

Proposal for Special Session at IEEE CASE 2022

Goal:

When facing complex problems in the real world, autonomous agents should have a comprehensive knowledge of tasks, environments, their own capability, and potential assistance from collaborators. The knowledge could be high-level knowledge networks that represent the relationships between sub-tasks, a presentation of the environment, a common-sense knowledge of the interactions between objects, a robot's motor skill capabilities, and the intention of a collaborator. Using the knowledge, autonomous agents can comprehend a task goal by breaking the task down to steps, allocating subtasks to collaborators, making decisions on how to carry out motions, and adjusting actions if facing anomalies. Knowledge Representation and Reasoning play a central role in this paradigm. This special session will spotlight the recent developments in this critical area and help advance robotics and automation technologies. Themes of interest to this session include, but are not limited to:

- Knowledge representation for robotics
- Knowledge graphs for robotics
- Knowledge extraction for robotics
- Consolidating knowledge from multi-modalities
- Ontology engineering for robotics
- Uncertainty representations for robotics
- Cognitive Architectures for Robotics
- Environment representations
- Quality presentations for robotics
- Commonsense knowledge for robotics
- Knowledge for Human-robot Interaction and collaboration
- Knowledge for Multi-Robot Systems Coordination
- Reasoning with multi-sensory modalities
- Causal reasoning for robotics
- Combining reasoning with control theories
- Reasoning for task planning
- From knowledge to action
- Reasoning for decision-making
- Anomaly detection and correction
- Integrating symbolic and data-driven approaches

Session Title: Knowledge Representation and Reasoning for Autonomous Agents

Organizers: Yu Sun, Professor
University of South Florida
E-mail: yusun@usf.edu
Phone: +1 813 974 7508

Yunyi Jia, Assistant Professor
Clemson University
Email: yunyj@clemson.edu
Phone: +1 864 283 7226

David Paulius, Postdoctoral Research Associate
Brown University
E-mail: dpaulius@cs.brown.edu
Phone: +1 – 813 546 2032

Contributions:

1. “Robot Learning and Optimization of Assembly Tasks from Non-expert Demonstrations via Functional Object-Oriented Network” by Yi Chen, David Andres Paulius, Yu Sun, Yunyi Jia
2. “A Robot-Trusting-Human Framework in Human-Robot Collaborative Tasks” by Pallavi Tilloo, Omar Obidat, and Weitian Wang
3. “Functional Task Tree Generation from a Knowledge Graph” by Md Sadman Sakid and Yu Sun