Virtual Reality Interfaces for Surface Telerobotics

Michael Walker, Jack Burns, and Daniel Szafir
CU Boulder NESS Team & Interactive Robotics and Novel Technologies Laboratory
The Field of Telerobotics
Robotic Advancements: Hardware
Robotic Advancements: Software
Robotic Advancements: Interfaces?
Virtual Reality Headsets
VR Headsets and Robots
Experiment: Traditional Interface vs. VR Interface
Experiment: Design

2 x 1 (Standard Interface or VR Interface)

Within-Subjects Design

12 Subjects
  Gender: 10 Male & 2 Female
  Average Age = 22

Evaluated over a series of robot teleoperation assembly tasks
Experiment: Apparatus & Environment
Experiment Task Two: Object Stacking
Experiment Task Three: Object Sorting
Stacking: Time to Complete

Cubes
- Monitor: Mean = 189, P-Value = 0.0223 *
- VR: Mean = 127

Cylinders
- Monitor: Mean = 328, P-Value = 0.0558
- VR: Mean = 244
Sorting: Time to Complete

Monitor: Mean = 612

VR: Mean = 519

P-Value = 0.122
Overall Preferred Assembly Task Interface

Monitor: 17%
VR: 73%
Follow Up Experiments

Explore more complex VR interfaces

Body Tracking
   Head Tracking
   Hand Tracking
   Full-Body Tracking

Assistive Augmented Reality

Integration of Point Clouds
VR Telerobotics: Looking to the Future

Advance from VR Simulation to Teleoperation

Take Advantage of the Lunar Gateway

Prepare for Mars
Thank You!

Questions?

Michael Walker, Jack Burns, and Daniel Szafir

CU Boulder NESS Team & Interactive Robotics and Novel Technologies Laboratory