SESSION: Innovation and development

MARS Themes:

Innovation and development

Oceans and marine ecosystems under global change

Title:

The classification of multi-impact events by the application of inverse methods and machine learning

Author(s):

C. C. van der Spuy[1]

A. Bekker[1]

Affiliation: add rows below for more affiliations

1. Stellenbosch University, Department of Mechanical and Mechatronic Engineering

Abstract:

As maritime transportation in ice-covered seas is projected to rise in coming decades, the demand for efficient and safe shipping in Arctic regions has become increasingly crucial. During the navigation of Polar regions, ice impacts on ship propellers pose a significant threat to propulsion mechanisms as these impacts may cause extreme loads on machinery which can result in fatigue and the failure of critical components. As such, progressive research is aimed at identifying and classifying the ice-loads experienced by propellers to improve upon current design regulations. In the case of ships featuring elongated propeller shafts, measuring the ice-loads directly at the propeller blades becomes challenging due to destructive ice impacts on sensors. Consequently, alternative methods are employed where indirect measurements are taken along the inboard section of the propulsion shaft, and inverse models are utilized to estimate the loads on the propeller blades. Furthermore, advancements in signal processing and machine learning now offer a promising avenue for tackling this issue more effectively. This project explores the development of an automated system for identifying and classifying multi-impact propeller loads by utilizing machine learning techniques. These techniques are developed and validated against current inverse models to assess their accuracy and real-life applicability. The application of advanced measurement techniques and machine learning methodologies holds significant promise for enhancing our understanding of propeller-ice interactions, enabling more precise design regulations and the efficient monitoring of propulsion systems in ice-covered maritime environments.

Format:

Oral presentation

Keywords: (add ; between keywords)

Propeller; Inverse mathematical methods; Machine learning; Impact classification