Uncovering People's Preferences for Robot Autonomy in Assistive Teleoperation

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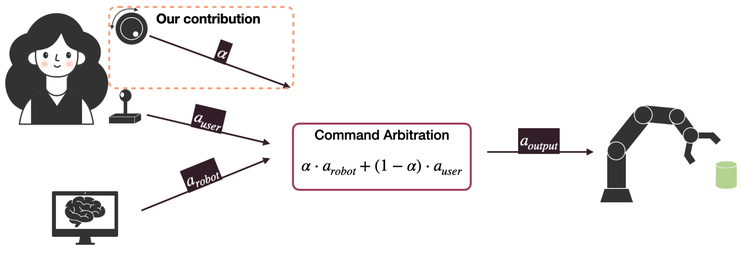
Motivation

Sometimes assistive robot users prefer assistance that is not optimal, or they prefer the challenge of teleoperation to losing their sense of control when assistance is applied [1],[2]. This fact underscores the need to study people's preferences for autonomous assistance rather than assuming their preferences align with our limited definitions of optimality.

Contributions & Background

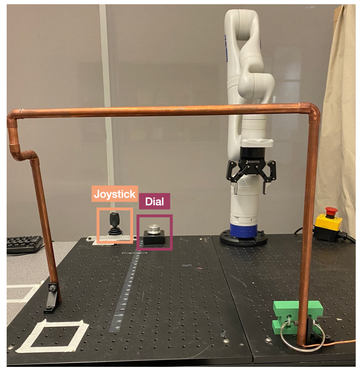
- A study on user's preferences for assistance throughout tasks
- The first shared control paradigm that lets users directly control the arbitration at any point during a task



Command arbitration: process by which user's command is combined with an assistive policy in shared control

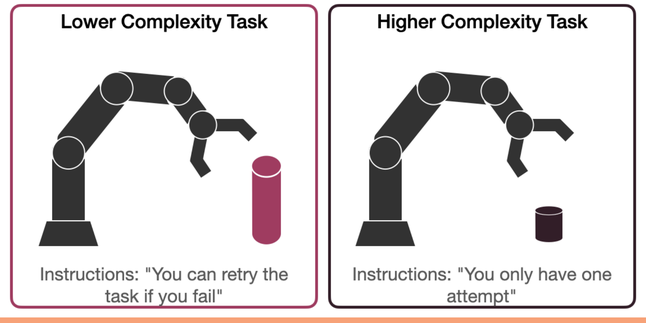
Users Control the Amount of Assistance

We enable people to choose how much assistance they receive in a shared control framework by letting them adjust **command arbitration** with a dial.



Studying Magnitude of Movement's Effect on Assistance Preference

Magnitude of movement: magnitude of linear velocity of end effector

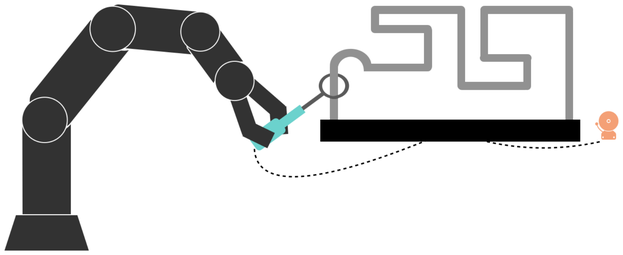


H1: In tasks of higher complexity, users will prefer a relative increase in assistance when switching from gross movements to finer movements.

In tasks of lower complexity, users will not show a consistent trend in the relative change in assistance when switching from gross to fine movements.

Studying Active DOF's Effect on Assistance Preference

Active DOFs: degrees of freedom being controlled by the user at a point in time



H2: Users will prefer more automated assistance when moving in rotational DOFs than in translational DOFs.

Implications for Future Work

- Develop assistive policies sensitive to users' preferences
- Use system to study other task features that might influence assistance preferences

References

1. Kim et al. "How autonomy impacts performance and satisfaction: Results from a study with spinal cord injured subjects using an assistive robot," IEEE Transactions on Systems, Man, and Cybernetics-Part A: Systems and Humans, vol. 42, no. 1, pp. 2–14, 2011.
2. Gopinath et al. "Human-in-the-loop optimization of shared autonomy in assistive robotics," IEEE Robotics and Automation Letters, vol. 2, no. 1, pp. 247–254, 2016.