Guest Editorial: Special Issue on Maritime Transport

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Guest Editorial

Special Issue on Maritime Transport

Maritime transport is an important industry sector that is responsible for the carriage of around 90% of the total volume of world trade. It also includes the transport of people, offshore service vessels, and naval ships. The maritime industry is currently experiencing significant changes, influenced by both regulatory and technological developments. Some important current trends in maritime transportation are related to digitalization, decarbonization, and automation. This Special Issue addresses engineering challenges related to maritime transport, as well as other technical, economic, regulatory, and societal issues relevant to shipping. Scientists, engineers, and policymakers were invited to contribute with original research papers or reviews on different aspects of maritime transportation. Participants of the DNV NMU 2024 workshop were encouraged to submit their research to this Special Issue, but other relevant papers were solicited if they addressed the theme.

There is a wide range of papers included in this special issue dealing with emerging advances and challenges and dealing with maritime transport. Some of the topics addressed are related to safety, control, efficiency, economy, performance, fuels, batteries, emissions, data-driven models, and enabling algorithms. A very brief outline on the 13 papers in this Special Issue:

(1) The work by Bakdi and Vanem studies the integration of algorithmic rules into maritime autonomous surface ships that aid in decision-making, complexity analysis, and conflict resolution in dynamic multivessel scenarios, while addressing both safety and regulatory compliance.
(2) Eftekhar and co-authors describe a deep neural network model, trained on strip-theory data, for estimating wave-added resistance that predicts ship performance, including propulsion power and biofouling, using basic ship parameters.
(3) Eide and co-authors present a study on "milliAmpere2," an autonomous urban passenger ferry where they highlight its design, testing, and outcomes during a public trial, challenges for future research in human–autonomy interaction, fleet management, and safety in urban waterways.
(4) Grindheim and co-authors discuss data-driven deep learning models for predicting the state of health (SoH) of lithium-ion batteries in maritime systems and suggest that binning with ridge regression models can provide good SoH prediction performance.
(5) The work by Jaramillo Jimenez and co-authors discusses barriers to adopting data analytics for improving energy efficiency in the maritime industry, revealing various obstacles, including inadequate data governance and complex supplier contracts.
(6) Jiang and co-authors propose the use of a cooperative consensus control algorithm for multiple unmanned dynamic positioning tugboats to transport an unactuated floating structure, using a leader-follower strategy to enhance performance under variable environmental conditions.
(7) Liang and co-authors describe a greenhouse gas emission reduction strategy, toward net-zero shipping, that uses a hybrid model combining physics-based and expert-augmented neural networks for enhanced fuel consumption prediction and improved operational efficiency.
(8) Nitonye and co-authors review the digitalization of anchor hanging tug supply vessels in the offshore industry, highlighting enhanced operational efficiency, safety, and resilience, and benefits of their integration especially in harsh environments.
(9) Using an interesting case study, Ringsberg and co-authors outline a method for assessing the structural integrity and estimating the service life of dynamic subsea power cables, considering factors like fatigue, fretting, wear, and water treeing.
(10) The work by Schwartz and co-authors highlights why the shipping sector must reduce emissions and move with a transition to carbon-neutral fuels, as future competitiveness may leave fossil fuel-powered ships at risk of becoming stranded assets.
(11) Tassew and co-authors evaluate the technical and economic requirements of electrofuel production for shipping using green hydrogen and CO_2, and highlight several benefits of electrofuels especially in cost competitiveness.
(12) Regarding risers, Vaillant and co-authors dimension-reduction methods for the solution of the complex fatigue analysis of flexible pipes in bimodal seas with significantly reduced computational costs are compared to traditional Monte Carlo simulation.
(13) Zhu and co-authors propose a conditional variational auto-encoder approach for ship trajectory forecasting in dynamic, multimodal encounters, utilizing a shared recurrent neural network with validation against real-world data.

We believe that this Special Issue is timely and serves to highlight recent developments in the maritime transport sector while providing readers with access to important advances being made in academia and industry at this time.

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