NRI: FND: The Robotic Rehab Gym: Specialized co-robot trainers working with multiple human trainees for optimal learning outcomes

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Challenge

- how can groups of robots efficiently teach multiple skills to groups of humans over a longer time period?
- how can robot artificial intelligence be effectively combined with human expertise?

Scientific impact

Broad contributions to:

- multi-robot dynamic task planning
- robot perception and sensor fusion
- human-robot collaboration

Solution: Three-pronged approach. Activity 1: Multi-robot task allocation & scheduling to optimize human learning outcome using mathematical optimization or market/auction-based approaches. Activity 2: Estimating human skill level & predicting expected learning improvement based on multimodal data. Activity 3: Human-robot collaborative planning framework using guided policy learning from demonstration / interaction. At the moment, we are focusing on Activities 1 & 3 in simulation studies.

Broader impact on society

- robot- and agent-aided group learning beneficial in, e.g., rehabilitation, sports, surgery, language therapy, education…
- relieve load on human trainers

Broader impact (education)

- two new courses in co-robotics + upgrade existing courses
- K-14 outreach at rural Wyoming schools
- popular science publications

Broader impact (long-term)

More efficient robot-guided group learning could relieve shortage of human therapists / teachers, providing more broadly accessible training & education.

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