IFAC World Congress 2023
CALL FOR PAPERS
for Open Invited Session on
Advanced Control of Human-Robot Interaction in Extreme Environments: From Theory to Applications
(submission code: j35t3)

Theme: Interaction control can take opportunities offered by contact robots as they are physically interacting with their human users in applications, such as intelligent gravity support for ergonomic manufacturing and teleoperated "three-hand (or three handed) surgery" using a soft endoscope equipped with tools. Over the last decades we have witnessed the burgeoning field of interaction control in the control theory and machine learning communities, by analysing the exchange of haptic information between the robot and the human user, and how they share the task effort. Estimation and learning methods predicting human user intention with a large level of uncertainty, variability, and noise, when only limited observation of human motion is available, have played an important role in constructing the control framework. Based on this motion intent core, recent methods of haptic, communication, and game theory have considered the co-adaptation of human and robot control and yielded a versatile interactive control pattern. Therefore, this invited session aims at discussing the latest research on interaction control of pHRI with application to extreme environments.

This session will focus on (but is not limited to) the following topics:

- Extreme environment perception-based control analysis and synthesis
- Advanced control strategy with prescribed performance
- Bilateral motion intent detection and prediction
- Behavioural cloning and reinforcement learning for robot task learning
- Assistance/Co-Operation/Co-Activity/Competition human-robot interaction strategies
- Sensory augmentation that combines human perception with non-haptic sensor information/data such as camera, ultrasonic, radio-frequency identification
- Differential game theory-based interactive control

- Dynamic human-robot relationship regulation using negotiation theory
- Interaction control applications in extreme environments such as nuclear decommissioning, space maintenance, and micro/nano surgery.

Submission

Papers and all other proposals must be submitted electronically using the [IFAC PaperPlaza conference manuscript management system](). All submissions must be in PDF format, written in English, and prepared according to [IFAC format](). The submission procedure is described in detail [here.]()

[NB]: The submission code is j35t3.

There are **three paper categories** for the World Congress:

- **Regular papers** will have 6 pages length limitation. At the time of initial submission, however, regular papers can be **up to 8 pages for review**.
- **Survey papers** overviewing a research topic are also most welcome, and **14 pages are allowed for initial submission**.
- **Discussion papers** are introduced to encourage participation from industry and from colleagues outside the traditional academic control community. Such papers should be submitted in the form of extended abstracts typically between **2 and 4 pages in length**.

Important Dates

- Invited Paper Submission: October 31, 2022 (submission link: [here]())
- Discussion Paper: November 30, 2022
- Notification of Acceptance: February 21, 2023
- Final Paper Submission: March 31, 2023
- The IFAC World Conference: July 9, 2023

Organizers

- Dr. Ziwei Wang, Lancaster University, UK
- Dr. Bo Xiao, Hamlyn Centre for Robotic Surgery, Imperial College London, UK
- Dr. Allahyar Montazeri, Lancaster University, UK
- Dr. Yanpei Huang, Department of Bioengineering, Imperial College London, UK
- Dr. Hak-Keung Lam, King's College London, UK
- Prof. Xiaojie Su, Chongqing University, China
- Prof. Hongyi Li, Guangdong University of Technology, China
- Prof. Hongjing Liang, University of Electronic Science and Technology, China
    Contact [ziwei.wang@ieee.org] to get more information about our invited session