Osaka University, Graduate School of Engineering, Dept of Naval Architecture and Ocean Engineering

SHIP DESIGN SUB AREA

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Safety of Ships at Sea

Development of Advanced Marine Traffic System

Tokyo Bay and Osaka Bay are known as prominent congested ports. In such congested area, the intelligent ship which avoids automatically dangerous situations, such as collision and grounding, is investigated and risk level of such accidents is evaluated by the marine traffic simulator. To develop more advanced marine traffic system, mathematical modeling of ship special manoeuvre and automatic berthing system using a neural network is developed.
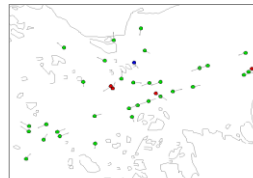

Impact evaluation of the second runway of Haneda to ongoing ships

Collision accident which leads to serious sea pollution

**Development of automatic berthing system**

Collision risk assessment at Singapore Straits

Assessment of Stability in Waves

At International Maritime Organization (IMO), physics-based intact stability criteria are now under development. Their drafts are proposed by using capsizing probability, optimal control theory and nonlinear dynamics etc. Model experiments or numerical tests are conducted to measure hydrodynamic forces and ship motions, and safety level of ships at sea is assessed.
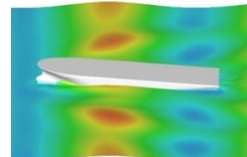

Direct safety assessment by free running model experiment
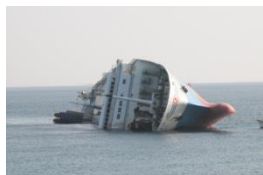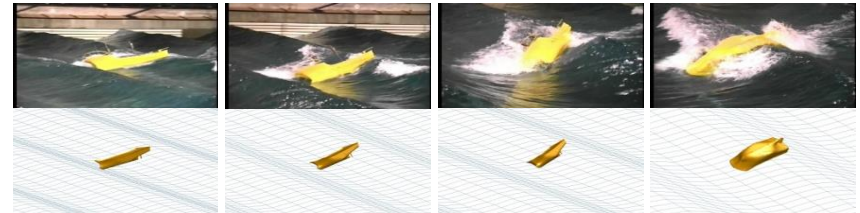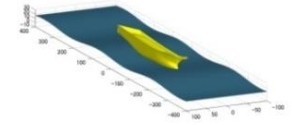

Intact stability accident of RoPax ship

Captive mode test in towing tank

Estimation of hydrodynamic forces by CFD

Numerical Prediction of Extreme Ship Motions

Numerical model as a first principle tool is developed for predicting nonlinear ship motions in waves and hull form effects on ship motions are investigated using such numerical modelling.

Comparison of capsizing due to broaching between experiment and numerical simulation

Towards Energy Saving for Reducing GHG Emission from Ships

Reduction of green house gas emission from ships are one of crucial issues in maritime industry. For this purpose, under the support of Japanese government and Class NK, we are executing the following research projects.

1. Application of real-time optimal control theory to CPP and RPM control system in waves.
2. Experimental research for developing IMO guidelines of minimum power requirements under adverse weather.

Bulk carrier model fail to keep her speed and course under adverse weather

Investigation on Next-generation Vessels

We also contribute to the international competition of ship designing technology by investigating new generation ship types such as a wave-piercing tumblehome vessel and a high-speed trimaran (multi-hull ship).a

Trimaran

Wave-piercing tumblehome vessel

We are tackling the latest researches for preventing accidents which could result in sea pollution or human life loss!