

Advanced application of the Middleware Services for the Digital Twin of an Autonomous Electric Vehicle Propulsion Drive

Summary

In this position, the PhD candidate will study the Digital Twin (DT) concept and services provided by implementing DT to the actual application, on the example of autonomous electric vehicle (AEV) propulsion drive.

Research field:	Electrical Power Engineering and Mechatronics
Supervisor:	Anton Rassölkin
Availability:	This position is available.
Offered by:	School of Engineering Department of Electrical Power Engineering and Mechatronics
Application deadline:	Applications are accepted between May 03, 2021 00:00 and May 31, 2021 23:59 (Europe/Zurich)

Description

The PhD candidate will be responsible for developing, verifying and implementing the proper models for the proposed system. The department will provide the necessary hardware and software to evaluate DT performance and the development of new services.

The main tasks of the PhD candidate are:

1. Understanding the main concept of developed AEV Propulsion Drive Digital Twin
 - Middleware is a collection of software frameworks that provide applications services beyond those available from the system. The first task of the PhD candidate will be to deeply understand the developed DT.
 - Moreover, a literature study in the field of DTs and propulsion electrical drives must be performed to understand the field trends and analyze possible research gaps.
2. Advancement of developed main components models used in DT of AEV and contribution to new approach development
 - Advancement of physical models of different AEV components (controller, inverter, motor, reduction gear, transmission, bearings, etc.) and the related reduced models of these components.
 - Advancement of data-driven models of different AEV components and the related reduced models of these components.
3. Developing a framework for DT verification and implementation
 - DT is continuously updated with sensor data in near real-time and can be supported by synthetic data generated from a virtual entity. This part's major objective is to develop and implement a novel framework for the exploration, simulation, identification, and assessment of multiple DT and AEV configurations aiming to provide fast and concise information about their most important indicators.
 - The goal is to propose a methodology for adjusting the DT according to the actual physical entity.
4. Developing the proposed DT services
 - The DT services include regulation for virtual and physical entities and carry several sub-services of AEV, such as maintenance and diagnostic, energy optimization, path planning, etc.

Applicants should fulfil the following requirements:

- Master's degree in electrical engineering or mechatronics
- Experience with common scientific software (e.g. Matlab, Octave, ROS, Agros, ANSYSetc.)

- Experience with common research support software (e.g. Office 365, Mendelay, LateX, etc.)
- Practical experience with IoT devices
- Practical experience with electrical drives
- Practical experience with publishing and presenting research works (e.g. conference papers)
- Very good command of English
- Fluent written and oral Estonian language skills are eligible



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