Technische Universität Braunschweig
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Ref: 124

Thesis Project : Real-time Hardware-in-the-loop Simulation of an eVTOL On-board Electrical System with Protection Algorithm

The thesis can be written in German or English.

Anmerkung (Deutsch): Diese Masterarbeit eignet sich besonders für Studierende der Elektrotechnik, Energietechnik, Leistungselektronik und der erneuerbaren Energien, die sich für die Elektrifizierung von Flugzeugen interessieren.

Note: This Master thesis is especially suitable for students from the field of electrical engineering, power systems engineering, power electronics, and renewable energy engineering students who are interested in working in projects related to the electrification of aircrafts.

Background

Urban Air Mobility (UAM) shows great potential for passenger or cargo air transportation within urban or metropolitan areas. The utilization of electric vertical takeoff and landing (eVTOL) aircraft is suitable for zero emission and noise free urban air transportation. Companies and researchers are working to develop safe and reliable UAM solutions. In the project ETHAN, which stands for 'Secure and reliable electric and thermal networks for hybrid-electric propulsion systems' in German, we are working with industry partners like Rolls-Royce Electrical and other Universities to develop environmentally friendly and secure electrical and hybrid electrical propulsion systems for eVTOLs and smaller aircraft with 19 passengers capacity.

Electric Vertical Take-Off and Landing aircraft (eVTOL)
Source : https://www.hispaviacion.es/wp-content/uploads/2021/07/Vertical-Aerospace-VA-X4-1.jpg
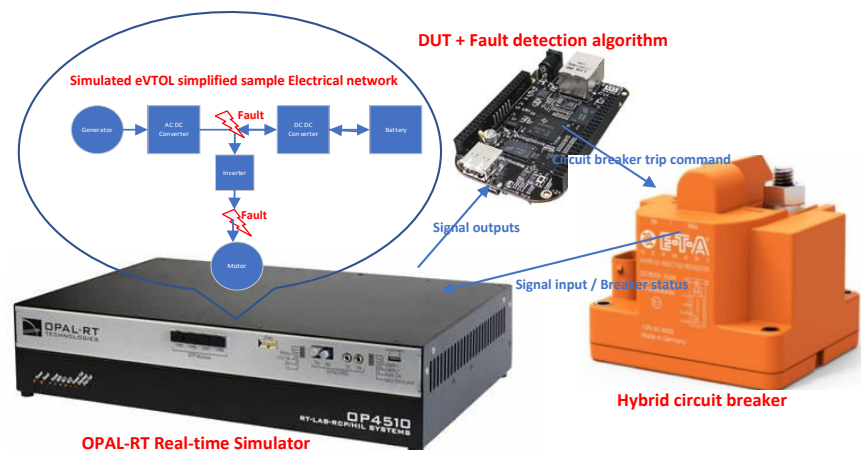
Diagram of Real-time Hardware in the loop Simulation setup

Tasks:

- Use the eVTOL On-board Electrical System model developed at TU Braunschweig with Matlab/Simscape to perform hardware- in-the-loop real time simulations. The device under test is a microcontroller with protection algorithm controlling a hybrid circuit breaker. Normal and fault scenarios are simulated in real-time to validate the protection algorithm.

Desired competences:

- Modelling of electrical and power electronic systems
- Modelling and Programing skills in Matlab/Simulink
- Basic knowledge of hardware in the loop real time simulations

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