ELECTRICAL, ELECTRONICS AND COMMUNICATIONS ENGINEERING

DENERG/Fincantieri - Digital twin models of drives and electrical propulsion systems for marine applications

Funded By	FINCANTIERI S.P.A. [P.iva/CF:00629440322] Dipartimento DENERG
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Context of the research activity	The electrification of 3D mobility (land, air, water) is a key strategic action in reducing pollution in a sustainable society today. In particular, the electrification of naval transport is still under development, with numerous technological challenges resulting from the high powers (tens of MW) required by naval propulsion systems.
Objectives	Currently, the design and simulation of modern electrified propulsion systems require accurate digital twin models as the power levels are exceeding MW levels. Therefore, the main goal of the PhD thesis is to develop digital twin models of electrical drives for the new generation of propulsion systems for ship applications. The research activity includes the following main tasks: • Study and analysis of existing and new generation naval propulsion architectures • Analysis and modelling of multiphase electric drives for propulsion systems (electric machines and power electronic converters) • Development of digital twin models of naval propulsion electric drives for their direct integration into system simulations • Small-scale testing of a multiphase drive for the validation of digital twin models • Hardware in-the-loop (HIL) testing of a full-scale naval propulsion system with fault emulation and its impact on the naval distribution network The doctoral thesis will be carried out at the Power Electronics Innovation Center of the Politecnico di Torino in collaboration with Fincantieri S.p.A.
Skills and competencies	Basic knowledge of power electronics converters (inverters, active front-end) Advanced understanding of the modelling of multiphase machines Advanced knowledge of torque controllers for multiphase machines

for the development of the activity	Experience in experimental validation of torque controllers for multiphase machines Teamgroup Show enthusiasm and hard dedication to the work