

## Special Session

Code: cc863

### Title

*Patterns for Shared and Cooperative Control of Multi-Agent Collaboration and Cooperation*

### Proposer / Main Organizer

#### ***SMC Technical Committee on Shared Control***

*Prof. Dr.-Ing. Frank O. Flemisch*  
*balanced Human Systems Integration / Systemergonomie*  
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*Prof. Dr.-Ing. Frank Ole Flemisch started as an aerospace engineer with a specialization in systems engineering and system dynamics. After a couple of years in the management and training of safety critical systems in the German Airforce, he did his Ph.D. in Human Factors Engineering for Assistance and Automation at the University of German Armed Forces in Munich, which was the leading edge of autonomous driving and assistance system at that time. From 2001 to 2004 he pursued a NRC associateship on haptic-multimodal interaction with unmanned flying vehicles at NASA, Langley, USA. Transferring this work into the field of ground vehicles, he built up and led a research group for System Ergonomics & Design at the German Aerospace Center DLR, initiating and leading German and European projects on automotive assistant and automation systems, and served as the lead of a national standardization group and a technical expert in ISO TC204. He and his team, together with partners from academia and industry, coined the terms highly automated driving and cooperative automation. Beyond the work on assistance and automation, he also engaged in research on fundamental questions concerning design and development processes. From 2011 to 2014, he was head of the Department for Human Machine Systems, since 2014 leading the department of Human System Integration at the Fraunhofer FKIE institute near Bonn, Germany. He is also a Professor for Human Systems Integration at the RWTH Aachen University, Germany, and representing Germany in the STO-HFM Human Factors and Medicine Panel, the scientific advisory body of NATO.*

### Co-Proposers / Co-Organizers

*Marcel C. A. Baltzer, Marie-Pierre Pacaux-Lemoine,  
Yuichi Saito, Makoto Itoh, David Abbink, Tom Carlson*

### IEEE Member or SMC Society Member

*Tom Carlson*

## Category

- *Human-Machine Systems*

## Number of Expected Paper Submissions:

6 or more

## Keywords

- *Design Methods*
- *Human Factors*
- *Human-Machine Cooperation and Systems*

## Brief Description and Justification (200-250 words):

*This session is organized by the Technical Committee on Shared Control, which has organized special sessions at SMC conferences over the past 10 years. Our community develops and shares scientific insights into the cooperation between humans and machines, and when, where and how this cooperation can be beneficial for humans, societies and earth.*

*Patterns for shared and cooperative control are increasingly used in automation and AI based human-machine interaction, in many fields including driving and flying systems, wheelchair control, teleoperation, underwater robots, etc. Contrary to the idea of replacing humans by technology, the concept of shared and cooperative control consists in joining the reliability, repeatable precision, speed and availability of a technical system with the ability of humans to adapt to and to perform unfamiliar tasks. Our vision is to optimally combine the strengths of both humans and the technological world and ensure an intuitive and more comfortable human-machine interaction. Therefore, in this special session, we will address the conference theme of "Integrating real world, virtual models, and societies" by discussing collaboration between humans and machines. E.g. on the one-hand, how interactions with AI-based systems happen in the real world, and their effects on both societies and the environment; and on the other hand, how virtual models like design and interaction patterns help to organize and control this cooperation, to assess and judge once again the effects on reality.*