USC Viterbi School of Engineering

CAL STATE LA

Communicate, Share, Adapt: A Mixed Reality Framework for Facilitating Robot Integration and Customization

Award #: IIS – 1925083

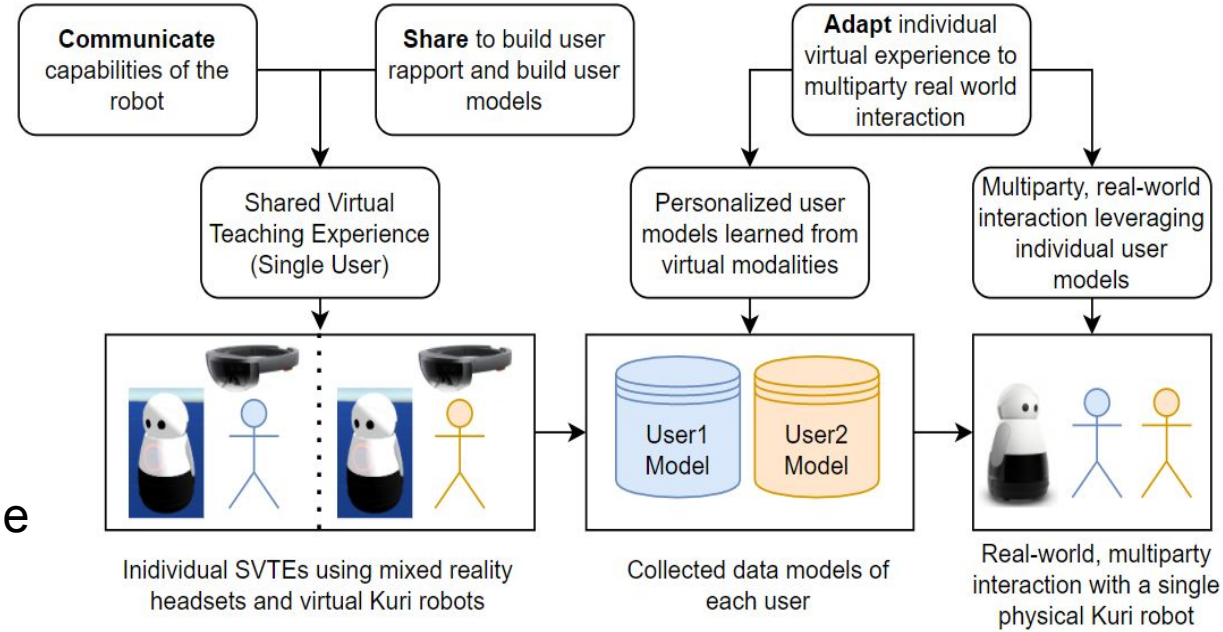
PIs: Maja J Matarić, David M. Krum
PhD Students: Thomas R. Groechel, Christopher Birmingham

Poster #75

Developing a Shared Virtual Teaching Experience (SVTE) for older adults

SVTE is a mixed reality teaching experience designed to:

- Teach users how to **communicate** with robots
- Build user-robot rapport through **sharing**
- **Adapt** to real-world, personalized, multiparty interactions based on the SVTE training and data



Established baselines through design interviews with older adult participants

Interview goals:

- Established baseline understanding of functional and affective capabilities of socially assistive robots
- Brainstormed appropriate robot backstory for positive interaction

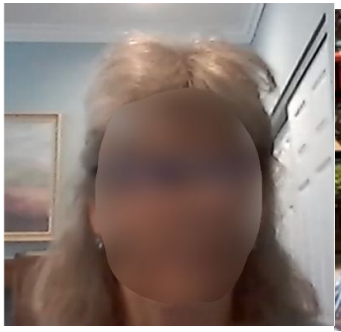
Partner Institution

front porch

Testbeds: Kuri [left] and Quori [right]

Key interview insights:

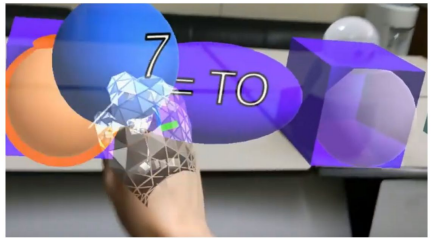
- Participants were interested in practicality - "*what can this robot do for me?*"
- User population contained a wide range of acceptance & understanding of technology / AI
- Users had secondary concerns about privacy and transparency



Interview participants from Front Porch

Explored feature modalities in mixed reality robot learning interactions for understanding user state & system usability

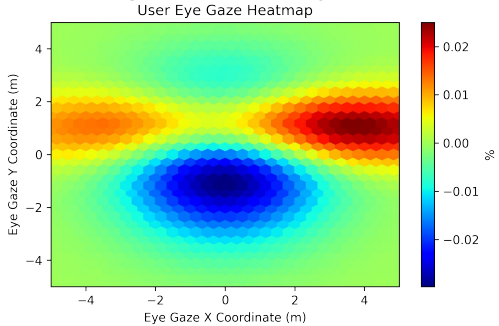
- Tracked and scored different data modalities from the MR headset
- Analyzed different data types (behavioral, surveys) for correlations about usability



Virtual object manipulations tracked as different objects grabbed over time

We tracked participant head and arm movement over time

We tracked eye gaze location and gazed-at objects

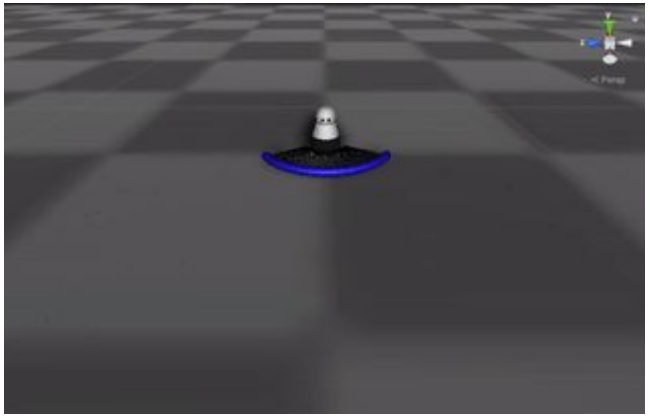


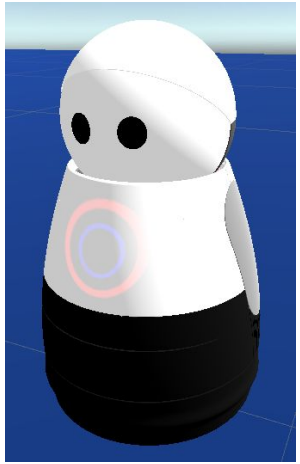
We developed MoveToCode - an MR visual block-based programming language

[1] Thomas R. Groechel, Roxanna Pakkar, Roddur Dasgupta, Chloe Kuo, Haemin Lee, Julia Cordero, Kartik Mahajan, and Maja J. Matarić "Kinesthetic Curiosity: Towards Personalized Embodied Learning with a Robot Tutor Teaching Programming in Mixed Reality", To appear in 17th International Symposium on Experimental Robotics (ISER), Virtual, Mar 2021.
[2] Kartik Mahajan*, Thomas R. Groechel*, Roxanna Pakkar, Julia Cordero, Haemin Lee, Maja J. Matarić "Adapting Usability Metrics for a Socially Assistive, Kinesthetic, Mixed Reality Robot Tutoring Environment", In Proceedings of 2020 International Conference on Social Robotics (ICSR '20), Colorado, USA, Nov 2020.

Ongoing work: developing SVTE signalling capabilities

- Creating a 1 to 1 virtual Kuri robot in Unity game engine to be deployed to multiple mixed reality headsets
- Exploring different sensor visualizations for non-expert users





Physical Kuri [left] and virtual Kuri [right]

- Created laser scan visualizations for Kuri within Unity to improve transparency for non-expert users
- Experimental visualizations are being further designed for an online study