

Teleoperation of Touch Screen Using 6-Degree-of-Freedom Robot Arm

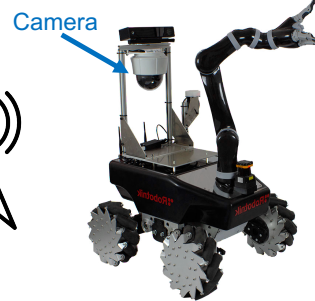
Teleoperated mobile robotic platforms are suitable for dexterous telemanipulation of real-world objects from a distance.

These systems are remotely controlled by a human operator using a 2D or 3D controller device under visual feedback provided by one or more cameras.

Operator



Teleoperated Robot



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Teleoperation of Touch Screen Using 6-Degree-of-Freedom Robot Arm

General purpose teleoperated mobile robotic systems usually have difficulty gently manipulating hard objects, such as a touch screen with high accuracy due to the inaccurate inputs provided by the controller device.



Problem:

Safe and precise telemanipulation of touch screens (or other similar control panels) using a teleoperated mobile robot is difficult without specialized controller.



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Teleoperation of Touch Screen Using 6-Degree-of-Freedom Robot Arm

A specialized teleoperation interface is needed for touch screens!

Operator Console
for Touch Screens



Teleoperated Remote Robot



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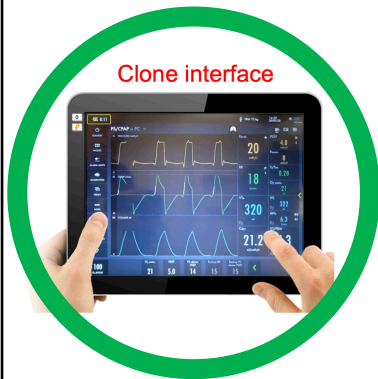


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Teleoperation of Touch Screen Using 6-Degree-of-Freedom Robot Arm

A specialized teleoperation interface is needed that:

1. Can **detect touch screen** on camera's image.
2. Can **register** remote **robot arm** to detected touch screen.
3. Un-distorts (de-warps) camera's image to **create "front view" image**.
4. **Clone interface**: Displays touch screen's un-distorted content on the operator's robot control console.
5. Allows operator to **select touch position** on the **clone interface**.
6. **Commands** remote **robot** to approach and gently **touch** the touch screen at the position that was selected on the **clone interface**.

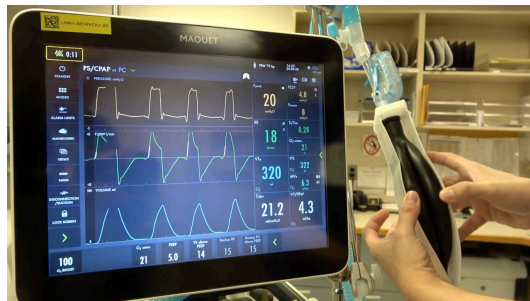
Next slide: Video demonstrating clone interface



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Teleoperation of Touch Screen Using 6-Degree-of-Freedom Robot Arm

Camera feed from remote robot



Clone interface



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Teleoperation of Touch Screen Using 6-Degree-of-Freedom Robot Arm

- **What Students Will Do:**
 - Create teleoperated robotic system using ROS based software
 - **Master:** Conventional computer interface with keyboard and mouse.
 - **Remote:** Rigidly mounted 6 DoF robot manipulating a nearby touch screen.
- **Deliverables:**
 - Develop **master** and **remote** systems:
 - Build robot end effector for touching screen; setup robot, camera and touch screen.
 - Calibrate camera and robot.
 - Capture camera images on remote and send them over to master.
 - Detect touch screen on camera image and create clone interface on master.
 - Generate touch input position on master in clone interface using mouse.
 - Command remote robot to touch screen at selected position.
- **Size group:** 2-3
- **Skills:** Computer Vision, ROS, Robot Control
- **Mentors:** Balazs Vagvolgyi (balazs@jhu.edu); Anton Deguet (anton.dequet@jhu.edu)

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Teleoperation of Touch Screen Using 6-Degree-of-Freedom Robot Arm

Movie time!

https://www.youtube.com/watch?v=ZG6RdPfghJs&feature=emb_title

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