

Six-DoF Hand-Based Teleoperation for Omnidirectional Aerial Robots

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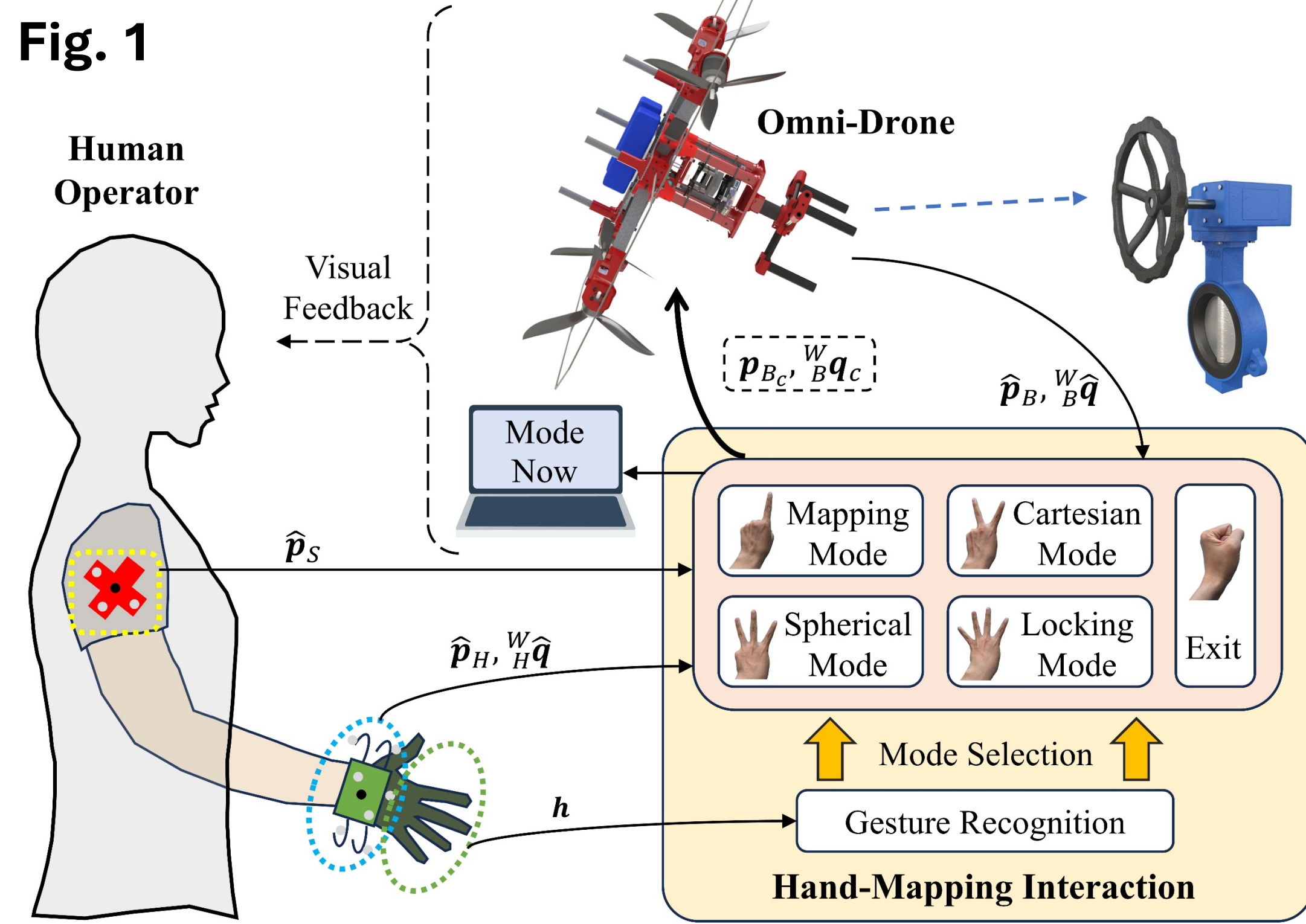
³HNL Lab, ME, The University of Tokyo



The **first time** the rotational dexterity of human wrist is intuitively shown on an omnidirectional aerial robot

Aerial Teleoperation System

Contribution 1



Interaction Framework – Contribution 2

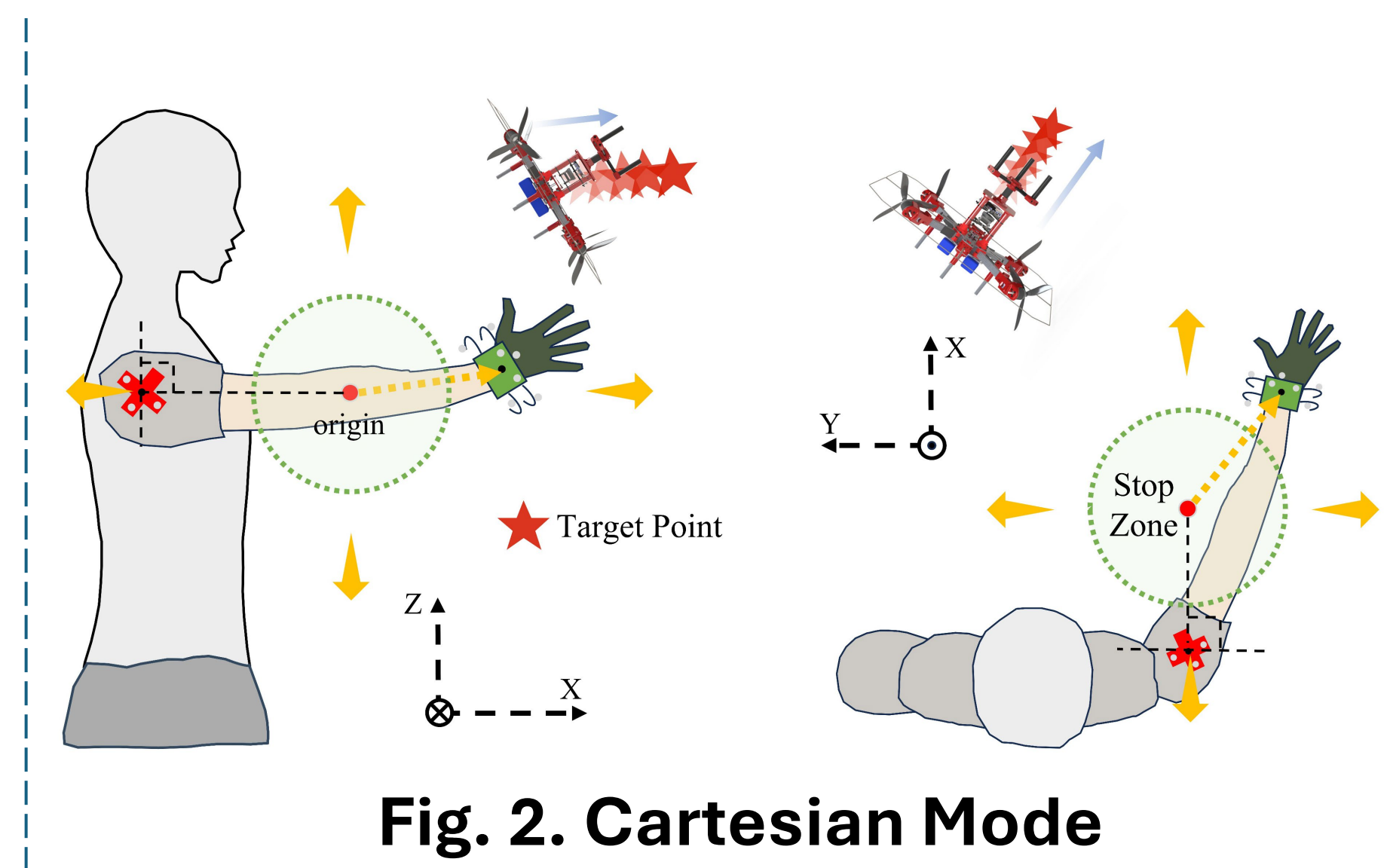


Fig. 2. Cartesian Mode

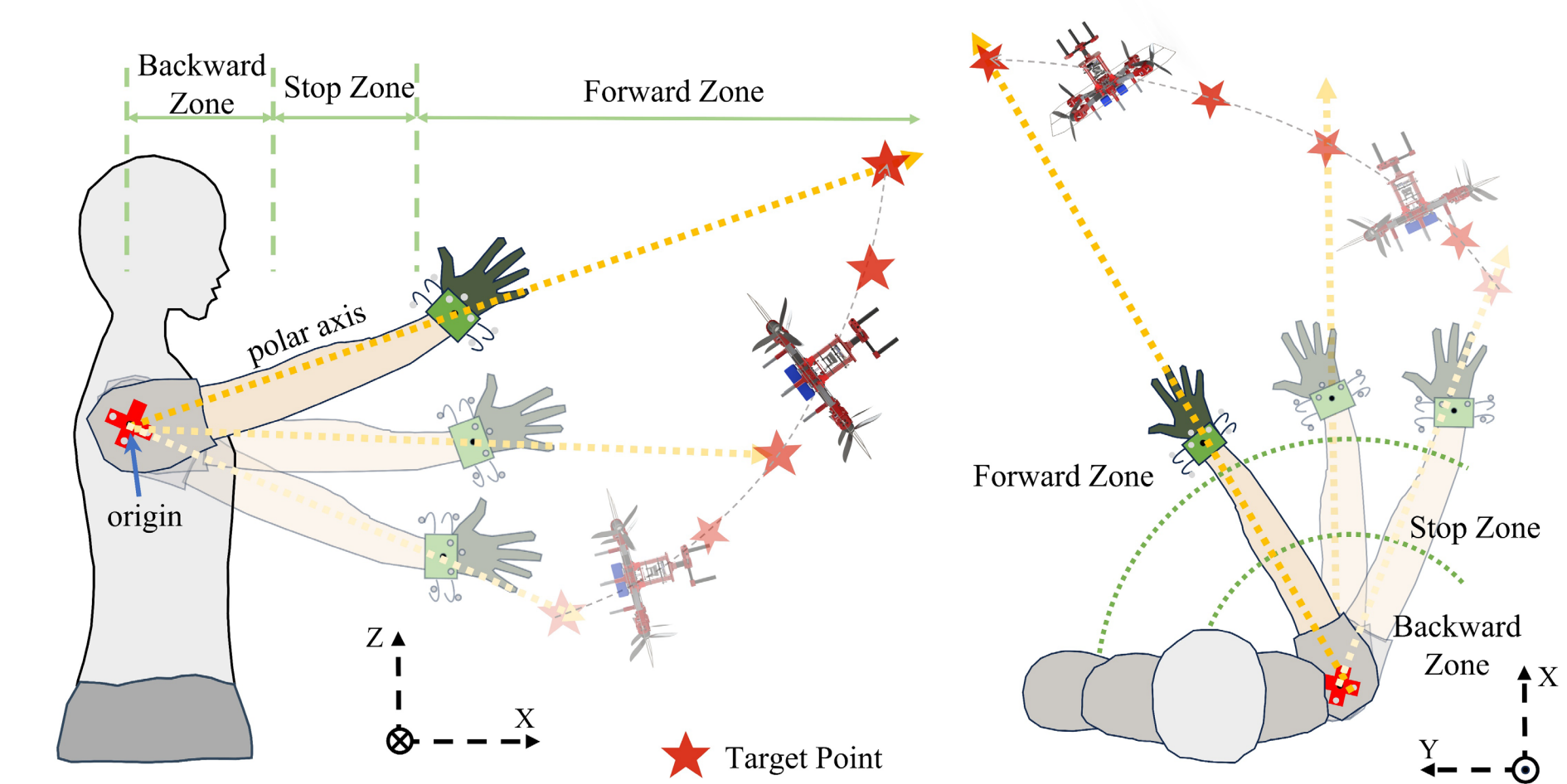


Fig. 3. Spherical Mode

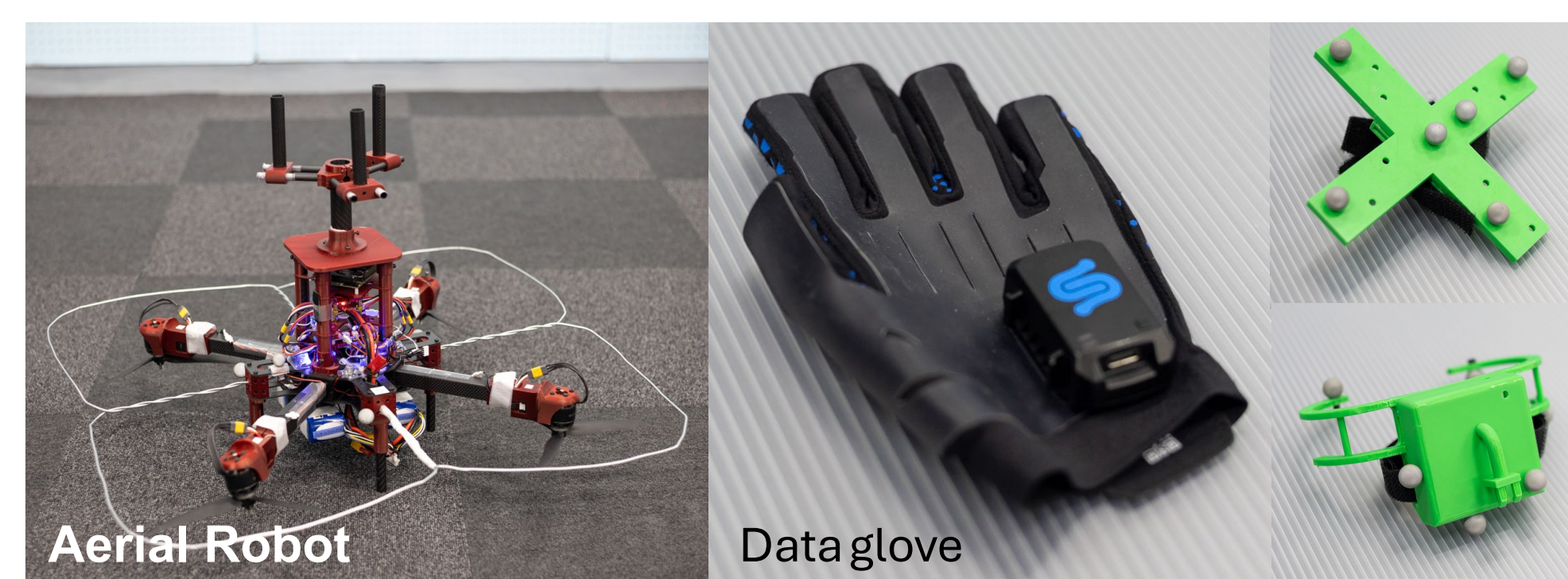


Fig. 4. Operation Mode

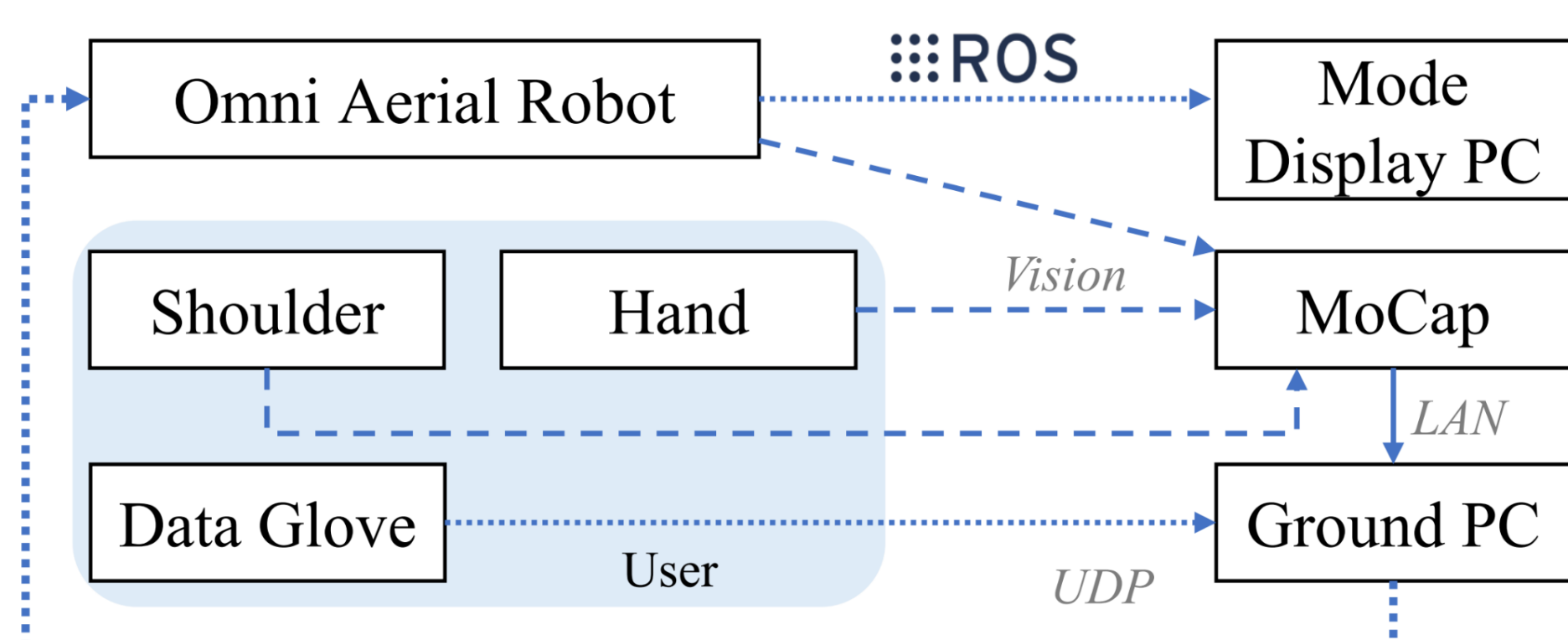


Fig. 5. Communication workflow

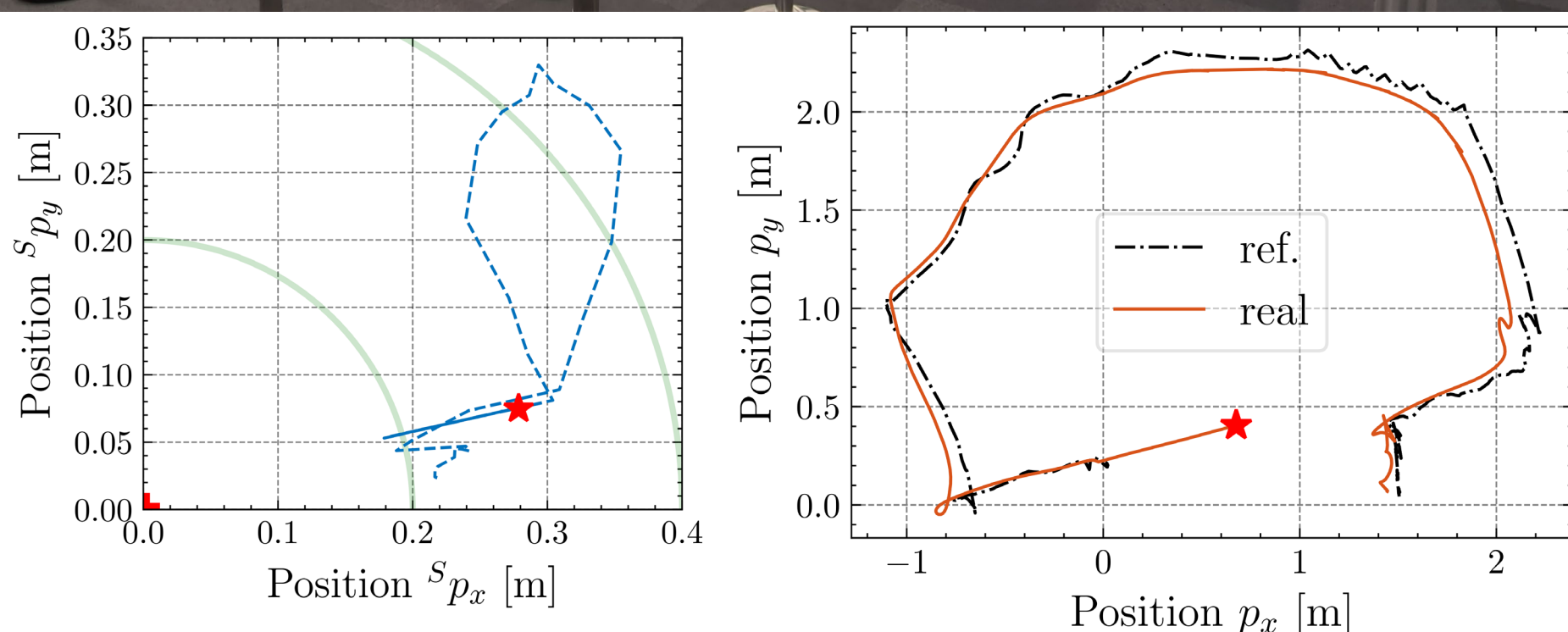
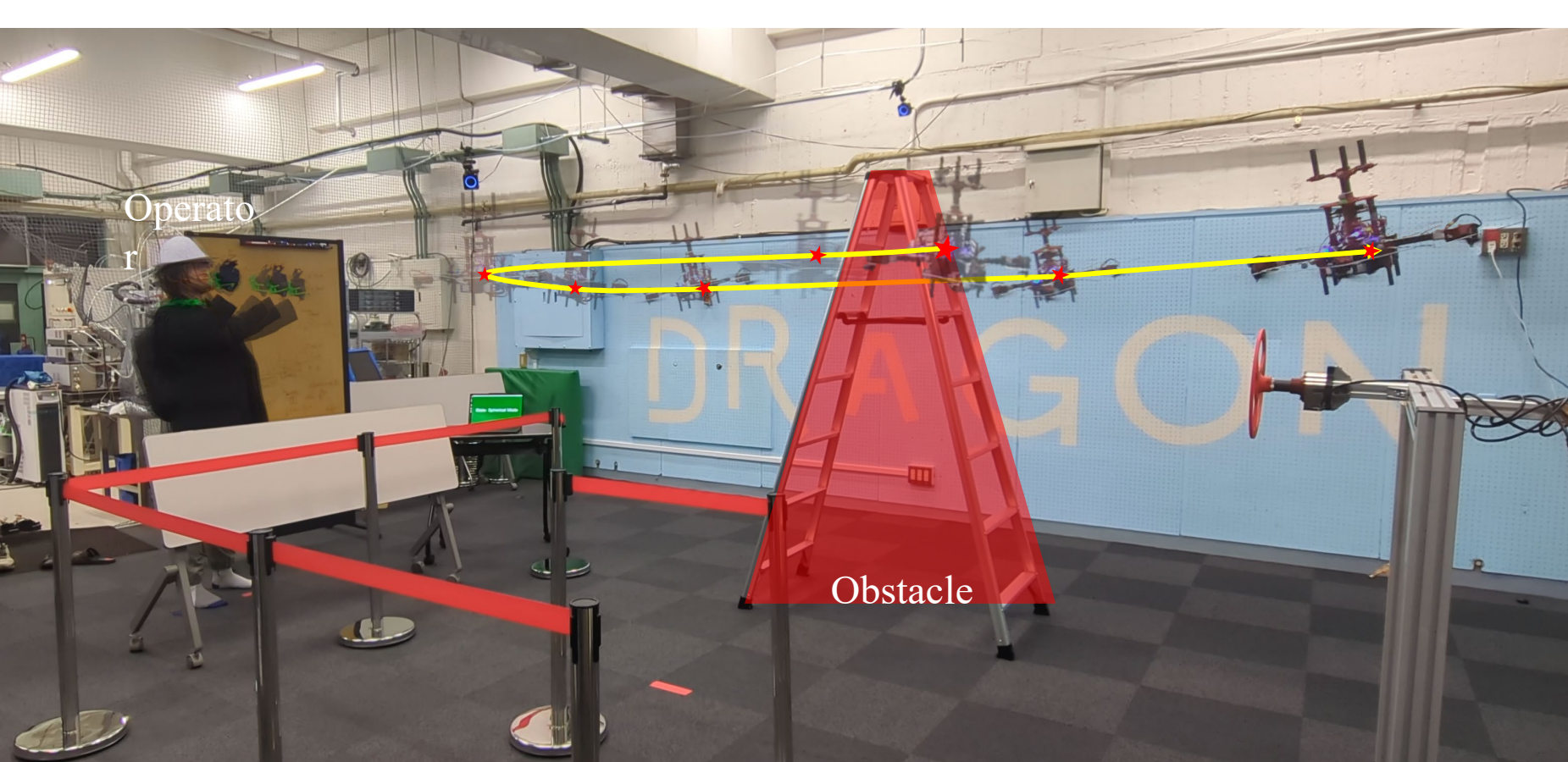


Fig. 6. Bypass an obstacle by Spherical Mode

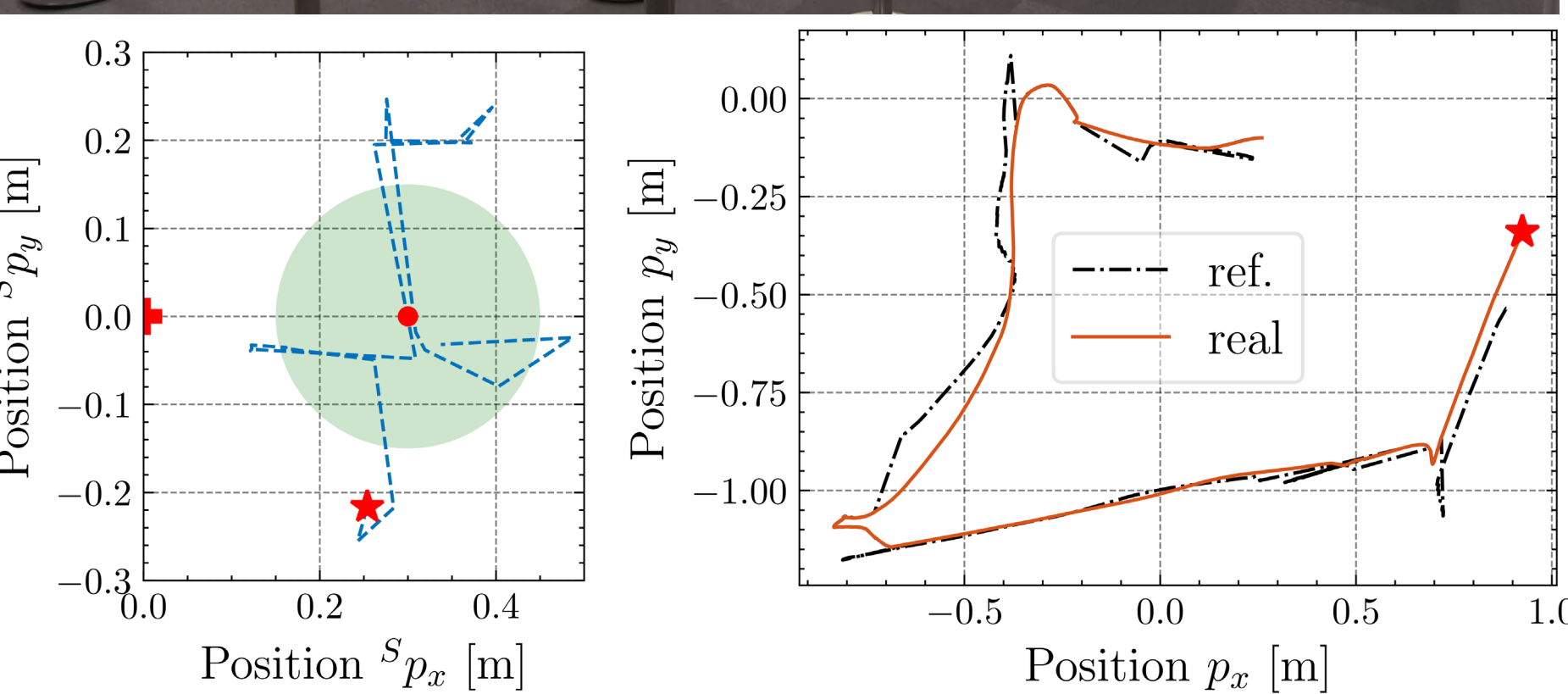
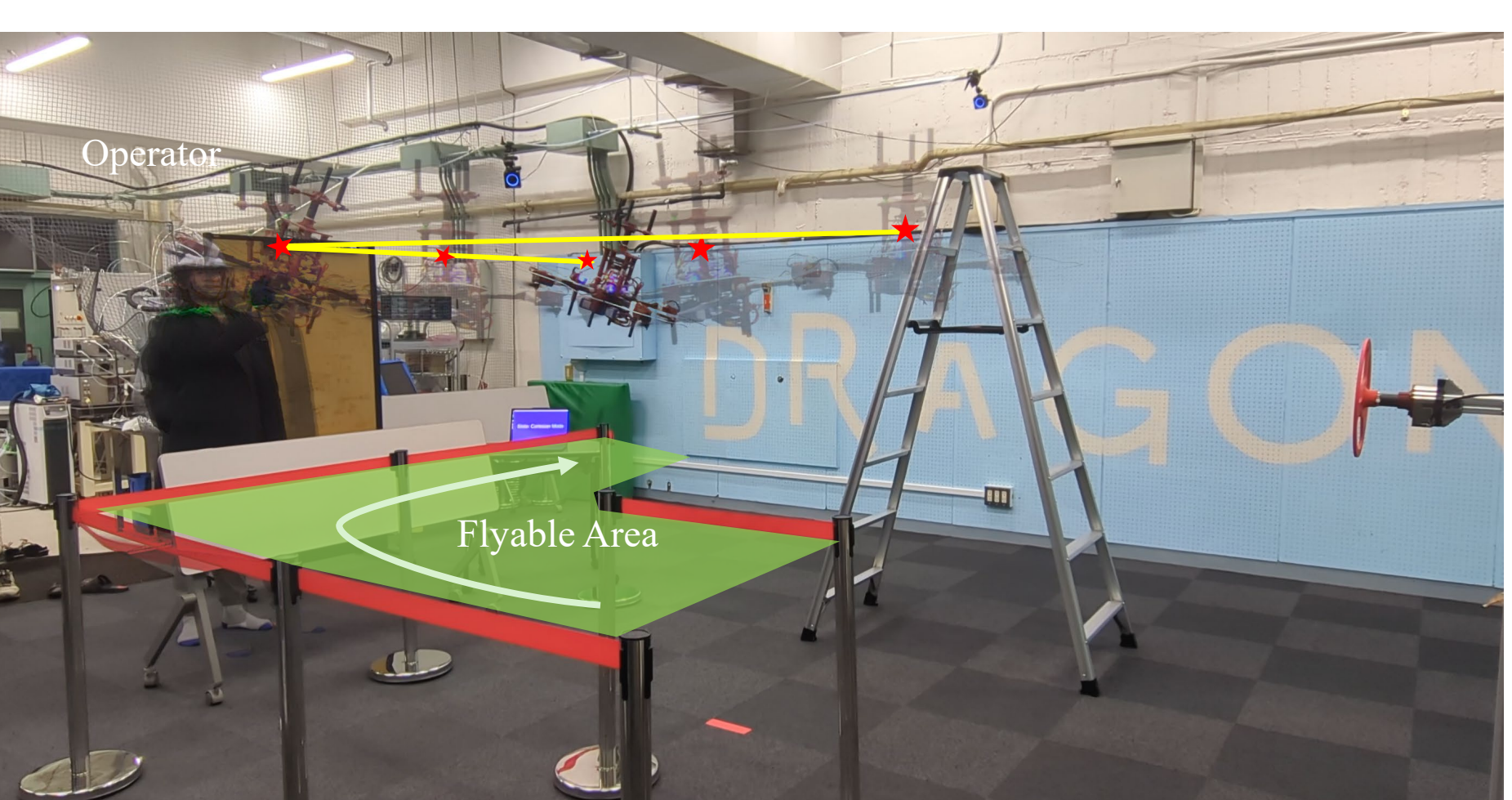


Fig. 7. Right-angle turn using Cartesian Mode

Experiments – Contribution 3



Fig. 8. Valve-Turning Scenarios: The operator switches to *Operation Mode* for precise manipulation, but the line of sight is blocked by the robot. To overcome this, they switch to *Locking Mode*, move to a different position, return to *Operation Mode*, and successfully complete the task.

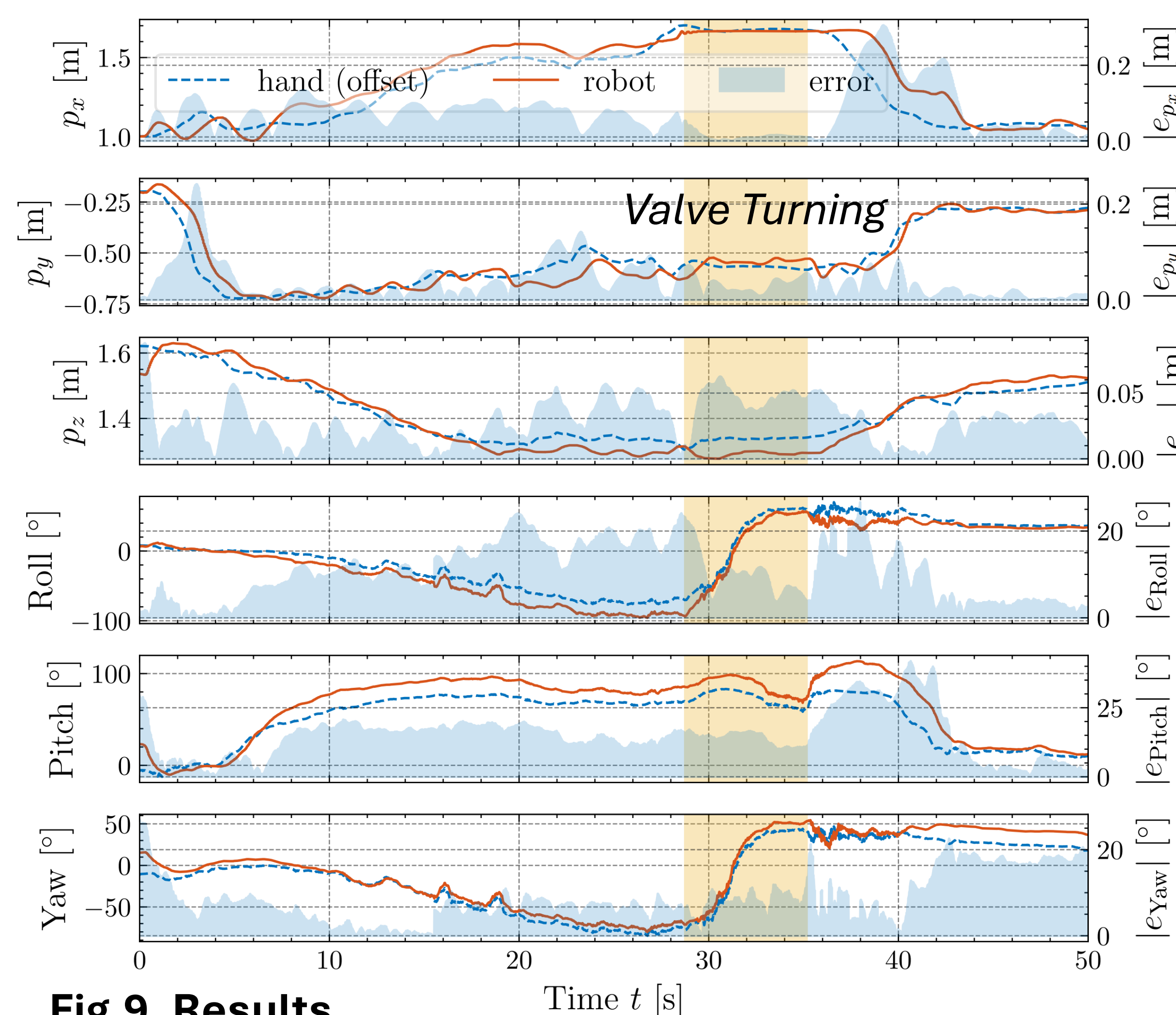
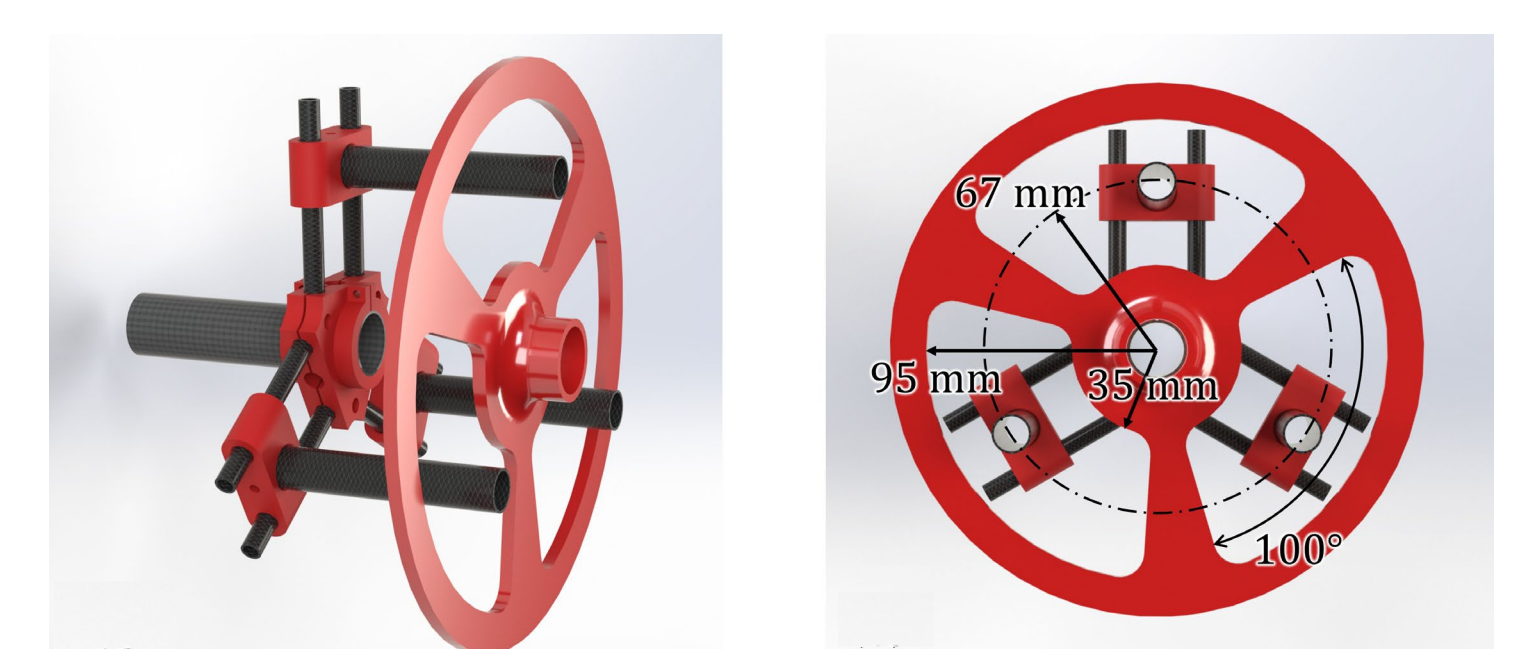


Fig. 9. Results



Future Work

- Onboard state estimation
- Outdoor teleoperation
- Beyond-visual-range control
- Delay compensation
- Force feedback

