DIGITAL TWINS AND DATA ASSIMILATION FOR MARINE ENGINEERING

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ABSTRACT

Digital twins are virtual models that progressively adapt and specialize by learning from data from real counterparts, that could be either natural or human developed systems. The popularity of the concept of digital twin is sensitively growing across different domains and a variety of definitions have been adopted across science and engineering communities. This Invited Session relies on the definition proposed by the AIAA DEIC in 2020 according to which a digital twin is "*a set of virtual information constructs that mimics the structure, context, and behaviour of an individual/unique physical asset, is dynamically updated with data from its physical twin throughout its lifecycle and informs decisions that realize value*" [1]. More recently, this definition crossed disciplinary domains to be adopted and further complemented with the acknowledgement that digital twins are purpose-driven models and their mathematical foundations root in the field of data assimilation, spreading across uncertainty quantification, model order reduction and scientific machine learning [2]. The objective of this Invited Session is to bring together researchers to share advances in computational methods and mathematical formulations that have been enabling digital twins and their use in support of design and/or decision problems. While particular attention will be dedicated to applications in marine engineering, developments pursued in close disciplines – such as mechanical engineering, aerospace engineering and environmental science – will also be most welcome.

REFERENCES

[1] AIAA Digital Engineering Outreach and Integration Committee (2020) *Digital twin: Definition & value*, AIAA and AIA Position Paper.

[2] Mainini L., Diez. M. Digital Twins and their Mathematical Souls. (2023). In STO-MP-AVT-369 *Research Symposium on Digital Twin Technology Development and Application for Tri-Service Platforms and Systems*.