PWM switching schemes for automotive SiC MOSFET Inverter

Revolve NTNU

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Objective

Revolve NTNU takes pride in it's self-developed electronic systems, especially our SiC MOSFET inverter running motor control algorithms on a Xilinx Ultracale+ MPSoC. Four IPMSMs are individually controlled by the inverters, using FOC with sinusoidal PWM and third harmonic injection running on the Real-Time Processing Units of the MPSoC. In the last years we have been focusing on the development of the inverter hardware. We now believe that we have achieved a level where the hardware should be sufficient for the coming years and see huge potential in developing further on the field of motor control.

The candidate will investigate, simulate, implement and validate different PWM switching schemes such as Space Vector PWM, Discontinous PWM, adaptive switching frequency, control of an IPMSM in the flux weakening region and reduction of torque ripple.

The investigation and implementation requires interests within areas like motor control, power electronics, control theory, firm and hard real time requirements in addition to HW/SW development using Matlab/Simulink and system development using Xilinx development tools. Familiarity within these subjects will be seen as benefitial, but not a requirement. Additionally, Matlab generated VHDL code for the FPGA will be used for the system.

Previous solutions developed in Revolve can be review and used for inspiration, in addition, Revolve NTNU will provide external resources for supporting the student.

The candidate will learn and develop skills and experience using a leading industry standard platform, in addition to work in an environment with resources to both help and push the student to develop word-class solutions over the span of eight months, following the Revolve NTNU development cycle.

Responsibility

The student is responsible for researching, simulations, implementation and validation of the chosen motor control concept that will contribute to a better

performing car. The task is fairly open and it is up the student to further define the master thesis.

Environment

In Revolve you will work closely with an ambitious and goal-oriented team. This is an unique opportunity to meet like-minded and talented students who can help you write a great Master's thesis while developing a world class formula student racing car.

For more information, see: *https://www.revolve.no/admission*
For further questions please contact Håkon Liverud at *hakon.liverud@revolve.no*