Train to Train: A Viability Study of a Hand-Over-Hand Training Approach for Robot Kinesthetic Teaching

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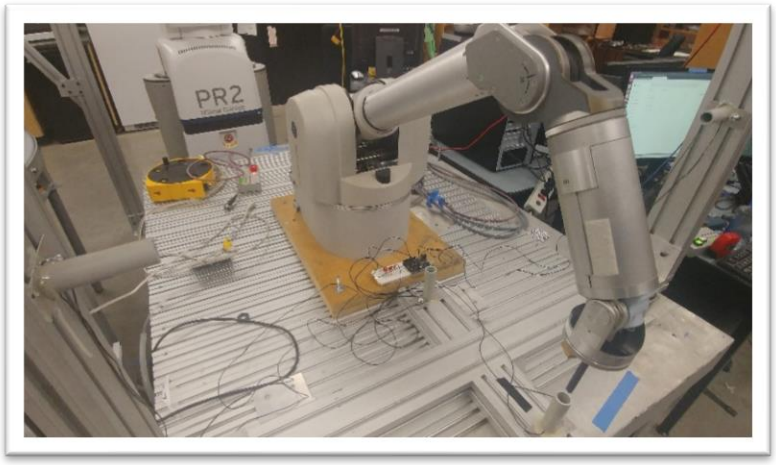

Kinesthetic teaching is a technique within Robot Learning from Demonstration (LfD) that allows robots to implement autonomous manipulation by replaying motions physically demonstrated on the robot by a human when the arm is in a state of gravity compensation. The viability of a hand-over-hand approach to training this technique in novice-level robot operators is explored and contrasted with current observation and discovery-focused learning approaches.

A study of nine novice participants is divided into the previous three learning groups and trained on a moderately complex task under their respective learning method. Performance metrics for the complex task trajectory are defined: Number of velocity peaks per minute, total pathlength, DTW (dynamic time warping)-based signal similarity to an expert trajectory, and time of completion. The hand-over-hand learning group exhibited indicators of superior performance in pathlength and similarity over the observational and discovery groups.

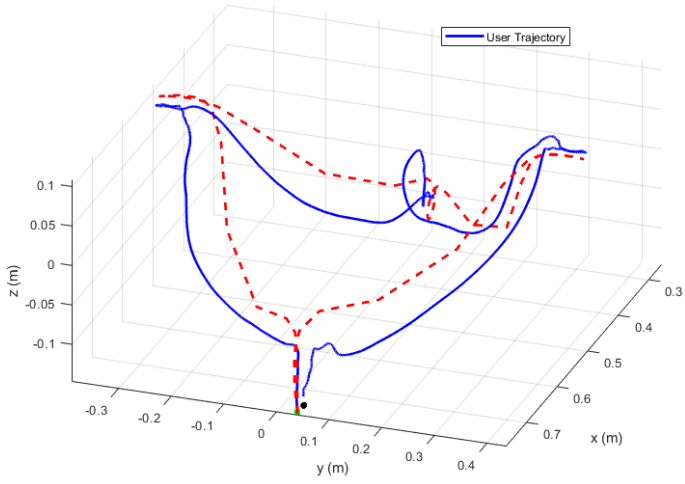

Figure 2 Expert (Blue) and Optimal Min-Jerk Trajectory

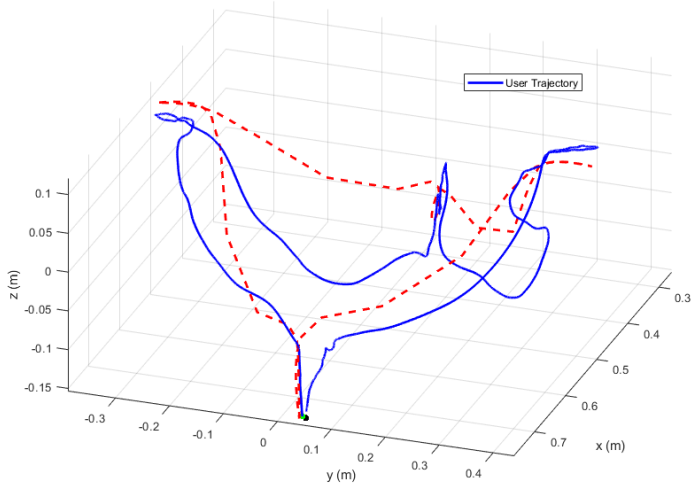

Figure 1 Novice (Blue) and Optimal Min-Jerk Trajectory