1. Motivation

For high-dynamic robot-environment interaction tasks in mobile manipulators, achieving ***rapid, low-lag uncertainty*** compensation with ***only partial models*** and ***readily available signals*** (e.g., base velocity) remains challenging.

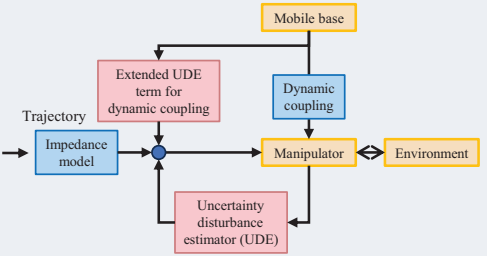
2. Approaches

1. A dynamic coupling-integrated manipulator model

In this model, the base kinematics are incorporated into the manipulator dynamics, which streamlines the modeling process for control purposes and avoids whole-body dynamic modeling of mobile manipulators.

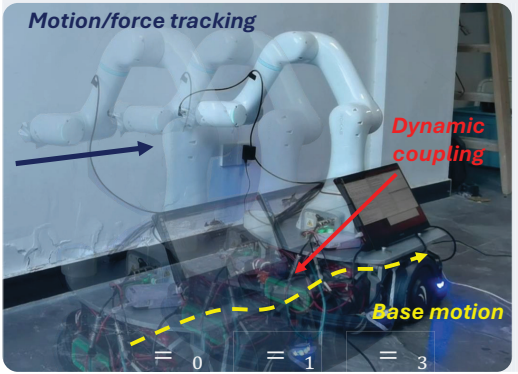
2. Extended UDE for motion/force control of mobile manipulators

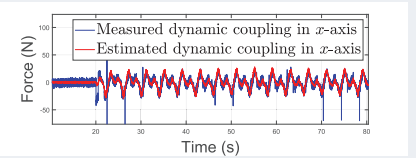
To enhance the transient response under dynamic couplings, an extended UDE is proposed to estimate dynamic coupling terms in the feedforward control loop. The other unmodeled uncertainties are compensated in the feedback loop.

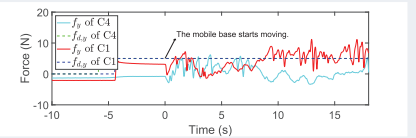


3. Experiment Results

Wall-cleaning experiments are conducted to verify the effectiveness of the proposed approach in compensating for dynamic couplings and uncertainties.







	Experiment 1		
Controller	RMSE	MAE	SSE
C4: Impedance control	2.888	2.091	1.403
C1: Ours approach	**2.518 (12.81%)**	**1.932 (7.60%)**	**-0.070 (95.04%)**