Robot-Mediated Learning: Exploring School-Deployed Collaborative Robots

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Goal: Create telerobots with new inclusive interfaces, control modalities, and telemanipulators for remote school attendance.

Problem:

- Each year, over 2.5 million children in the US are restricted to their homes due to medical risk [1]
- Urgent need to use inclusive technologies beyond static platforms such as Zoom or online schools [2]
- Commercially available telerobots were not designed for children or schools [2]

Approach:

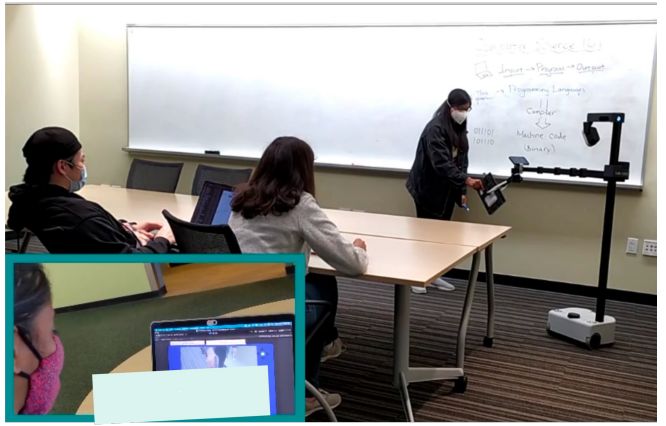
- Create best practices/guidelines that incorporate social norms for daily robot interactions [3]
- Explore how to make mobile telemanipulators accessible to remote children and children with disabilities. [4]
- Leverage interaction with an embodied co-robot to motivate interest in STEM for all children.

Personalized Pediatric Robot Design [5]

We are validating frameworks and measures for qualitative coding of artwork to inform pediatric robot design. We're exploring peer-informed robot personalization that combines HRI concepts with engineering capabilities. We've learned that children desire robot personalization features that represent their human bodies, social identities, and playful identities comparable to in-person peers.[5]

Designing for Shared Control [6,7]

We are designing new shared control interfaces for mobile telemanipulators with remote learners. We're exploring technical questions regarding shared autonomy, haptics, and AR cueing for navigation and manipulation, as well as HRI questions regarding the experience of remote learners and their classmates. [6,7]



[1] V. Ahumada-Newhart, M. Warschauer, and L. Sender, "Virtual inclusion via telepresence robots in the classroom: An exploratory case study," *The International Journal of Technologies in Learning,* vol. 23, no. 4, pp. 9-25, 2016.

[2] V. Ahumada-Newhart and J. S. Olson, "My student is a robot: How schools manage telepresence experiences for students," in *Proceedings of the 2017 CHI conference on human factors in computing systems,* 2017, pp. 342-347.

[3] V. Ahumada-Newhart and J. S. Eccles, "A Theoretical and Qualitative Approach to Evaluating Children's Robot-Mediated Levels of Presence," *Technology, Mind, and Behavior,* vol. 1, no. 1, 2020.

[4] V. Ahumada-Newhart and L. Riek, "Telerobots for informal learning in schools," in *proceedings of ACM/IEEE International Conference on Human- Robot Interaction, Workshop on Robots4Learning*, 2021.

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[7] Ghosh, P., Chow, A ., Haripriyan, A., Ahumada, V., and Riek, L.D. "Augmented Reality Teleoperation Interfaces for Remote Learners". *In prep.*

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