Behavior Adaptation for Human-Robot Collaboration

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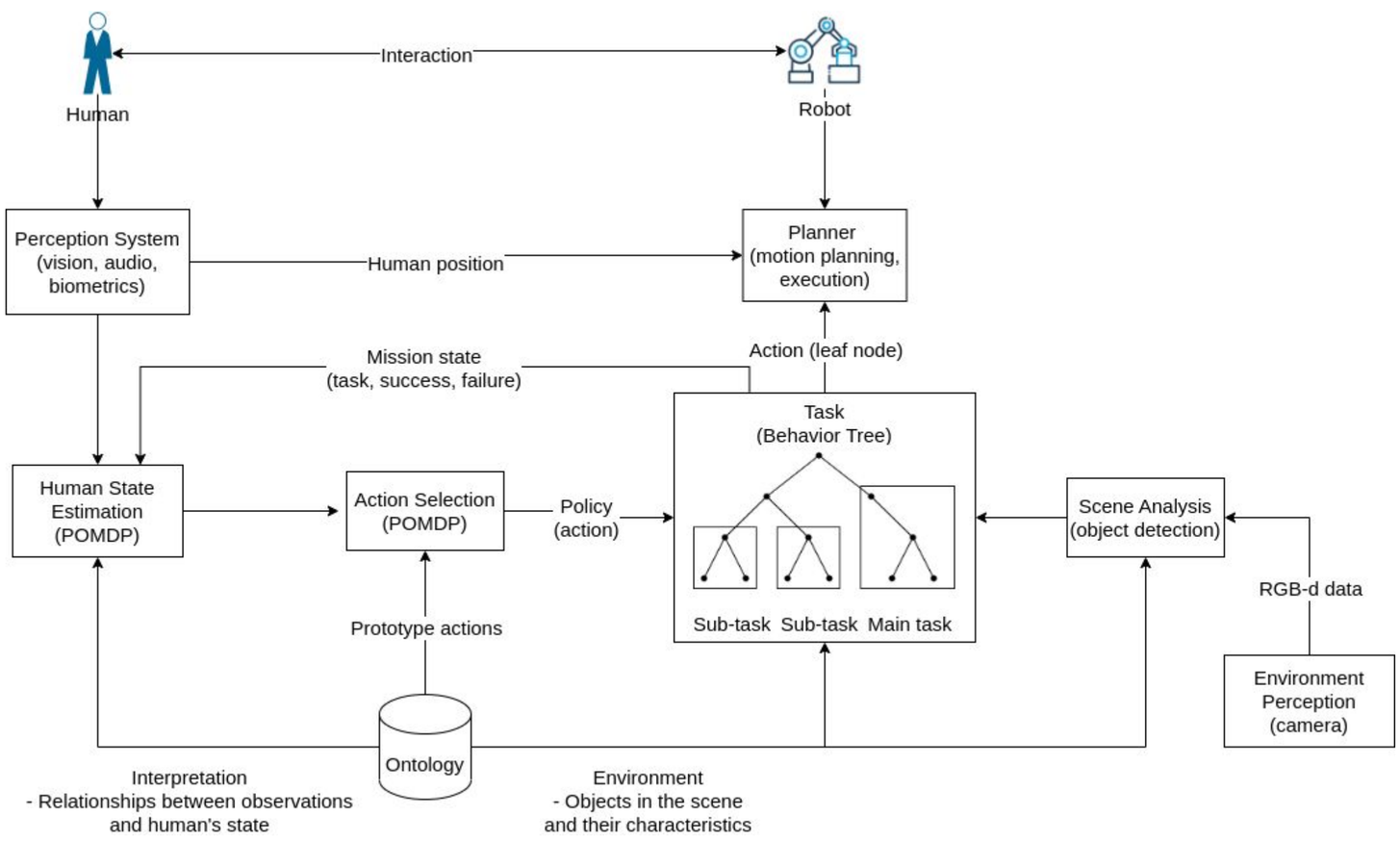
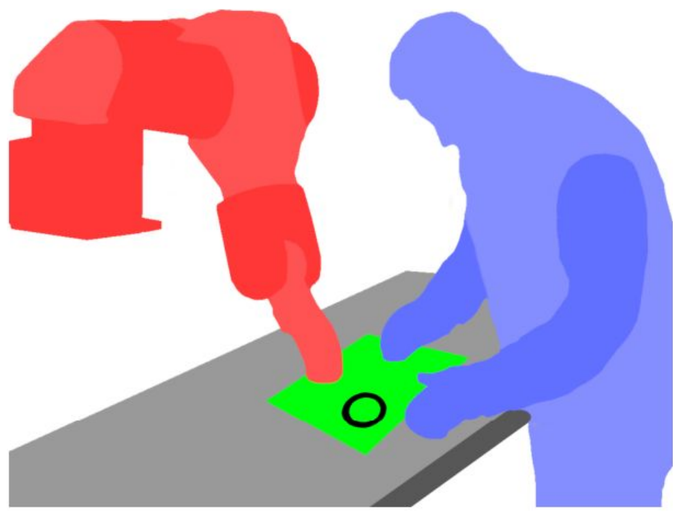


DESIGN OF THE MULTILEVEL COLLABORATIVE SYSTEM

Problem questions

- How can we effectively model the human worker's internal state (e.g., trust, fatigue, physical/mental workload?)
- Can we improve the human-robot collaborative performance by modeling the state of the human worker?
- How can we achieve adaptability of robot behavior concerning the control architecture?



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Background

Human-robot interaction (HRI) is a broad and multidisciplinary field within robotics. It is the study of designing and analyzing robot systems that perform interactive tasks with one or more human teammates.

Human-robot collaboration (HRC), a subcategory of HRI, involves the human-robot team working on a task in a shared workspace. The added level of proximity poses new challenges with the increase of the human operator’s feeling of vulnerability. Furthermore, it raises other relevant research areas, including trust in HRI and human state estimation.

Significance

The area of HRC is highly compelling for real-life use, as it investigates how to bring in robots as team members or collaborators (e.g., in manufacturing settings) and not merely as tools.

Methods

Control architectures like Behavior Trees describe reactive task planning. They have become useful as a tool in robotics as they are flexible, modular, and tolerant of task failures.

Human state inference will allow the robot to adapt to the human’s internal state to improve team performance.

The Fluently project

This research is part of the European project Fluently (- the essence of human-robot interaction). The work under this project forms a considerable part of the methodology.

The Fluently project focuses on HRC in manufacturing to create a human-robot interaction unit that can interpret communication (e.g., speech and gestures) and assess the state of the human worker.

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[1] Hald, K. (2021). Human-Robot Trust Assessment From Physical Apprehension Signals.