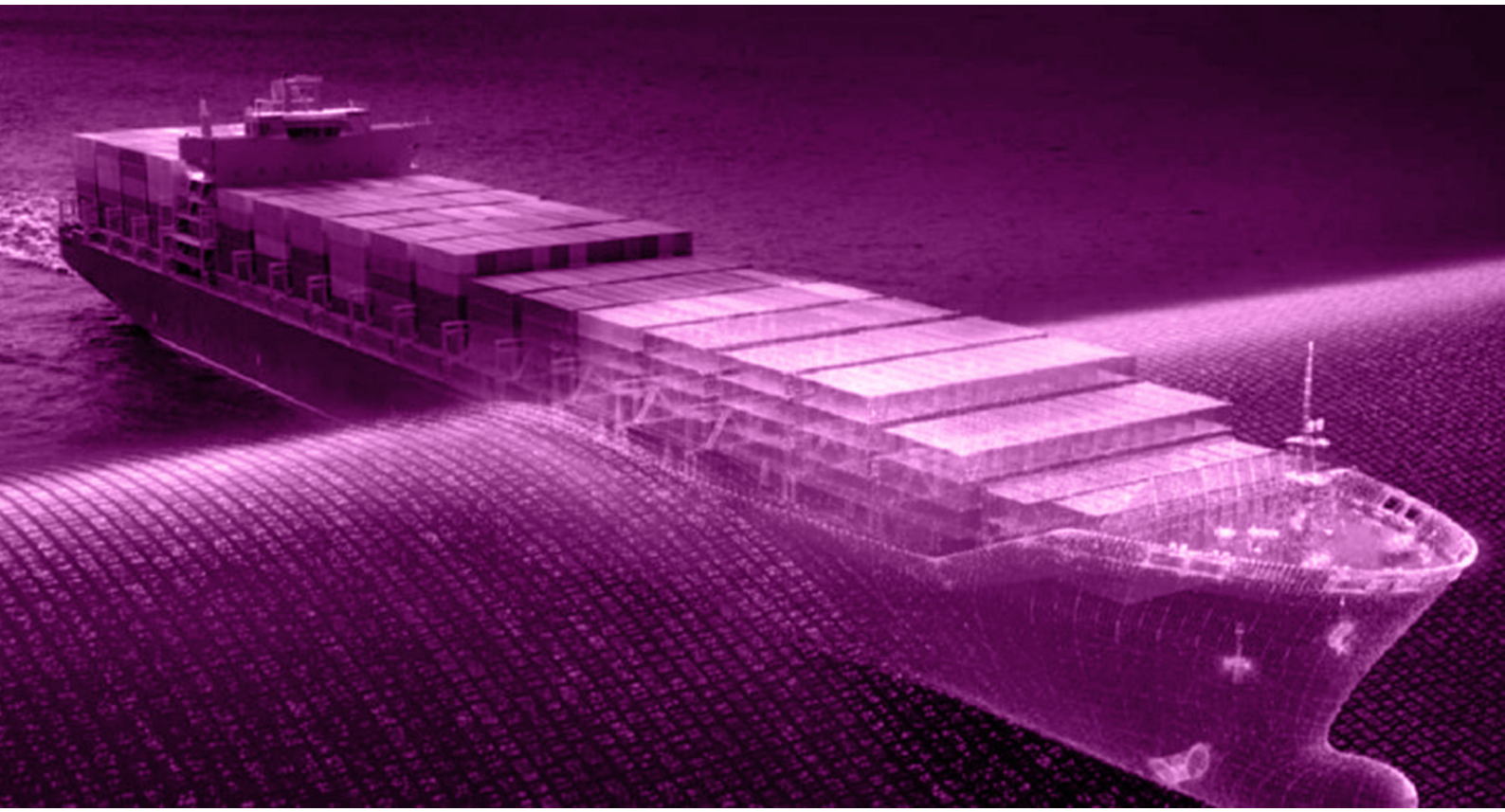
The Royal Institution of Naval Architects

Marine Industry 4.0

5th November 2019, Rotterdam, Netherlands



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Marine Industry 4.0

5th November 2019, Rotterdam, the Netherlands

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Practical guide for adopting industry 4.0 in cad systems

J. A. Muñoz and R. Perez Fernandez, SENER, Spain

Technologies are evolving faster than our ability to assimilate what we can do with them, but the potential is clear and the opportunity will be for those who identifies the right application of each technology. In the information era, we are literally swimming in an ocean of structured and not structured data and thanks to the evolution in the communications technologies, all that data are available everywhere for everyone. But data is not information. It is necessary to have the capability to analyse, extract conclusions and learn from it. Technologies as Big Data (BD) and the Artificial Intelligence (AI) are crucial for this purpose, but the intention of the treatment matters. Imagine how these technologies shall allow to engage the ship design by applying rules which will facilitate the design significantly, how the integration of the validation of the structural models by the Classification Societies will be linked directly by cloud applications. Imagine all the benefits of this two simple examples that can be implemented thanks to the potential of these technologies. The concepts that are absolutely clear from now to the future in shipbuilding is the use of Data Centric model and the concept of Digital Twin, a real and effective synchronization between what we design, what we construct, by covering the complete life cycle of the product thanks to technologies like IoT. It is important to understand how the new generations are immersed in a technological world in constant and rapid evolution. The way they interacts with this ecosystem will determine the way we should define the new rules of the CAD/CAM/CIM Systems. This paper examines different selected solutions describing practical use cases in ship design phase as an example of what IoT, BD or AI will represent for ship design and shipbuilding in the near future.

Living on the Edge - a New Paradigm for Remote Monitoring of Vessels and Marine Equipment

K. Rau, Flicq Inc, USA

Ideally, vessel health and equipment condition monitoring should be a round the clock activity and wireless sensors have the potential to enable this. However, conventional control systems and digital technologies require transmitting vast amounts of data to the cloud for analysis, resulting in high wireless communications costs and high latency. Applying edge computing technology to remote monitoring results in reduction of bandwidth utilization by 90% which results in significant cost savings. In addition, the ability of the vessels to autonomously monitor themselves without a constant link to the cloud allows the crew to handle issues more expeditiously.

One sea - on the road towards an autonomous maritime transport system

P. Haikkola and J. Merenluoto, One Sea / DIMECC, Finland

Increased automation in the form of remote-controlled and partially autonomous operations are being tested around the world. This development is expected to create safer, more efficient, sustainable, and reliable maritime logistics chains that will enable more efficient ways of transport globally. Much of the digital transformation is happening in ecosystems. The maritime transformation and development are also collaborative efforts, as no single entity can make the transformation by themselves. One Sea is the leading industrial alliance in maritime autonomy that seeks to enable an autonomous maritime ecosystem by 2025. The alliance, founded in 2016, gathers together globally leading maritime actors, from equipment manufactures to ship owners and ICT companies. The paper introduces One Sea and its activities and the steps towards safe autonomous and remote-controlled maritime operations. It also addresses the recent achievements and practical examples of what One Sea partner companies have done in maritime autonomy.

The Challenges and Opportunities for Developing Digital Twins to Support Maritime Operations

S. Willmore, G. Mercer and J. Rigby, BMT, UK

The concept of Digital Twins provides a conceptual way of improving the through life support of Marine platforms. The collation of machinery information through connected smart sensors and connectivity ashore enables advanced data analytics providing insights into the causes and trends for platform or fleet performance. The opportunities are vast however, the challenges are also considerable. Increased sensor connectivity similar to the Internet of Things can lead to considerable cyber security concerns, and the amount of information available will need to be presented to the user in a suitable but succinct manner possibly using visualisation technology. How this vision is brought together alongside legacy processes, tools and data centres is non-trivial but modern solutions and approaches make a Digital Twin possible.

Classifying bow entry events of wave piercing catamarans in random waves using unsupervised and supervised techniques

B. Shabani, J. Lavroff, D. S. Holloway, University of Tasmania, Australia,

S. Penev, UNSW Sydney, Australia

D. Dessi, Italian National Research Council, Italy

G Thomas, University College London, UK

An onboard monitoring system can measure features such as stress cycles counts and provide warnings due to slamming. Considering current technology trends there is the opportunity of incorporating machine learning methods into monitoring systems. A hull monitoring system has been developed and installed on a 111 m wave piercing catamaran (Hull 091) to remotely monitor the ship kinematics and hull structural responses. Parallel to that, an existing dataset of a geometrically similar vessel (Hull 061) was analysed using unsupervised and supervised learning models; these were found to be beneficial for the classification of bow entry events according to the kinematic parameters. A comparison of different algorithms including linear support vector machines, naïve Bayes and decision tree for the bow entry classification were conducted. In addition, using empirical probability distributions, the likelihood of wet-deck slamming was estimated given vertical bow acceleration thresholds.

Aero-triangulation and Photogrammetry in Sensible Infrastructures – How the Industry benefits from low-cost 3D Modelling conducted by Unmanned Aerial Vehicles (UAV)

M Stein, Hapag Lloyd Centre of Shipping and Global Logistics, Germany

Given recent technological advances, small size UAV provide a suitable mean for accurate 3D modelling of sensible (maritime) infrastructures. Such models provide a valuable source of information in general port safety and security planning as well as emergency response operations. This aspect is particularly crucial as ports belong to a nation's critical infrastructure, where its multiple supply chains and hinterland connections are sensitive to disruptions of any kind. Dealing with a rising number of disrupting externalities and increasing occupancy rates, ports have a constant need for affordable technological innovations with regard to risk management. Based on practical experiments, this paper reveals the possibility of generating realistic 3D models on the example of port facilities. It further reveals that initial states of a 3D model can be generated in a short timeframe, providing a valuable quick-response information source for first responder in emergency scenarios.

Use of big data for enhancing safety and efficiency of cruise ship operations

Karan Bhawsinka and Craig Eveland, CSMART, the Netherlands

As part of a series of safety enhancements since 2010 Carnival Corporation implemented a cloud based big data infrastructure (called Project Neptune) enabling advanced fleet wide analysis to be conducted for the first time. Every day Neptune collects and stores more than 100 million signals from the fleet. This paper focuses on vessel operations; explaining how the data is used to help mitigate risk during vessel maneuvers into and out of port. It highlights how the insights from this analysis are integrated into a holistic approach to safety; working alongside subject matter experts from the industry, Fleet Operation Centers (FOCs), cruise ship captains, local port authority & pilots and simulator instructors. It further explains how this is part of a wider company philosophy to leverage data; enhancing compliance culture, encouraging consistent standards and increasing transparency. Additionally, the paper describes the following uses of collected nautical data:

- •Wind data analysis: Recorded wind data can be analyzed to generate wind statistics and to model wind patterns between pilot station and berth. Hourly, monthly or daily wind variations can be captured.
- • Pilotage plans: Data driven pilotage plans can be created which can be shared between ships, pilots, VTS, FOCs and bridge simulators. This will result in streamlining of simulator training, real operations and monitoring.
- • Evidence based training: Simulator exercises can be created directly from the recorded data (including weather, targets etc) and training needs can be adjusted based on identified trends.
- • Incident investigation: An incident can be instantaneously replayed on simulators and different risk mitigation strategies can be tested. Data driven incident reports can be immediately generated for management.
- • Dynamic UKC analysis: Recorded data can be used for generating realistic prediction tools for dynamic UKC. Ship and port specific UKC models can be developed.

As the broad theme of this paper is 'Cruising with big data', it directly addresses the theme of the conference - 'Marine Industry 4.0'. This paper would be interesting for the conference because it will demonstrate how Carnival Corporation is using recorded nautical big data for making data driven enhancements to port operations.

Future Workforce and Training in the Fourth Maritime Revolution

R. Westgarth and S. Harmer, BMT, UK

The fourth Maritime Industrial Revolution is driven by emerging and disruptive technologies. The key drivers for the coming decade are expected to be digitalization and decarbonisation. They offer opportunities for the maritime industry to become safer and more efficient while at the same time reducing its environmental footprint. This will create an innovative trading ecosystem, linking related aspects such as the Digital Economy, Future Cities and new trading systems such as Blockchain.The future workforce will need to adapt to this changing work environment, with changing working attitudes and new skills brought about by new technological and demographical changes. New roles and jobs will be created shifting the focus of human resources to enable increased efficiency and throughput. With an increased use of Artificial Intelligence and Robotic systems comes an increased emphasis on the role of human-machine collaboration; asking questions about how information can be fed back to the human user and how the system can be assured to ensure user trust in the Artificial Intelligence. New skills will require new forms of training to keep up with the high speed of change. Training that can be delivered digitally and remotely whilst still maintaining the connection and role models of one to one training. Technology can be amazing, it can be game-changing, but technologies on their own do nothing. It is the combination of people and technology that makes things happen, whether in an organisation, a city or the entire maritime sector.

International Conference

Marine Industry 4.0
5th November 2019, Rotterdam, the Netherlands

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VENUE
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Following the end of the day (27/03/19), delegates are invited to attend an afternoon drinks reception at the conference venue.

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