the sea area are displayed. The navigation screen is used for decision-support in collision avoidance maneuvers. The voyage screen helps to find a new route for the ship.

Timeline Overview & Operational Profile Editing Scheme
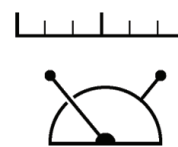
The autonomous ship follows a previously set voyage plan. In this screen, a navigator can find information about the route, and what is scheduled ahead for the ship. Also, the operational limits in which the autonomous ship is allowed to navigate can be set.