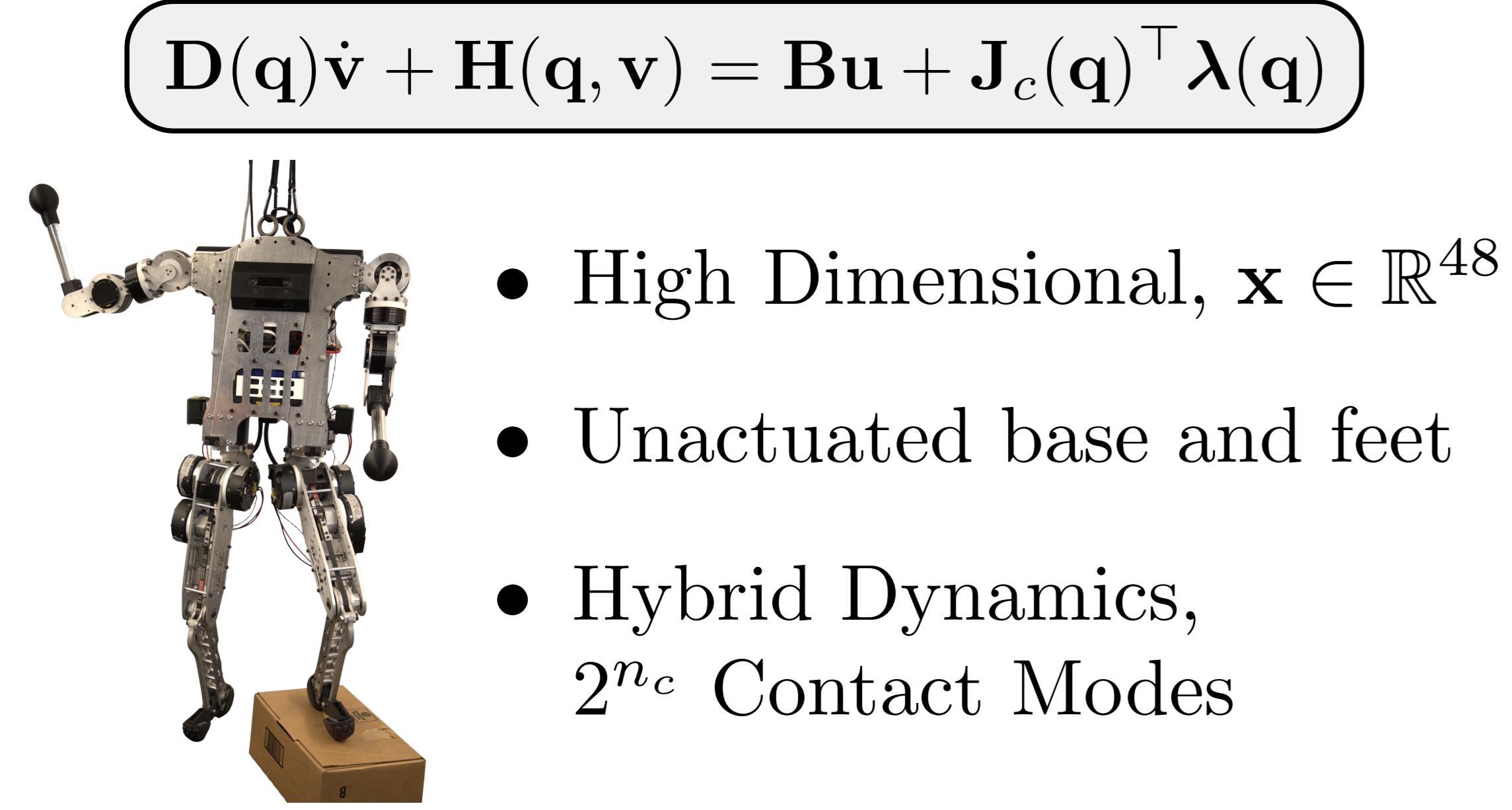


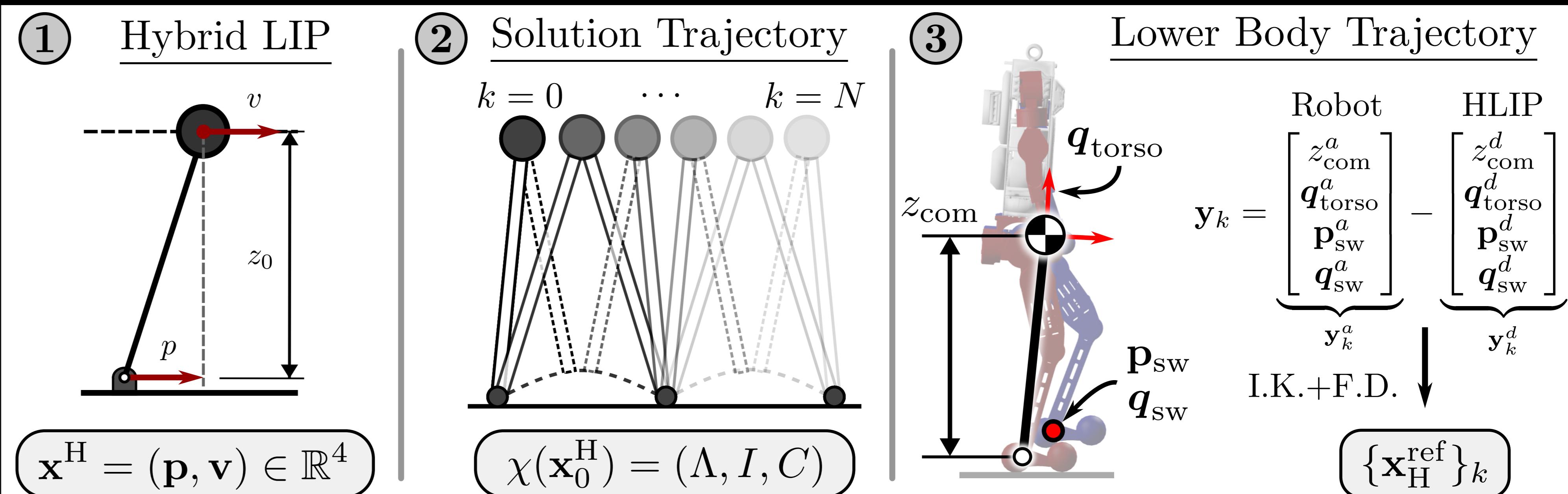
Reduced-Order Model Guided Contact-Implicit Model Predictive Control for Humanoid Locomotion

Sergio A. Esteban, Vince Kurtz, Adrian B. Ghansah, and Aaron D. Ames

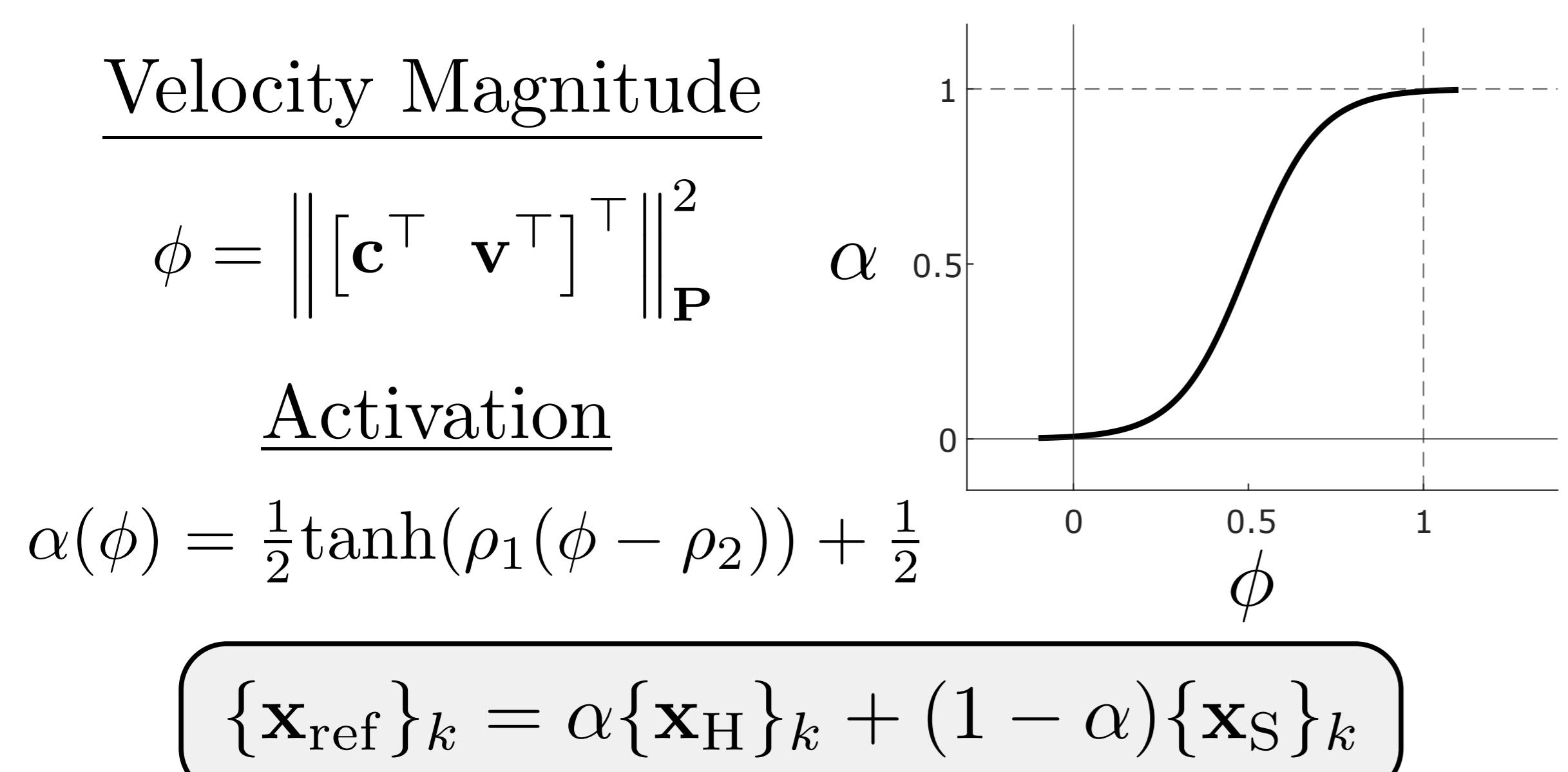
Humanoid Control



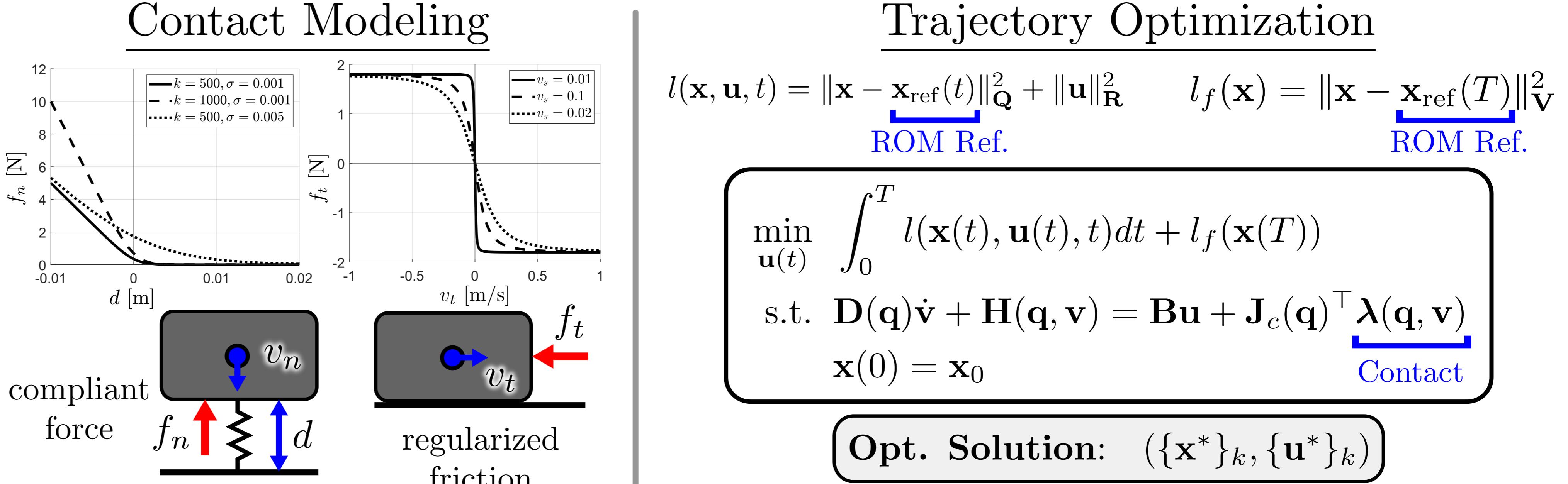
Reduced-Order Model References



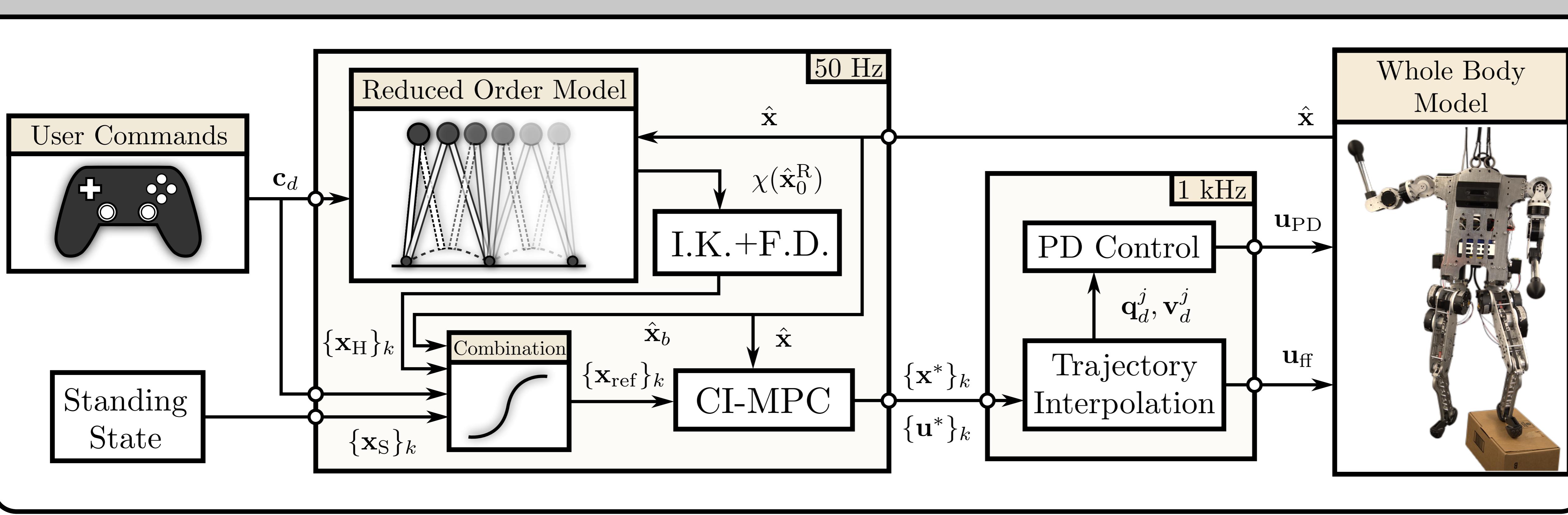
Trajectory Combination



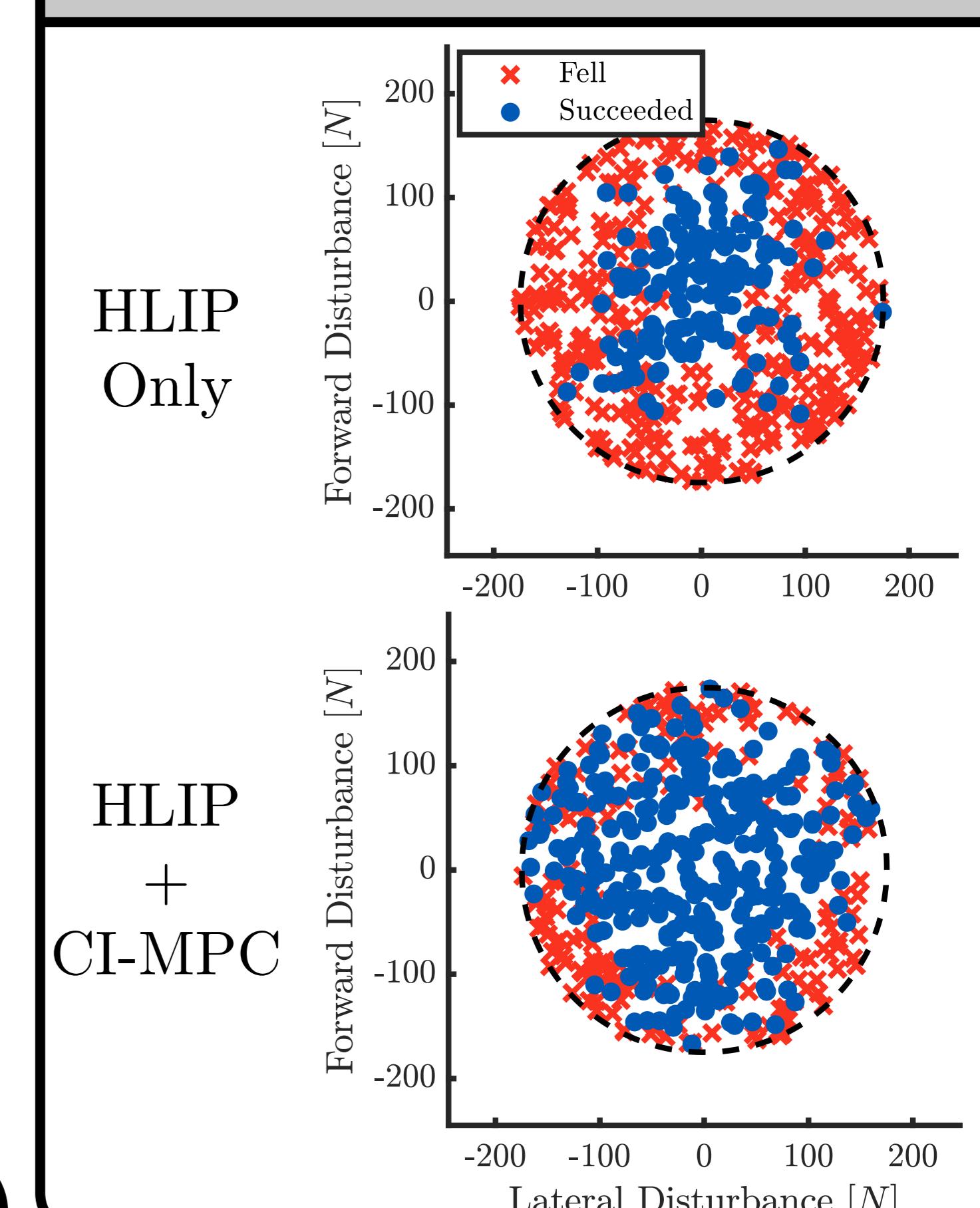
Contact-Implicit MPC



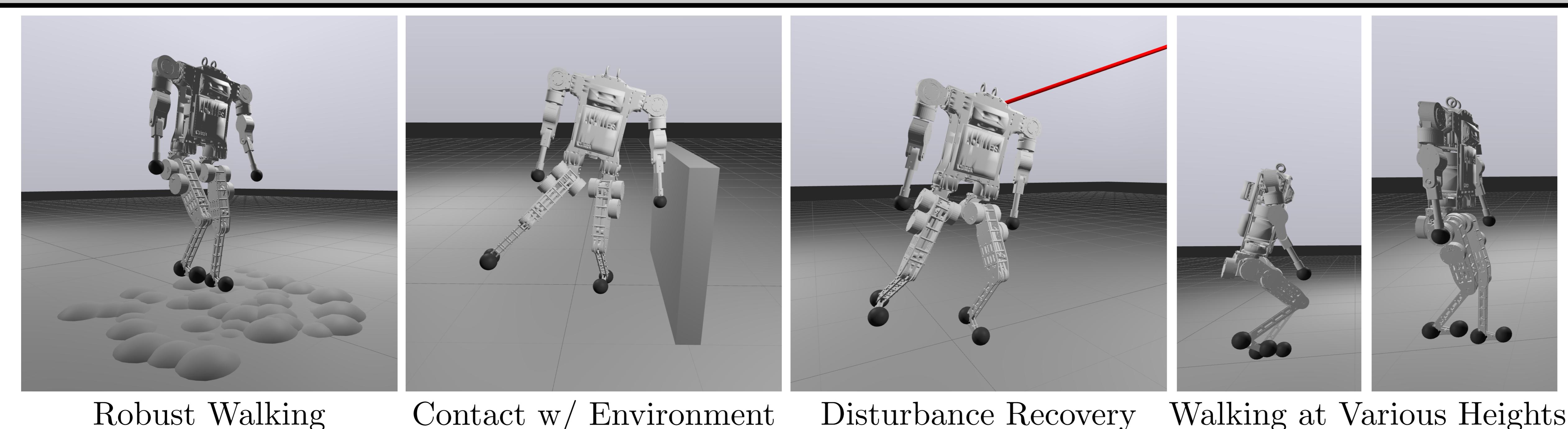
Control Architecture



Robustness



ROM Guided CI-MPC Behaviors



Implementation

HLIP & MPC Params:					
HLIP	CI-MPC				
$T_{\text{ssp}} [s]$	$z_0 [m]$	$\Delta t [s]$	N	Freq. [Hz]	Iters.
0.35	0.62	0.05	25	50	3

Key Takeaways

- Layered architectures enable modularity which can be leveraged.
- Contact relaxation enables discovery of diverse behaviors.
- Gradient-based methods for contact planning does not scale well.

Project Page

