Docket #: S20-460

Local Autonomy-Based Haptic Robot Interaction with Dual Proxy Model for Remote Operation with Simulation Software (OpenSAI)

Remotely operated robotic devices are becoming increasingly important in fields such as medicine, space and field research. However, their widespread application is hampered by distance between the robot and its operator which results in communication delays. To address this issue, Stanford researchers have developed a system to perform remote haptic control of robots even in the presence of large communication delays. While existing systems quickly become dangerous and unstable when delays reach ~100 milliseconds, this approach that leverages robot local autonomy is robust to delays longer than 1 second. The method consists in separating the control between the operator and robot into three components. Two local controllers on the operator and robot side that maintain a degree of autonomy, and a dual-proxy model that connects them and acts as a smart communication bridge by generating safe and consistent inputs to the local controllers. Finally, a perception algorithm allows the robot to detect its environment geometry in real time. This informs the parameters set in the dual proxy model to enable fully autonomous implementation of the system. This system is applicable to any remote robotic operation regardless of distance and communication delay.

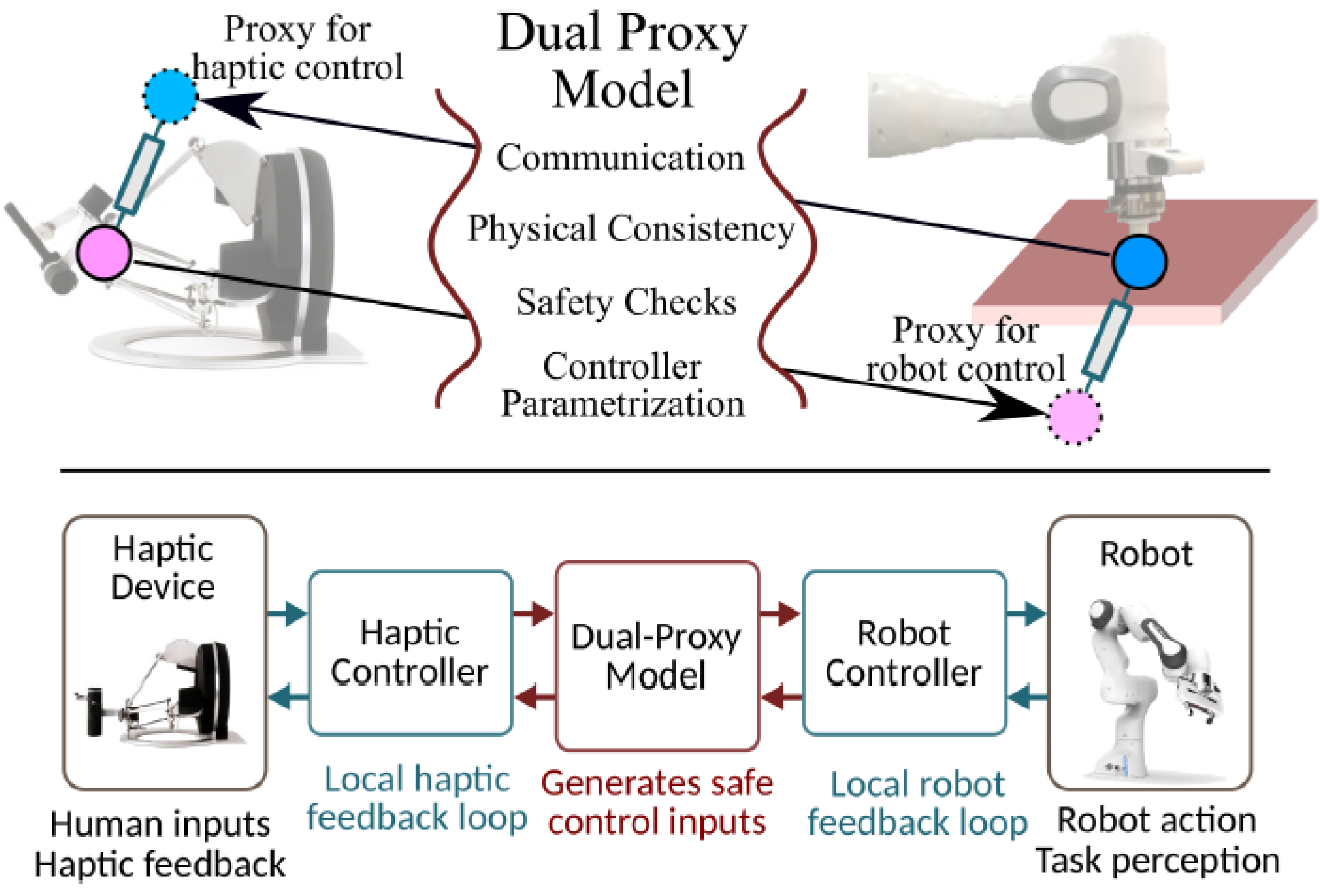

Photo description: Dual proxy model for local autonomy-based haptic interaction. Credit: Inventors

Stage of Research

- Proof of concept

Applications

- Remote control of robots: medical, underwater, space, etc.

Advantages

- Operation from anywhere around the globe
- Robust operation to delays above 1 second

Patents

- Published Application: 20230339121
- Issued: 12269156 (USA)

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