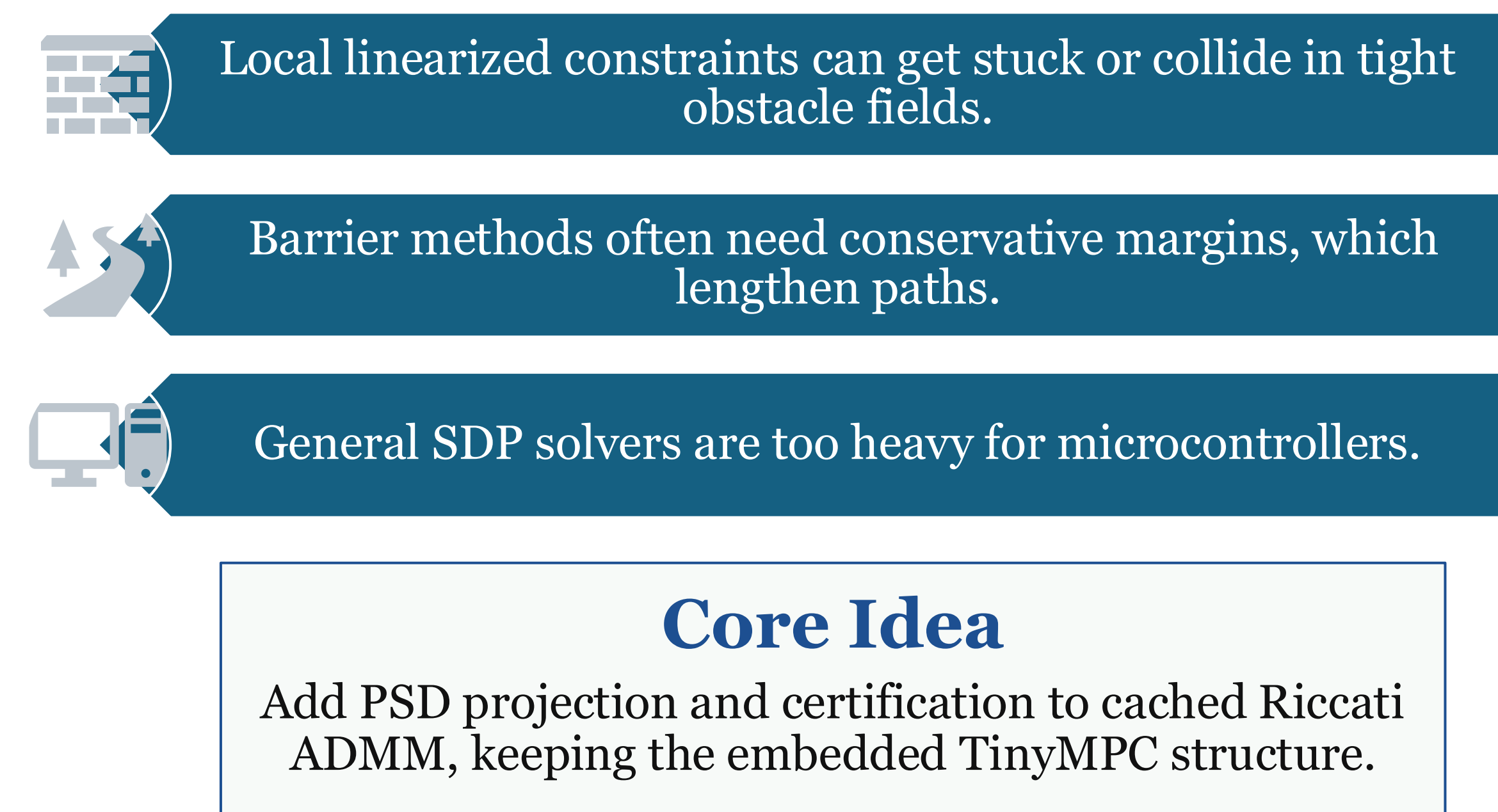


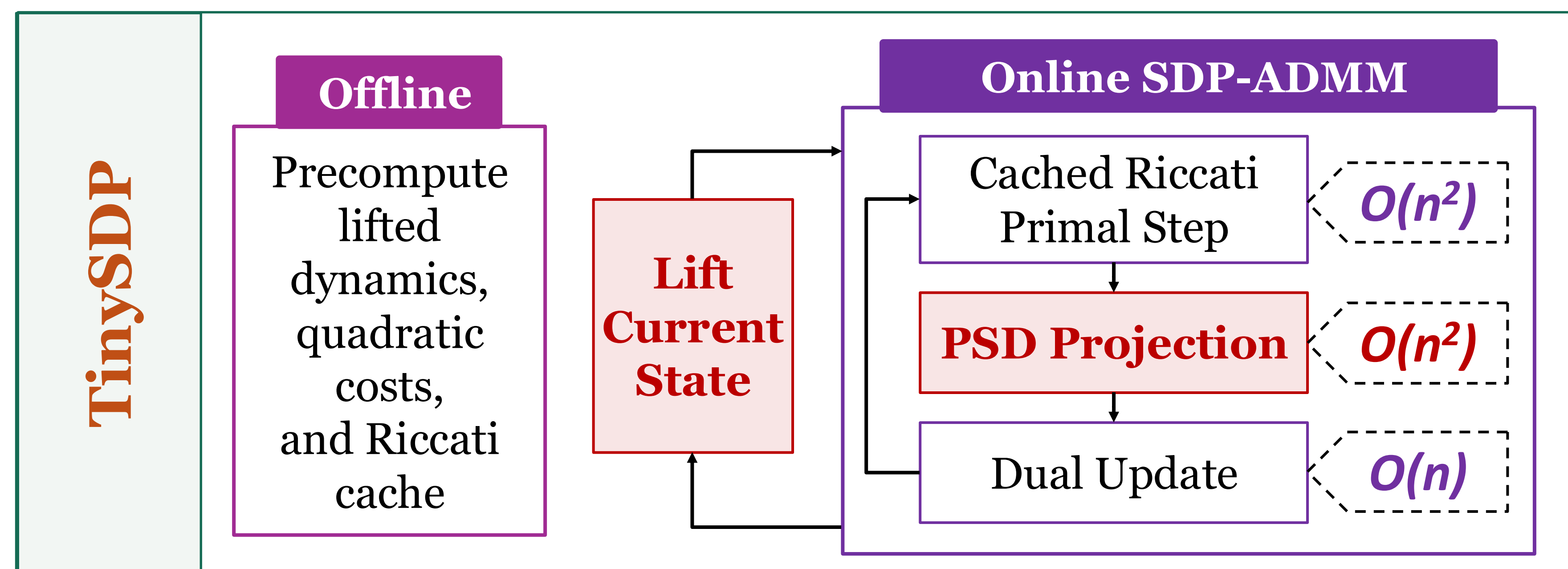
The Big Picture:

- **Microcontroller SDP:** TinySDP brings semidefinite optimization onto resource-constrained robots for obstacle-aware MPC.
- **Nonconvex Safety via Lifting:** Lifted PSD constraints encode keep-out geometry while preserving a Riccati-friendly compute.
- **Certify before Control:** A posteriori rank-1 checks certify the SDP relaxation at each control step before applying the control.

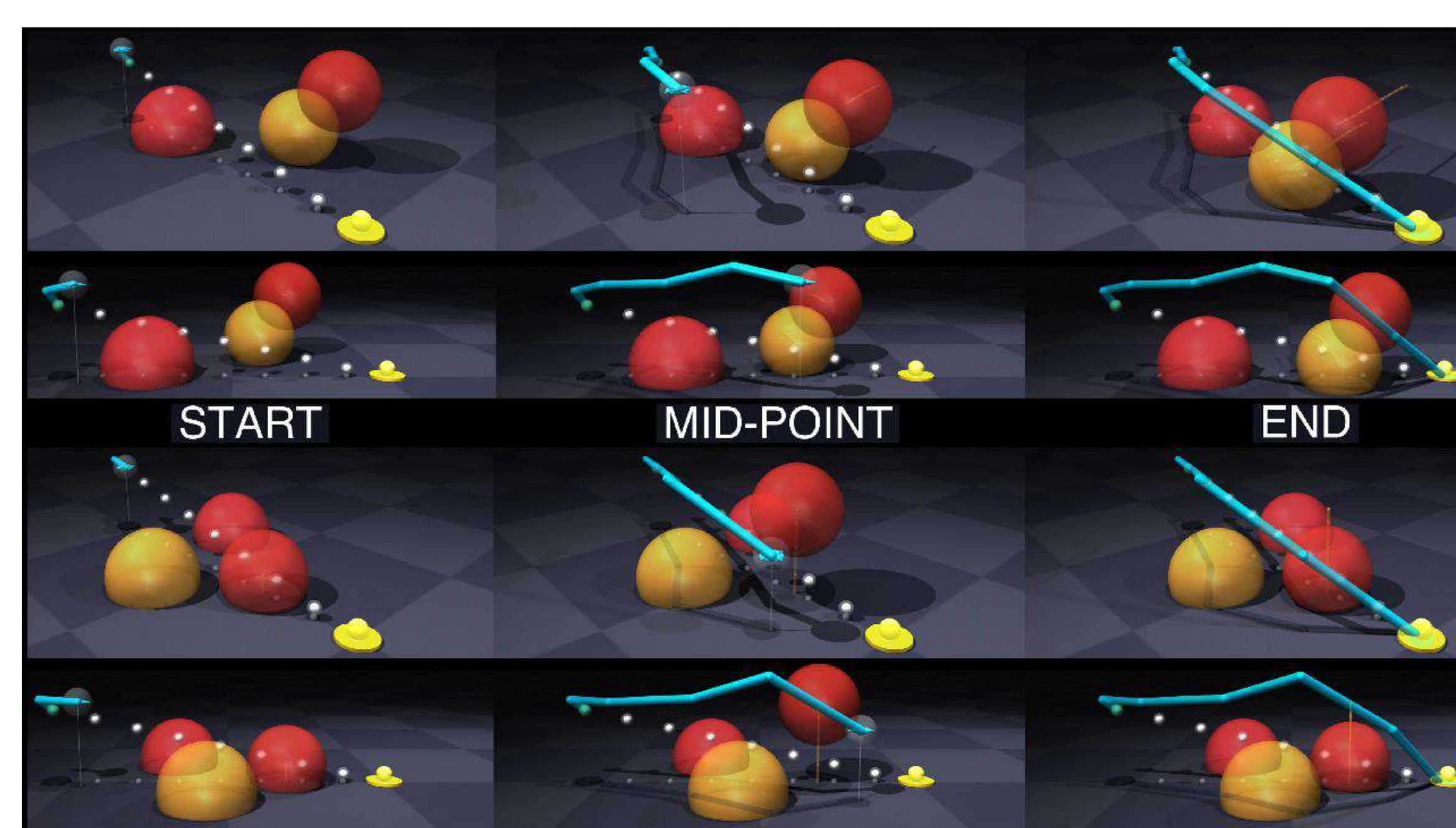
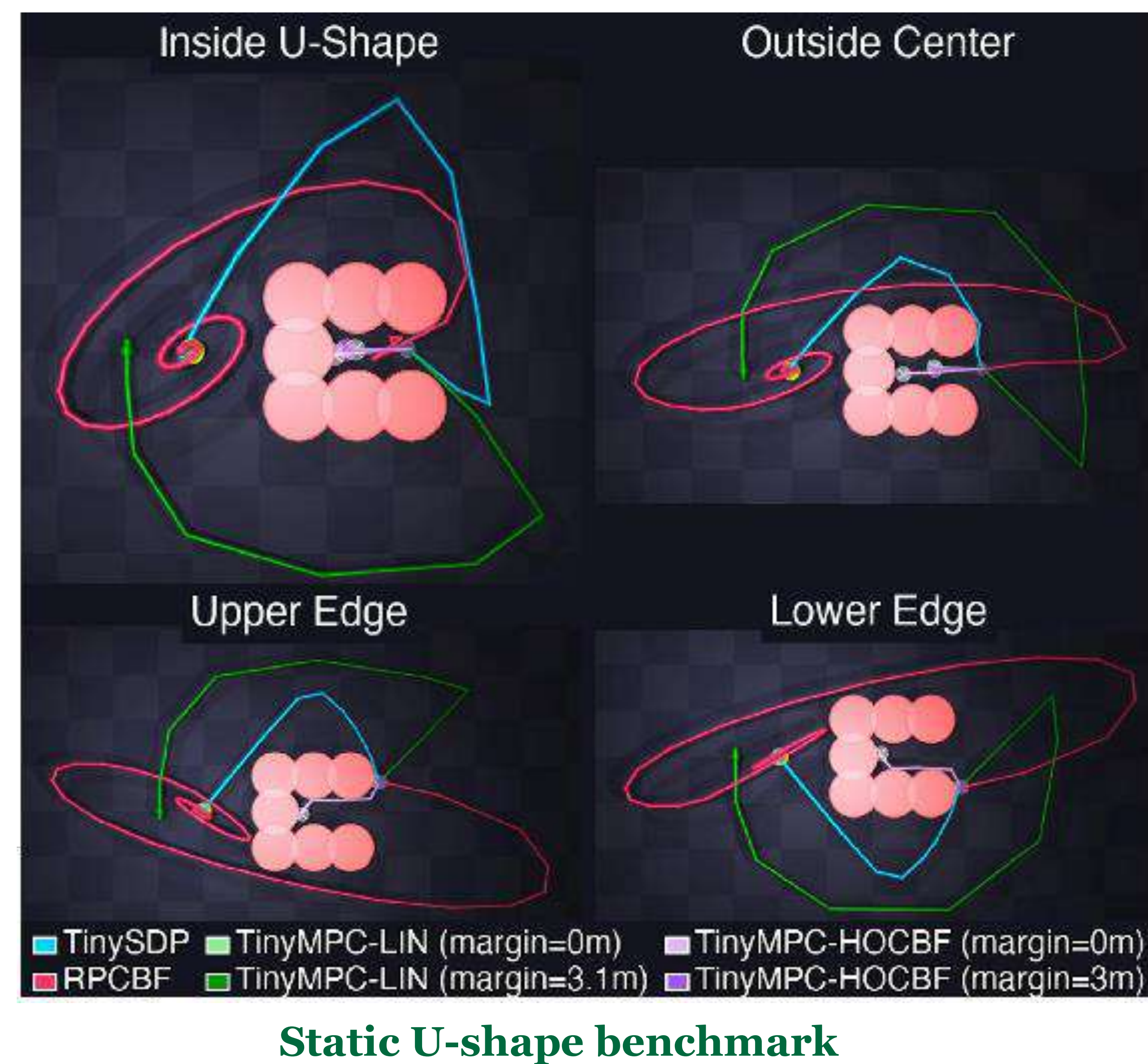
Background:



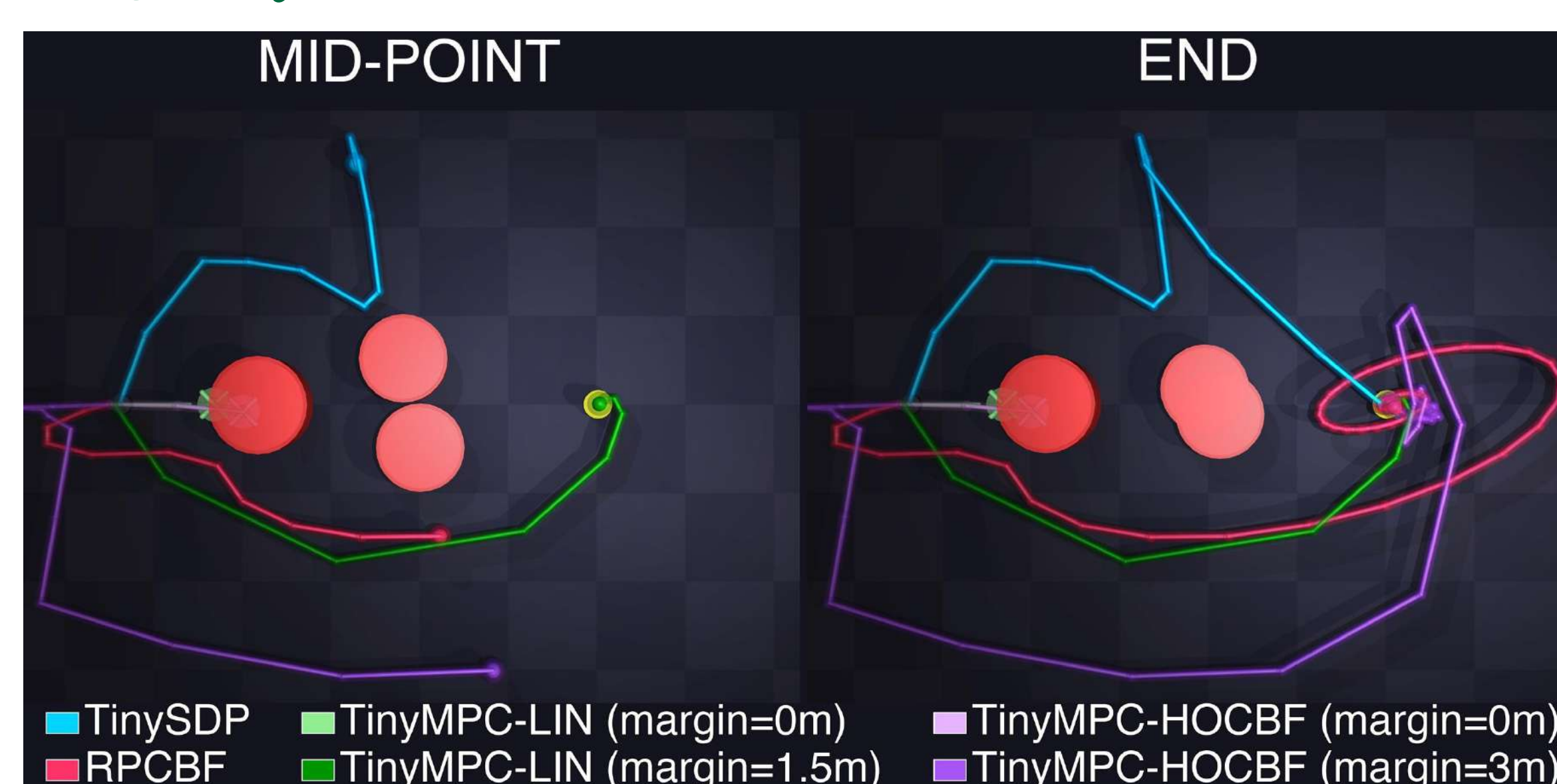
TinySDP Solver Structure:



Experimental Results:



3D dynamic obstacle avoidance extension



Dynamic moving-gap benchmark

73%

shorter paths than the strongest baseline in the static U-shape benchmark

1.47 KB

static memory overhead for PSD variables and projections

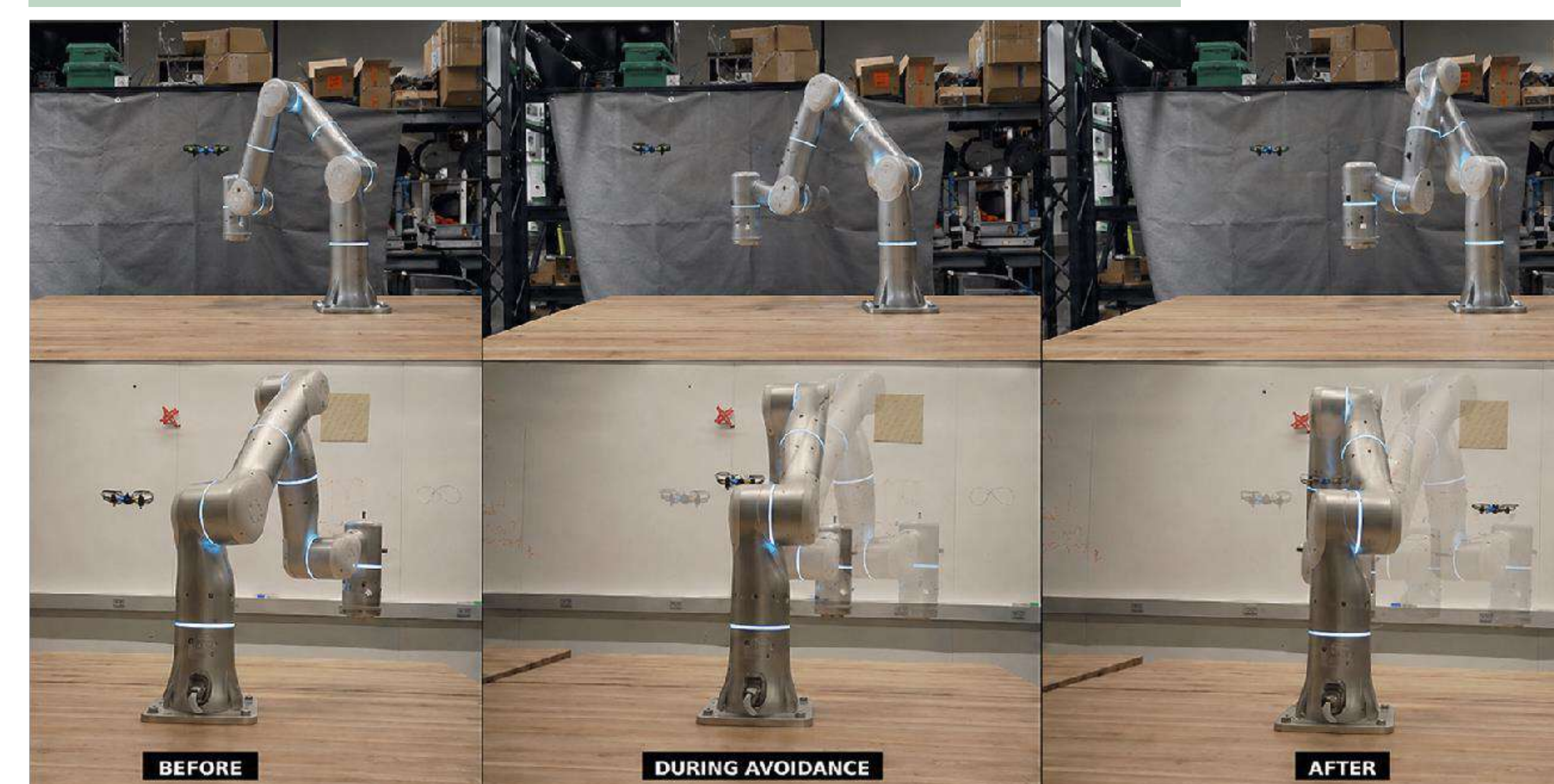
30%

shorter paths than the state-of-the-art baseline in the dynamic moving gap benchmark.

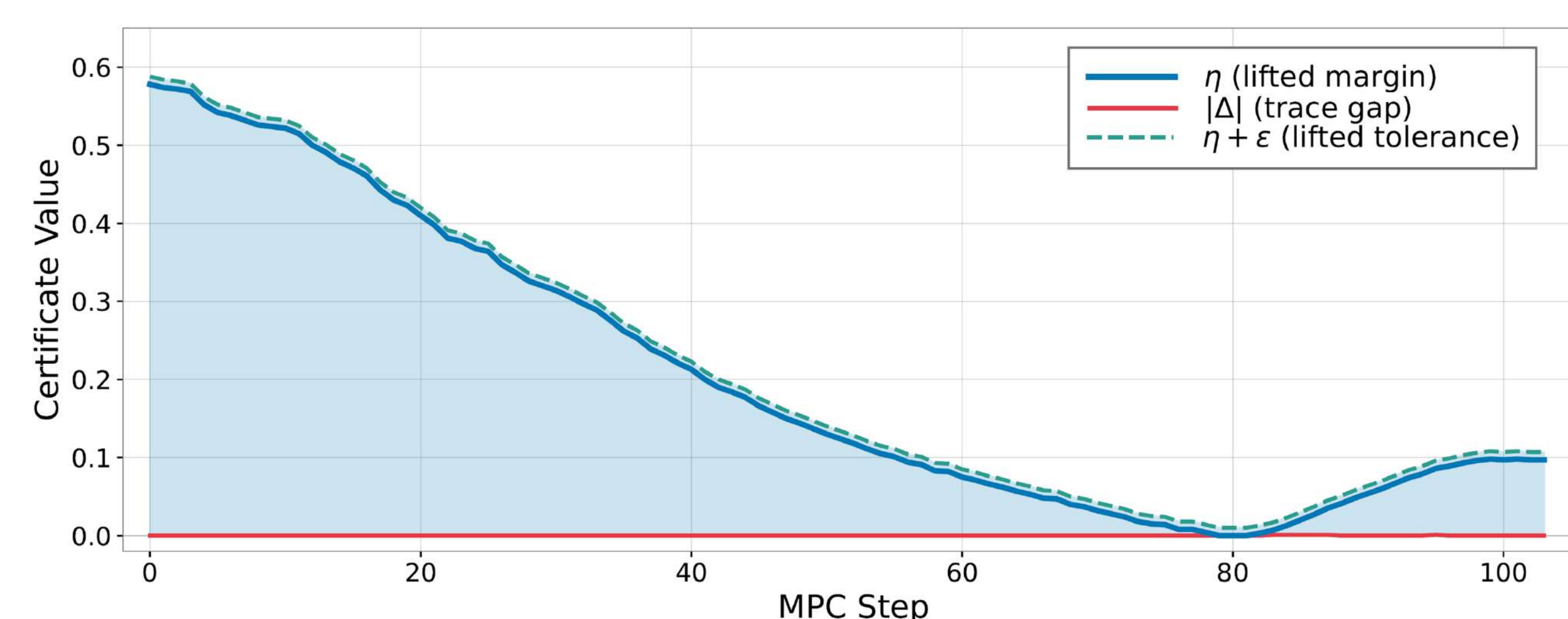
100%

success rate across 5 hardware trials.

Hardware Validation and Benchmarks:



Crazyflie moving-arm avoidance at 25 Hz



14.84 ms

latest hardware solve time inside the 40 ms control period

25 Hz

Onboard Crazyflie MPC with PSD constraints in the control loop

Rank-1 certificate holds across the hardware trial



Project Website