Contribution ID: **182** Type: **Oral presentation**

Integrated real-time supervisory management for handling of off-normal-events and feedback control of tokamak plasmas

Monday 19 October 2020 08:35 (20 minutes)

For long-pulse-tokamaks, one of the main challenges in control strategy is to simultaneously reach multiple control objectives using a limited set of actuators and to robustly handle in real-time (RT) off-normal-events (ONE). We have developed a flexible and generic architecture of the plasma control system (PCS) to deal with these issues. The PCS is separated into a tokamak-dependent and a tokamak-agnostic-layer. The first one converts tokamak-specific signals to a generic-state-description used by the tokamak-agnostic-layer and vice-versa. The latter includes:
• a plasma-event-monitor and supervisor to evaluate ONE, plasma and actuator states, decide the appropriate control scenario (list of control tasks), activate and prioritize control tasks
• an actuator manager to decide the best actuator resource allocation to active tasks and distribute commands to corresponding actuators
• controllers that execute control laws to fulfil their tasks with assigned resources and ask for more/less resources if necessary
Thanks to the modular and interface-standardized features of the tokamak-agnostic-layer, it facilitates the implementation, improves maintenance and development capabilities, as well as to be easily transferable to different devices.
We present here the recent development of RT decision-making by the supervisor to switch between various control-scenarios (normal, backup, shutdown, etc.). First, for each ONE, a danger-level and a corresponding ONE-reaction-level are determined. Then, a ONE-to-Scenario mapping decides the appropriate control-scenario based on the set of ONEs and the associated ONE-reaction-levels. The whole PCS has been implemented on the TCV, applied to disruption avoidance experiments with edge-density-limit, demonstrating the excellent capabilities of a RT integrated strategy.

Minioral

Yes

IEEE Member

No

Are you a student?

No

Author: Dr VU, Trang (SPC-EPFL)

Co-authors: Dr FELICI, Federico (SPC-EPFL); Mr GALPERTI, Cristian (SPC-EPFL); Dr MARASCHEK, Marc (IPP Garching); Dr PAU, Alessandro (SPC-EPFL); Dr RISPOLI, Natale (IFP-CNR); Dr SAUTER, Olivier (SPC-EPFL); Dr SIEGLIN, Bernhard (IPP, Garching)

Presenter: Dr VU, Trang (SPC-EPFL)

Session Classification: Oral presentations CMTS01

Track Classification: Control, Monitoring,Test and Real Time Diagnostics Systems