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Special Issue on Human-Robot Collaboration for Futuristic Human-Centric Smart Manufacturing

In line with human-centric concerns of Industry 5.0, modern factories are striving for an ever-higher degree of flexible and resilient manufacturing in mass personalization with increasing complexity. To achieve it, human-robot collaboration (HRC) becomes a prevailing strategy, which combines high accuracy, strength, and repeatability of industrial robots with high flexibility and adaptability of human operators to realize overall optimal productivity. Nevertheless, existing HRC development mainly undertakes either human-centered or robot-centered manner reactively by following pre-defined instructions, which is far from efficient integration of robotic automation and human cognitions for effective collaborations.

Recent research on human-level information processing of cognitive computing, mixed reality/metaverse, the industrial IoT, and advanced data analytics creates potential to bridge the gap of knowledge distilling and information sharing between onsite operators, robots, and the manufacturing system with mutual cognitions. In this context, a foreseeable HRC-empowered, human-centric, smart manufacturing paradigm characterized by high-level teamwork skills is emerging, of which several aspects should be addressed: 1) *Inter-collaboration cognition.* The human operator can obtain continuous changes and updates of robots, such as to represent status and working conditions. Synchronously, semantic knowledge understanding from the human's motions, activities to his/her intention can be learned by the robot for concurrent cognition. 2) *Spatio-temporal interaction prediction.* Spatio- temporal behavior of a human and robot in HRC consists of their dynamic structure of these two entities and their interaction with coexisting neighbors. The access of predictability of future execution between these entities can facilitate intra-collaboration intelligence for decision-making and path planning, such as proactive assistance either from a human to a robot or from a robot to a human. 3) *Proactive teamwork.* Models of various decentralized HRC systems in different workshops can converge a wider applicable knowledge representation, which can make a long-range allocation of manufacturing activities for both humans and robots based on their skilled abilities, to achieve self-organization.

To this end, as an emerging and promising research topic, this Special Issue aims to present the state-of-the-art methodologies, tools, systems, and cases to enable the readiness and realization of HRC for futuristic human-centric smart manufacturing.

Topic Areas

Topics relevant to this Special Issue include, but are not limited to:

- Cognitive human-robot collaboration systems
- MR/Metaverse-assisted human-robot collaboration
- Intuitive safety concerns in human-robot collaboration
- Multi-modal intelligence for human-robot collaboration
- Adaptive motion planning in human-robot collaboration
- Human intention prediction in human-robot collaboration
- Semantic knowledge representation for human-robot collaboration
- Human-robot collaboration cases, systems, and implementations in manufacturing

Publication Target Dates

Paper submission deadline	**January 31, 2023**
Review process completed	**May 22, 2023**
Special Issue publication date	**August 2023**

Submission Instructions

Papers should be submitted electronically to the journal at **journaltool.asme.org**. If you already have an account, log in as an author to your ASME account. If you do not have an account, sign up for an account. In either case, at the **Paper Submittal** page, select the **ASME *Journal of Manufacturing Science and Engineering*** and then select the Special Issue **Human-Robot Collaboration for Futuristic Human-Centric Smart Manufacturing.**

Papers received after the deadline or papers not selected for inclusion in the Special Issue may be accepted for publication in a regular issue.

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