



Force Feedback Leader Arm for High Quality Demo Data using F/T Sensor

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Portfolio



Introduction

- Why do we need high quality demo data?
 - Demo data quality = Imitation learning output (Action)
 - Vision sensors have inherent limitations
 - Lack of physical interaction data

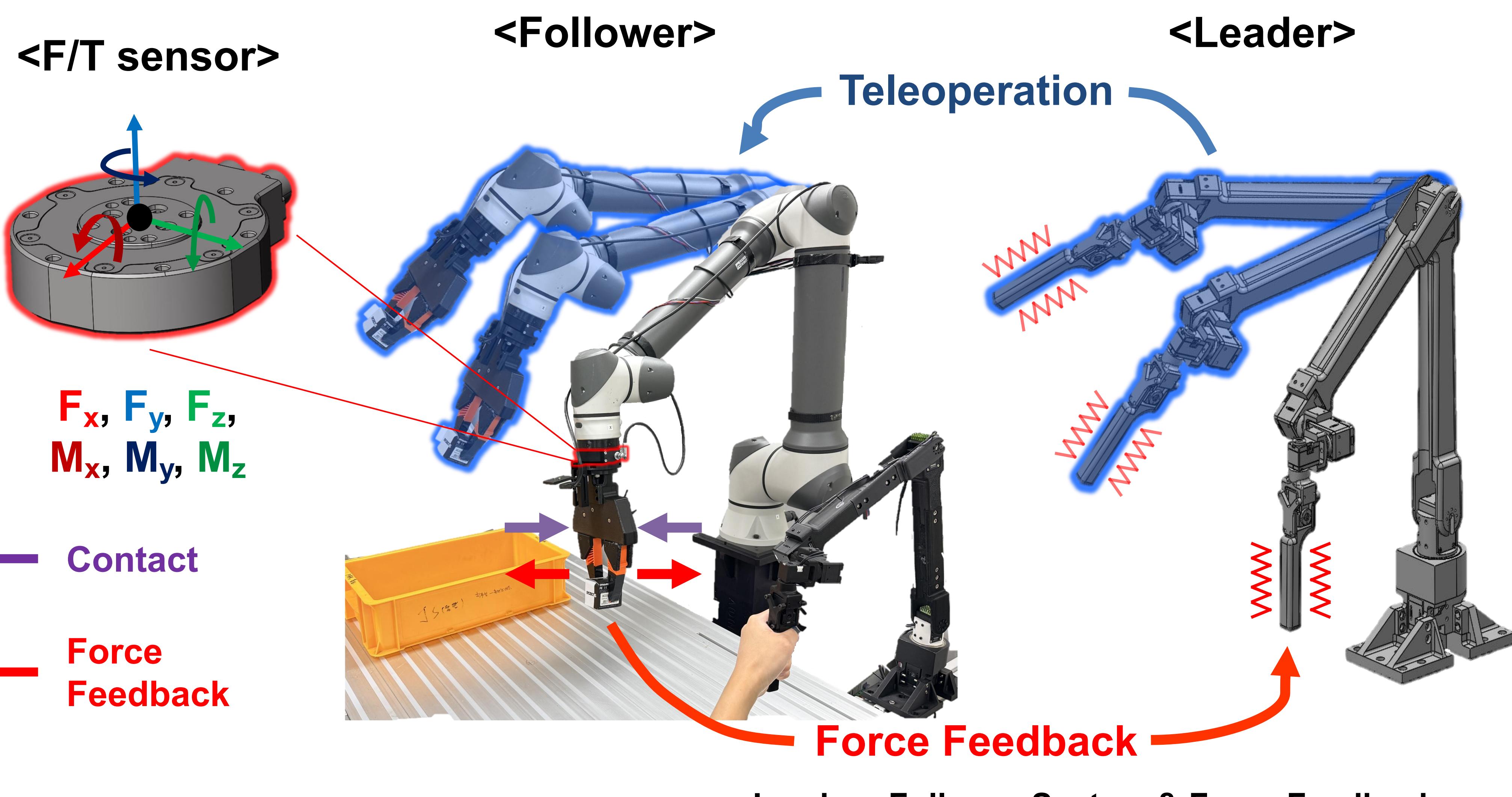
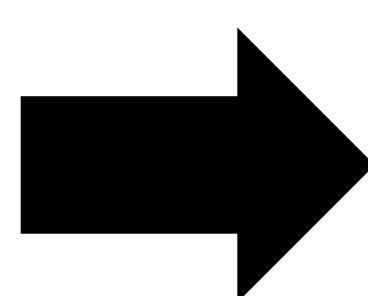


Explain & Results

- Force Feedback via F/T sensor
 - $\tau_{Feedback} = k_f(J^T F_{ext})$:
Senses contact through leader arm's force feedback
- Gravity Compensation
 - $\tau_{Gravity} = k_g(J^T F_{gravity})$:
Compensates for the leader arm's self-weight
- Teleoperation
 - Leader current joint angles = Follower target joint angles
 - Teleoperation w/ feedback and gravity compensation

Results

1. Faster and easier collection of **high-quality demo data**
2. More **intuitive** and immersive manipulation
3. Utilization of **force data for training**
4. Precise control
5. System **scalability** & cost reduction



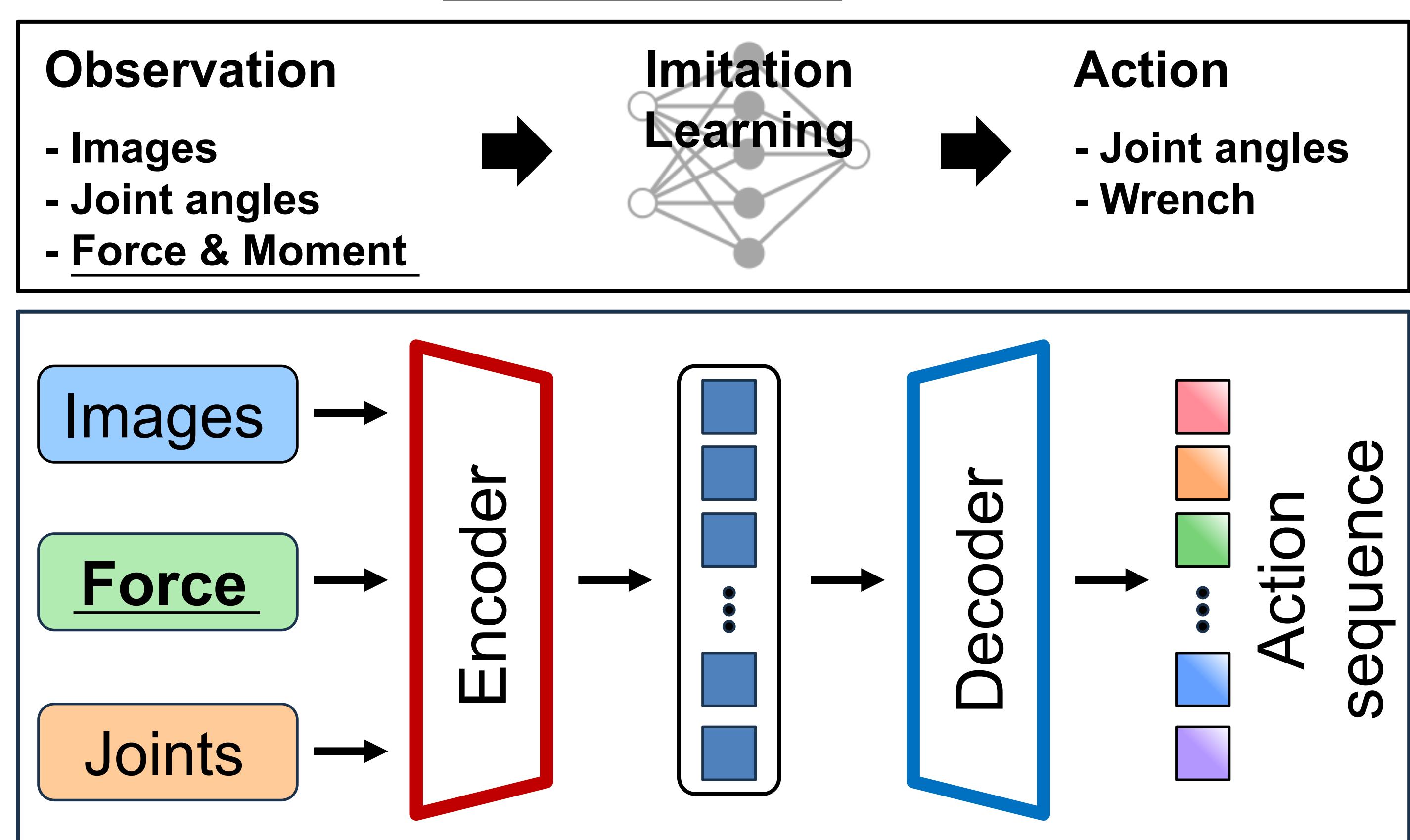
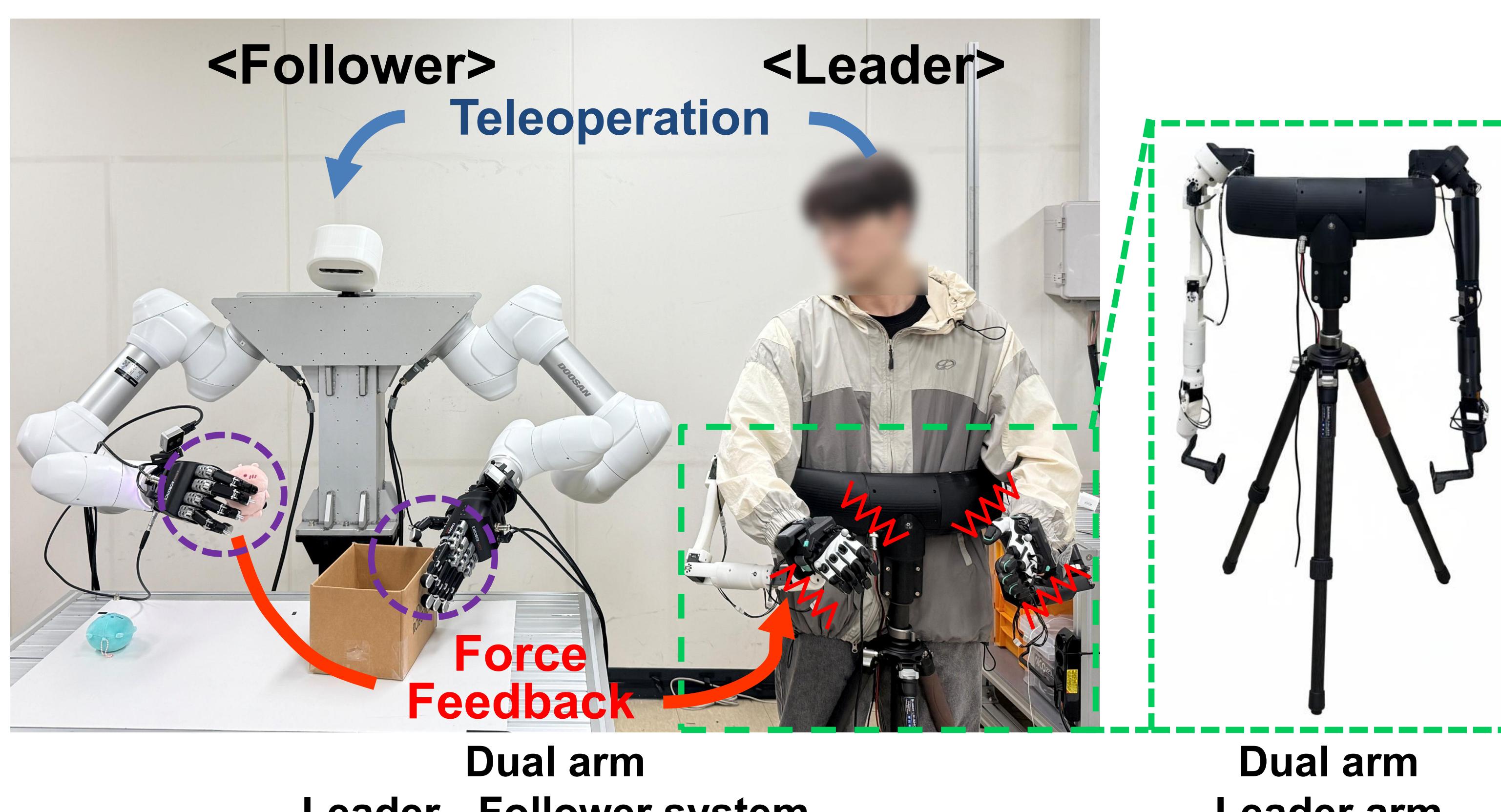
Functions

1. **Force Feedback**
enabled on all joints
(Follower → Leader)
2. **Gravity compensation**
enabled on all joints
3. **Teleoperation**
(Leader → Follower)

Applications

- **Modulization**
 - Force feedback and data acquisition can be implemented without altering the existing setup, simply by adding an F/T sensor.
 - **Easily scalable & Easy to set** the system.

- **Multimodal Imitation Learning**
 - Force data can be used to train the policy
 - Learn policy from high-quality demos
 - Learn policy with contact-awareness



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