

Summary

- Collaborative project between UIUC Engineering (Hauser) and Duke School of Nursing (Shaw) to develop trainable supervisory control interfaces for tele-nursing robots
- Direct applications: nursing in quarantine areas; infectious diseases, immunocompromised patients
- UIUC: fabricating the TRINA 2.0 hardware platform, devising semi-autonomous primitive tasks, and trainable UIs
- Duke: user studies with RNs (experts) customizing the UI for nursing students (novices) in nursing tasks

Prior work

Tele-Robotic Intelligent Nursing Assistant (TRINA)

- Developed with NSF RAPID funding in response to 2014 Ebola outbreak [1]



Direct teleoperation: 19/26 nursing tasks feasible, but 50-200x slower than human nurse

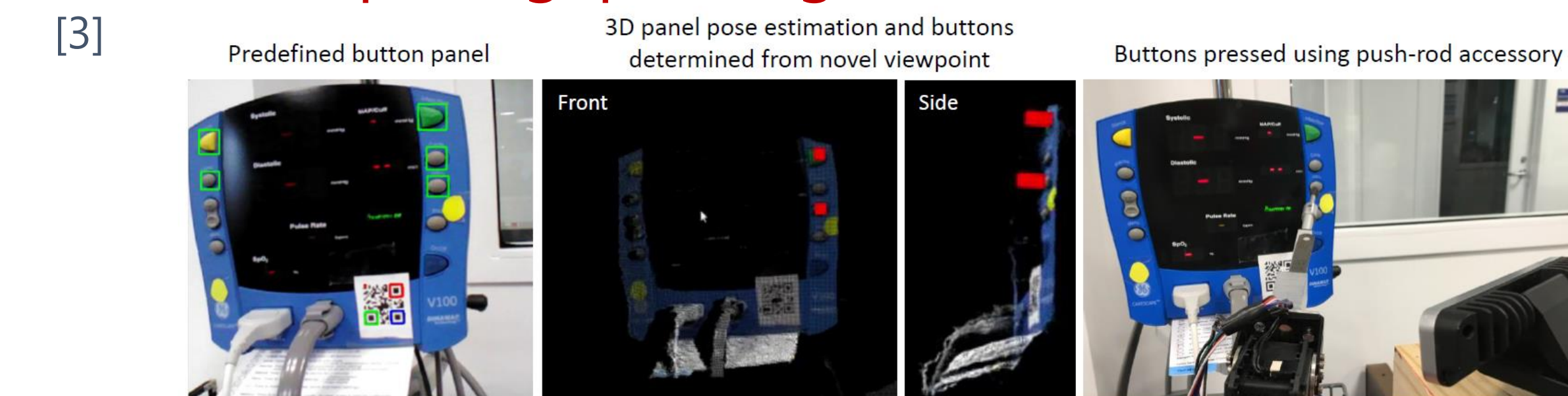
Automated: Personnel Protective Equipment (PPE) donning and doffing via PbD [2]



Project Vision

Primitive tasks

Navigation, button panel identification and pressing, force controlled pulling, pushing, auscultation

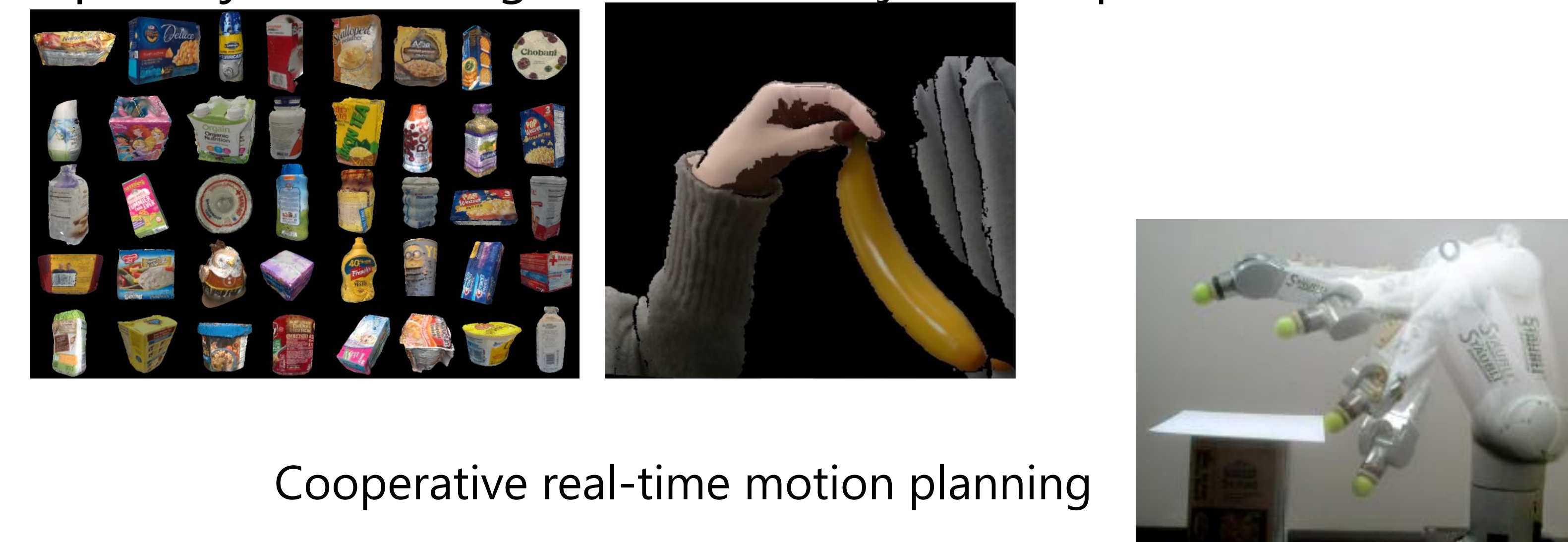


This year: improving pick and place reliability, articulated object manipulation, wiping => Intelligent UI, data gathering with RNs at Duke



Foundational components

Rapid object scanning via in-hand object manipulation [4]

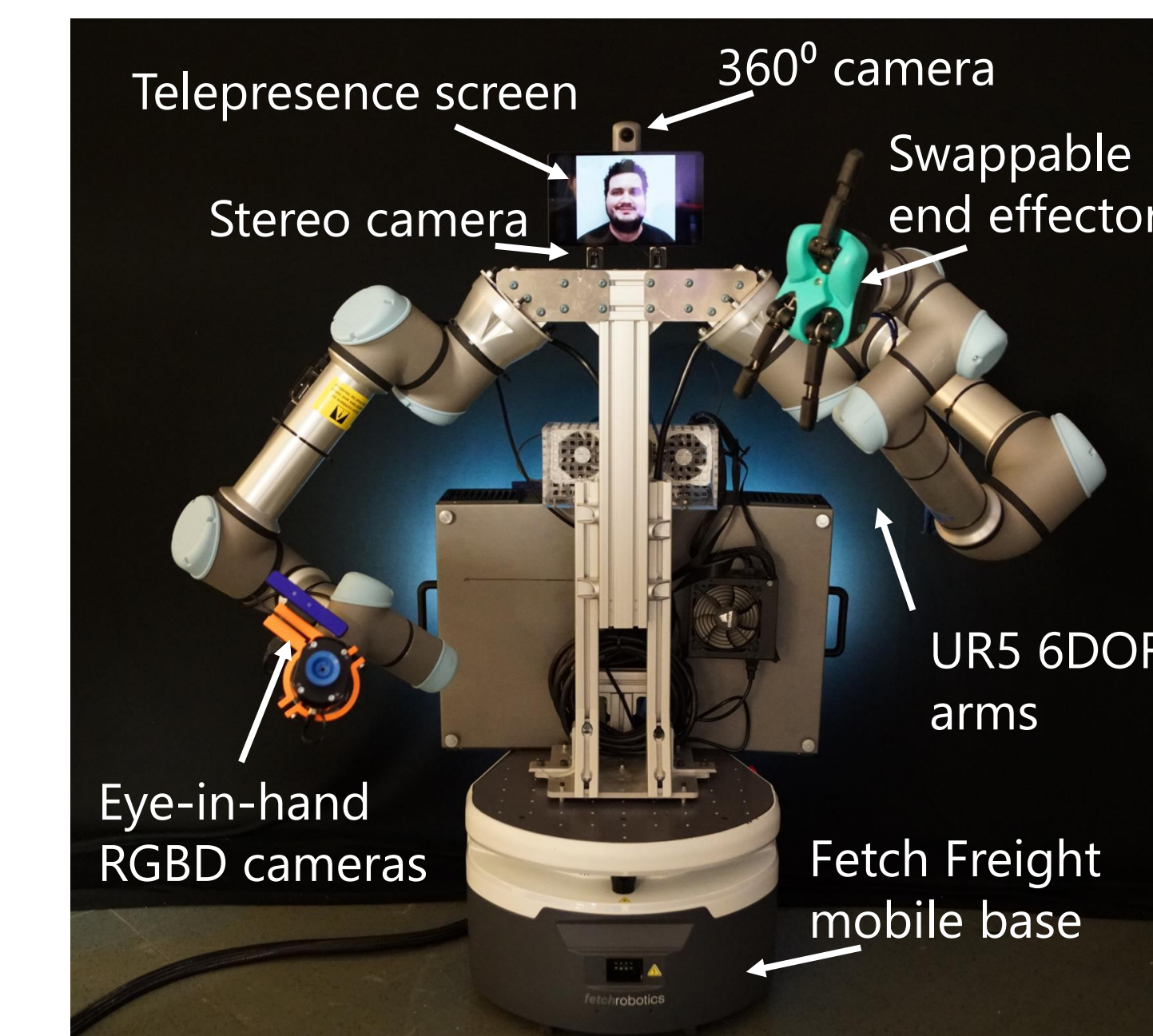


Cooperative real-time motion planning

Technical Challenges

- Design and fabrication of TRINA 2.0
- Implementation of reliable (95%) autonomous primitives
- Human-interpretable database of objects, locations, poses, motions
- Hierarchical task customization involving conditions, loops
- Contextual, most-likely task inference
- Implementation and testing on mobile GUI

Current progress

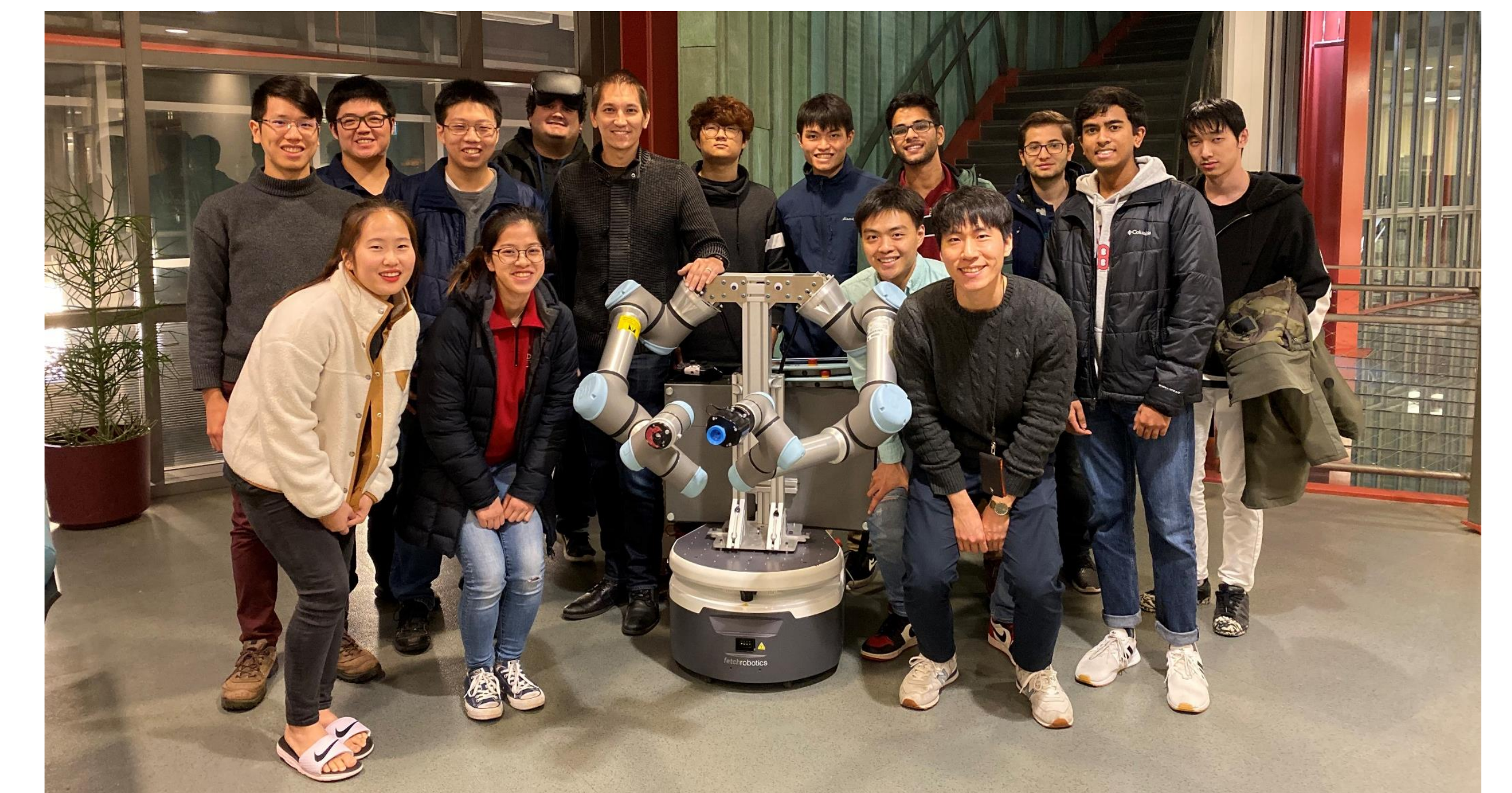


TRINA 2.0 complete. Sensors, 2D and 3D SLAM, VR input



2021 thrust
Semi-autonomous UI with data logging + learning => Intelligent UI for novices

Synergistic relation with ANA AVATAR XPrize



Fall 2019 UIUC TRINA group (9 UG, 1 Master's, 3 PhD)

References

- [1] Z. Li, P. Moran, C. Dong, R. Shaw, and K. Hauser. *Development of a Tele-Nursing Mobile Manipulator for Remote Care-giving in Quarantine Areas*. ICRA, 2017
- [2] T. Lu, H. Bader, and K. Hauser. *The Design and Doffing of Personal Protective Equipment for Healthcare Robots*. Military Health Systems Research Symposium (MHSRS), August 2018.
- [3] F. Wang, K. Hauser. *Robot Button Pressing in Human Environments*. ICRA 2018
- [4] F. Wang, K. Hauser. *In-hand Object Scanning via RGB-D Video Segmentation*. ICRA, 2019.