Mobile Manipulation Teleoperation Using a Compliant Exoskeleton

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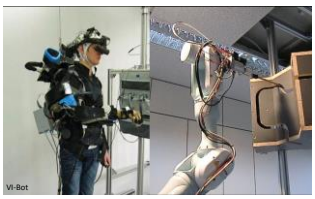
Introduction

- Exoskeletons provide a potential solution for teleoperation of mobile manipulations, in applications such as security, surveillance and manufacturing.
- This project aims to provide a new exoskeleton architecture for robot teleoperation, with a compliant and flexible human-robot interface.



Background

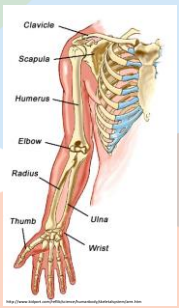
- Current exoskeletons are mainly rigid and have limitations when used as human-robot interfaces in teleoperation.
- Exoskeletons that cover all human degrees of freedom are not available.

Research Objectives

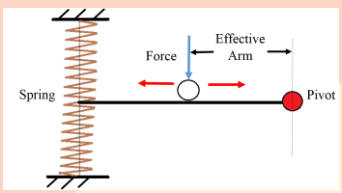
- Human motion based light, flexible, compliant exoskeleton design
- Compliant robot modeling and control
- Mapping between exoskeleton space and robot space.
- Control strategy for mobile manipulation using exoskeletons.

Research Methodology

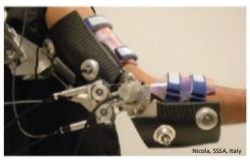
❑ Human anatomy investigation, motion tracking, encoding and representation



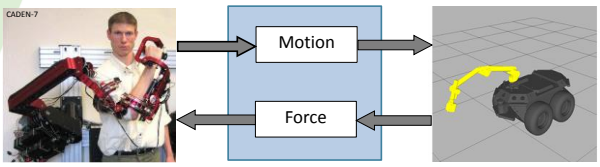
❑ Novel Compliant Joint Design with Variable Stiffness



❑ Compliant Exoskeleton Arm Design



❑ Teleoperation Control System with Haptic Interface



❑ Validation Criteria:
- Bandwidth
- Accuracy
- Efficiency
- Force feedback capability

Outcomes

- ❖ Human arm motion model for exoskeleton design
- ❖ Exoskeleton design to adapt to human arm motion
- ❖ A compliant joint design for exoskeletons
- ❖ Kinematics and dynamics model of the exoskeleton
- ❖ Exoskeleton-Operation space mapping strategy
- ❖ Feedback control strategy for mobile manipulation
- ❖ Compliant exoskeleton for mobile manipulation

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Collaborators

- ❖ BioRobotics Institute, SSSA, Italy
- ❖ Artificial Inteligence Lab, Stanford University, USA

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