ForceBot: A Robotic Platform for Body-Scale Human Physical Interaction in Embodied Virtual Reality

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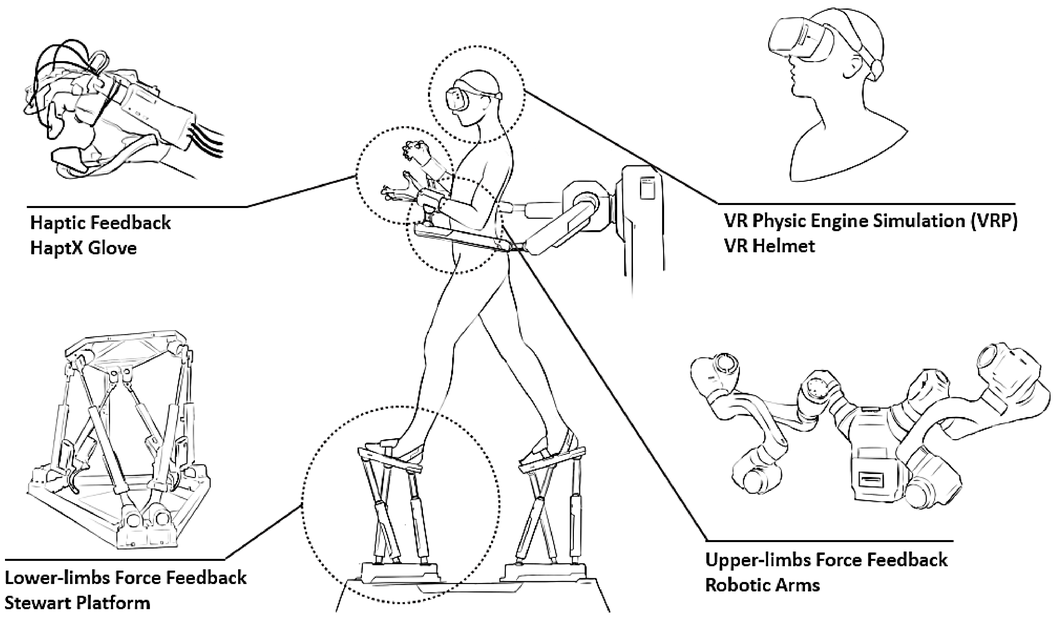
ForceBot is a novel convergence of VR, robotic control, sensory feedback, ergonomics, and human factors fields. The proposed VR system will provide interactive, full-body force feedback from a virtual environment.



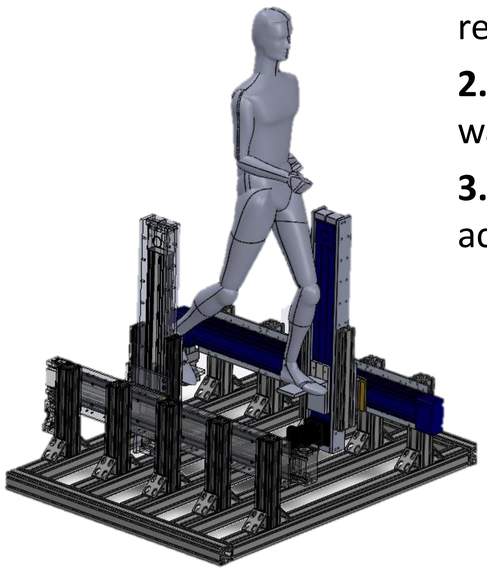
Broader Impacts

- Explore a wider range of human-robot interaction scenarios and exoskeleton control strategies
- Improve industrial exoskeleton design, implementation, and safety
- Applications in VR exoskeleton-assisted rehabilitation and intensive body motion training in sports, gaming, and industry

Project Goals

- Investigate the ability of exoskeletons to adapt to different tasks, environments, and users
- Use active haptics to expand the range of sensations relevant to a VR environment while minimizing modifications to software and hardware
- Overcome current controls and dynamics complexity limitations: simplify user dynamics and interactions to four interaction wrenches at the hands and feet

Lower-Body Force Feedback Methods and Challenges



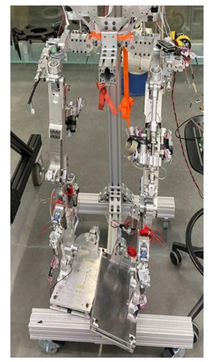
Two-Axis Gantry Robot

1. Two-Axis Gantry Robot: high force and acceleration requirements

2. Stewart Platform: infeasible platform dimensions, walking range of motion likely to cause collapse

3. OLL-E Exoskeleton: water cooling needed to achieve torque requirements

Stewart Platform



OLL-E exoskeleton, NSF #1525972

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