

Website

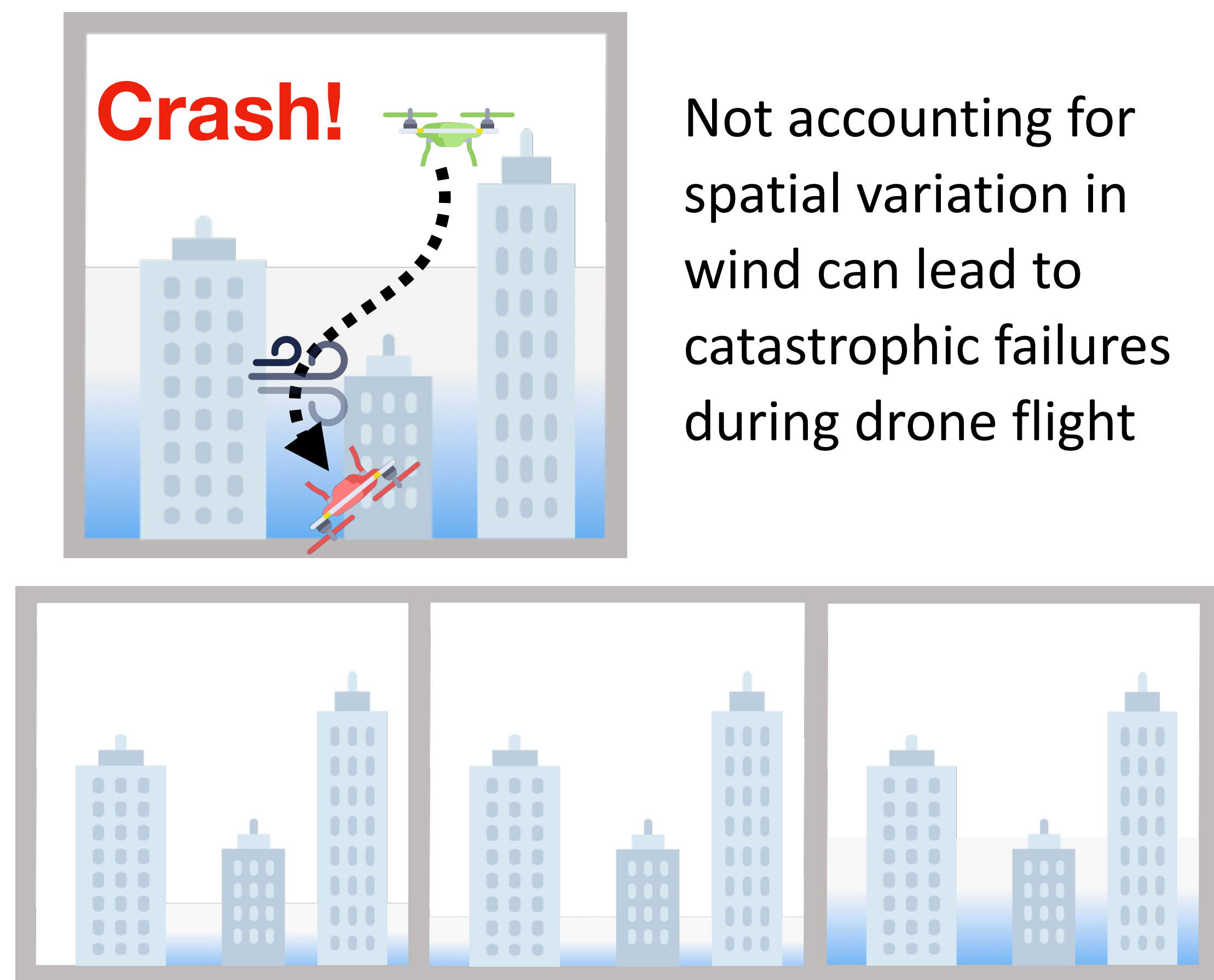
From Space to Time: Enabling Adaptive Safety with Learned Value Functions via Disturbance Recasting

Sander Tonkens*, Nikhil Uday Shinde*, Azra Begzadić*, Michael C. Yip, Jorge Cortés, Sylvia Herbert



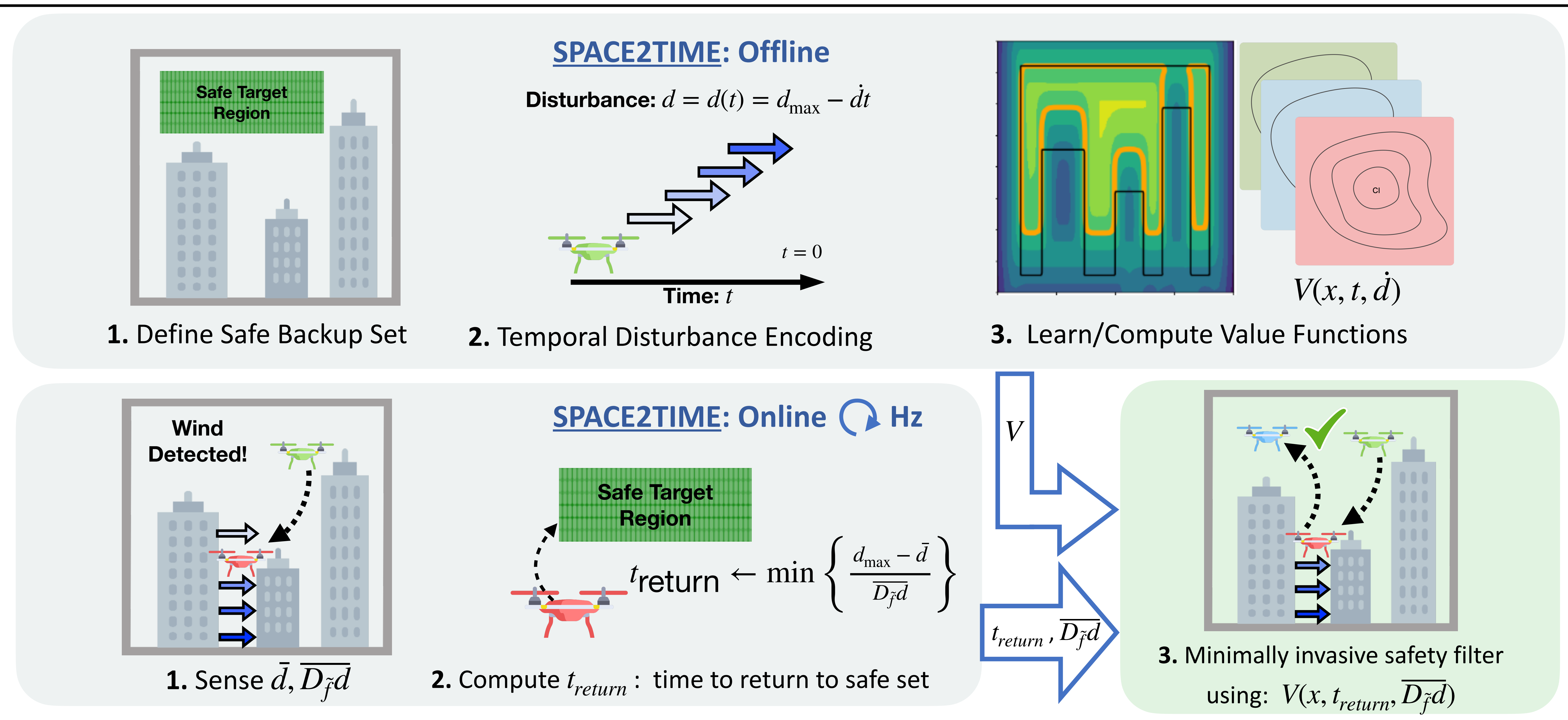
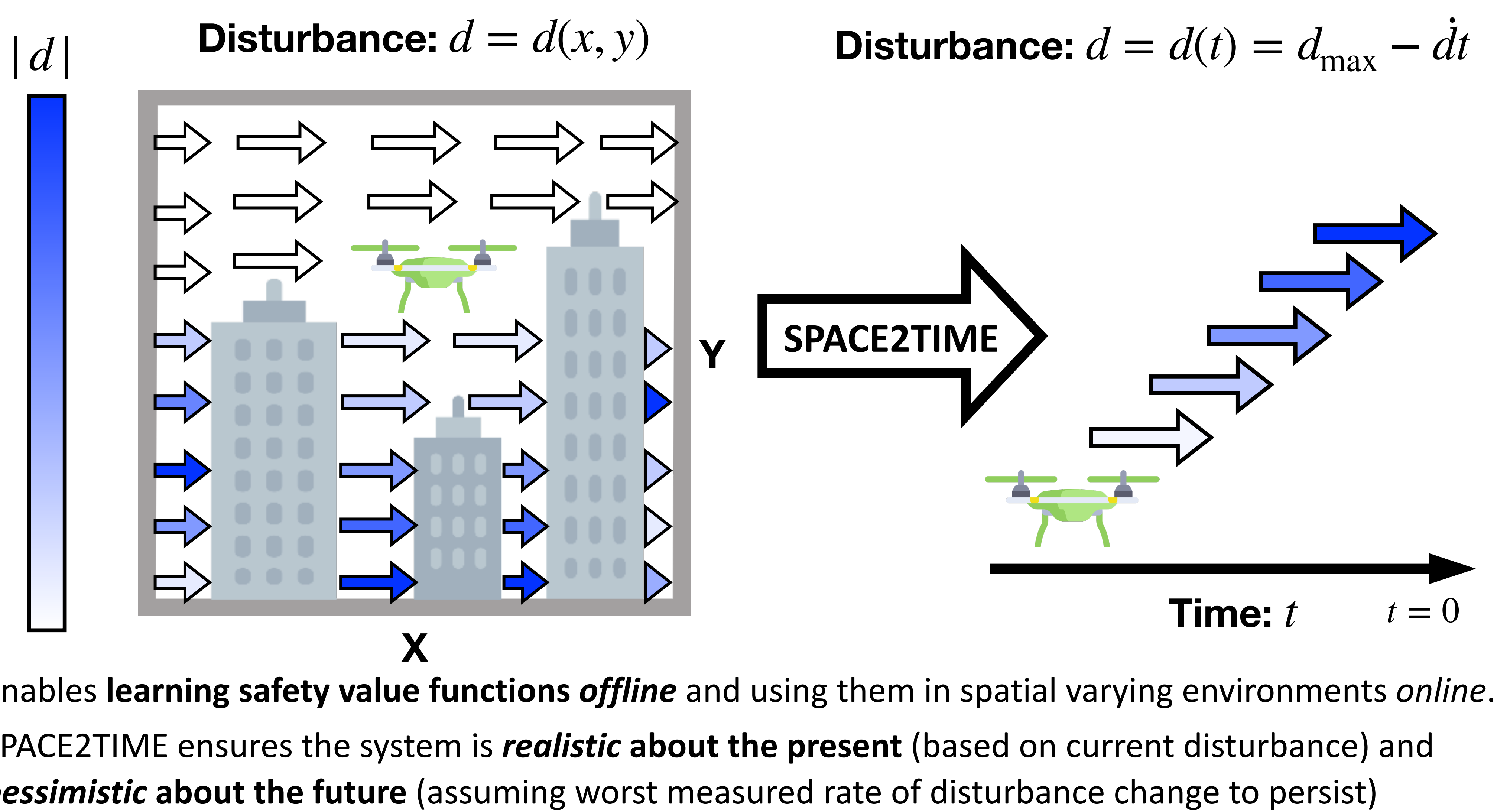
Paper

Motivation and Background:



Learned value functions are not amenable to online fine tuning, and learning a separate value function for every possible spatial variation is infeasible

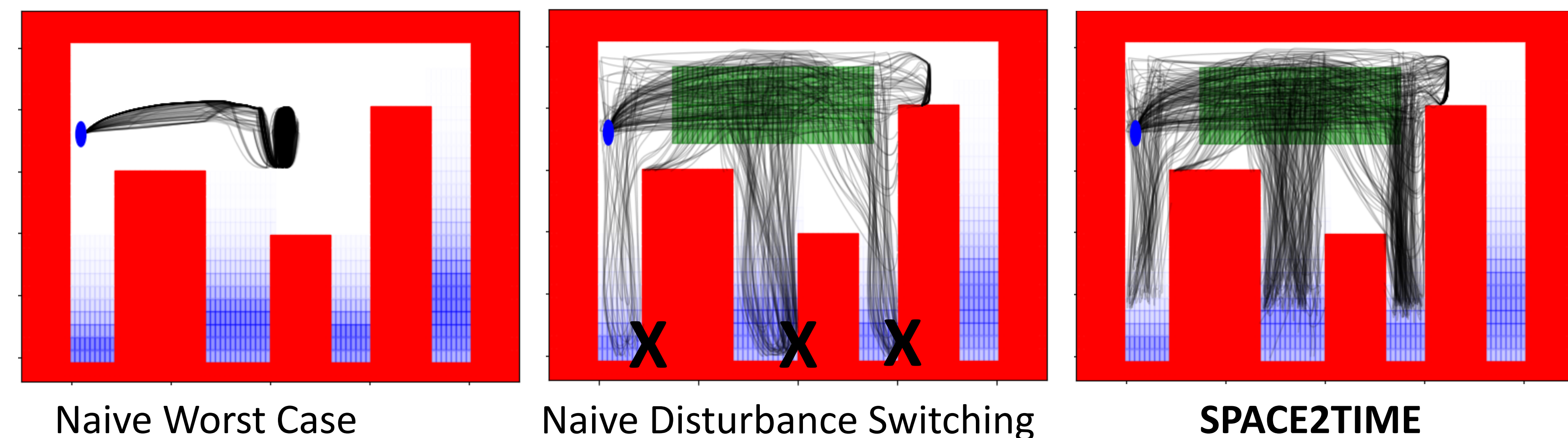
Key Idea: Reparameterize spatial variations in disturbance as temporal variations.



Results:

- **Naive Worst Case:** Safety filter assuming worst case disturbance magnitude bounds
- **Naive Disturbance Switching:** Switching safety filter to use disturbance bounds compatible with most recent observations

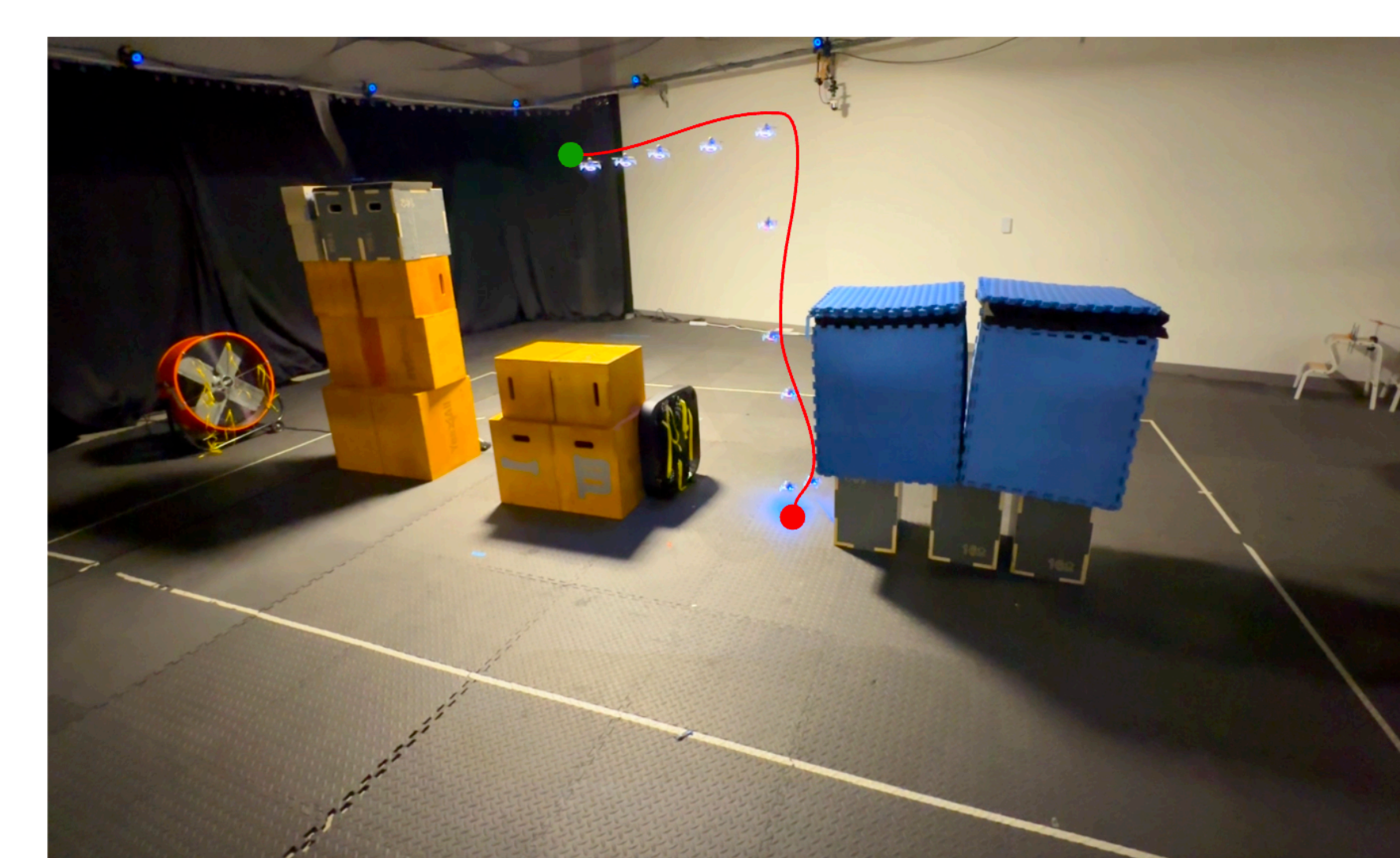
X = Crash



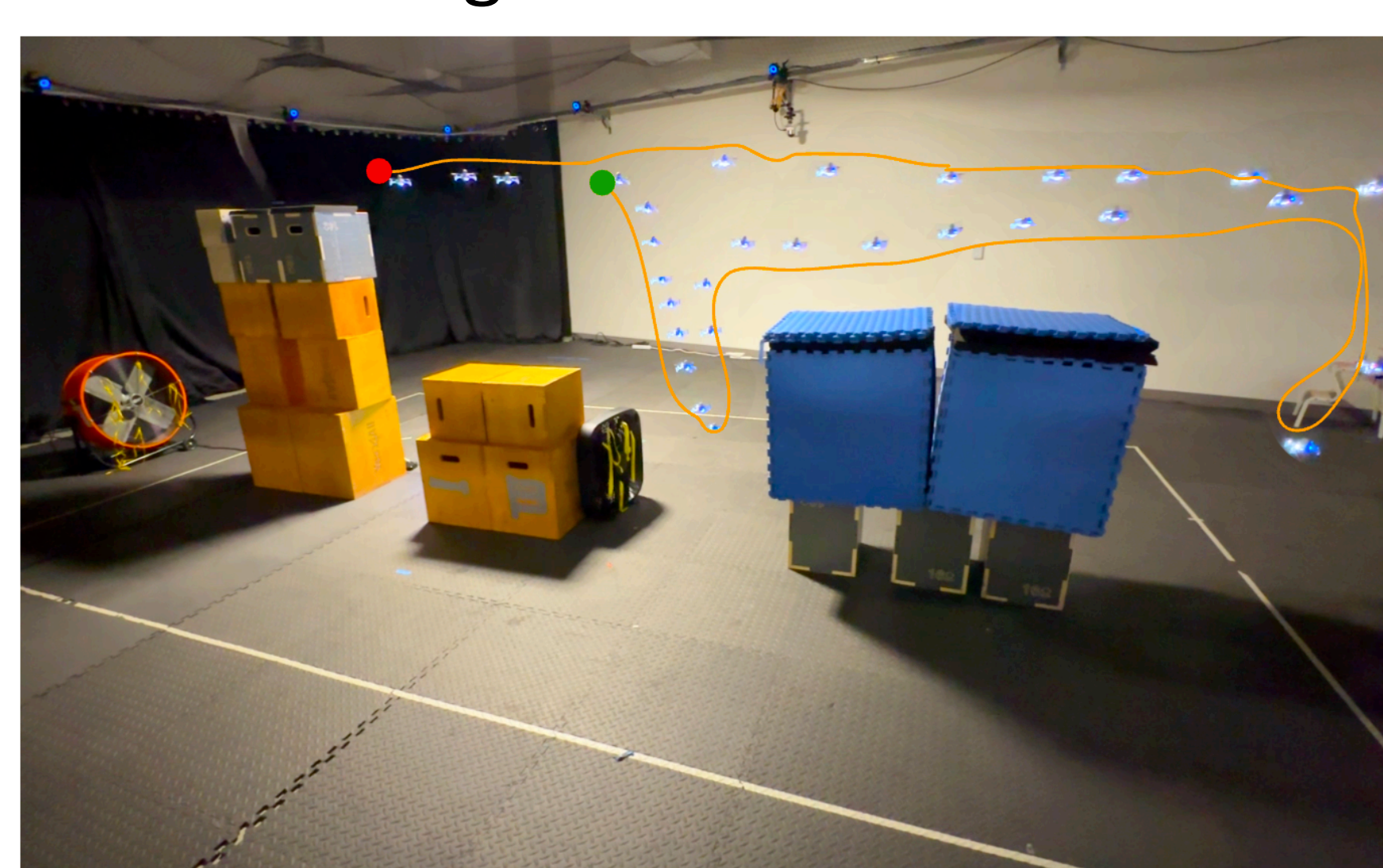
Naive Worst Case

Naive Disturbance Switching

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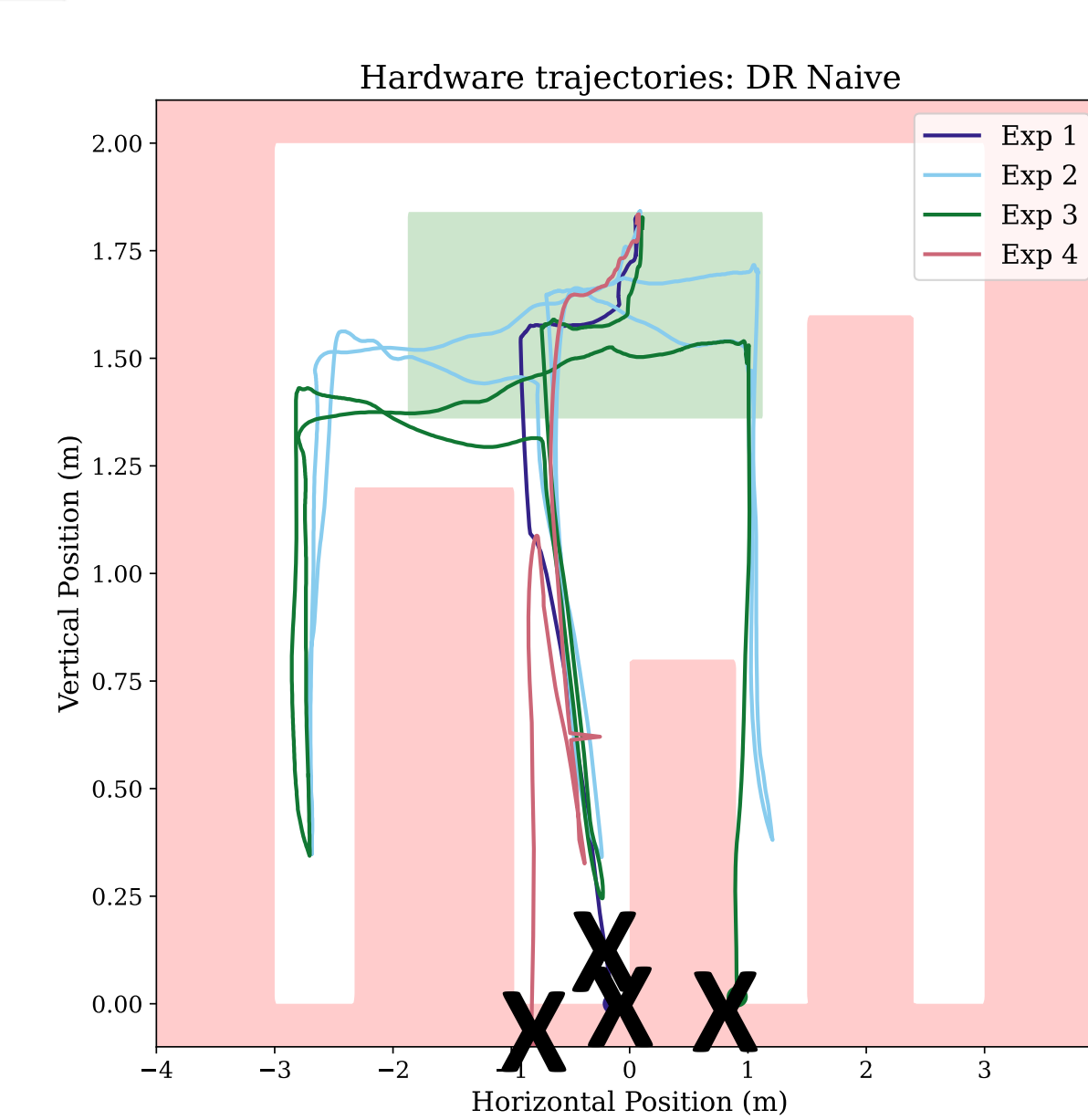
Naive Disturbance Switching



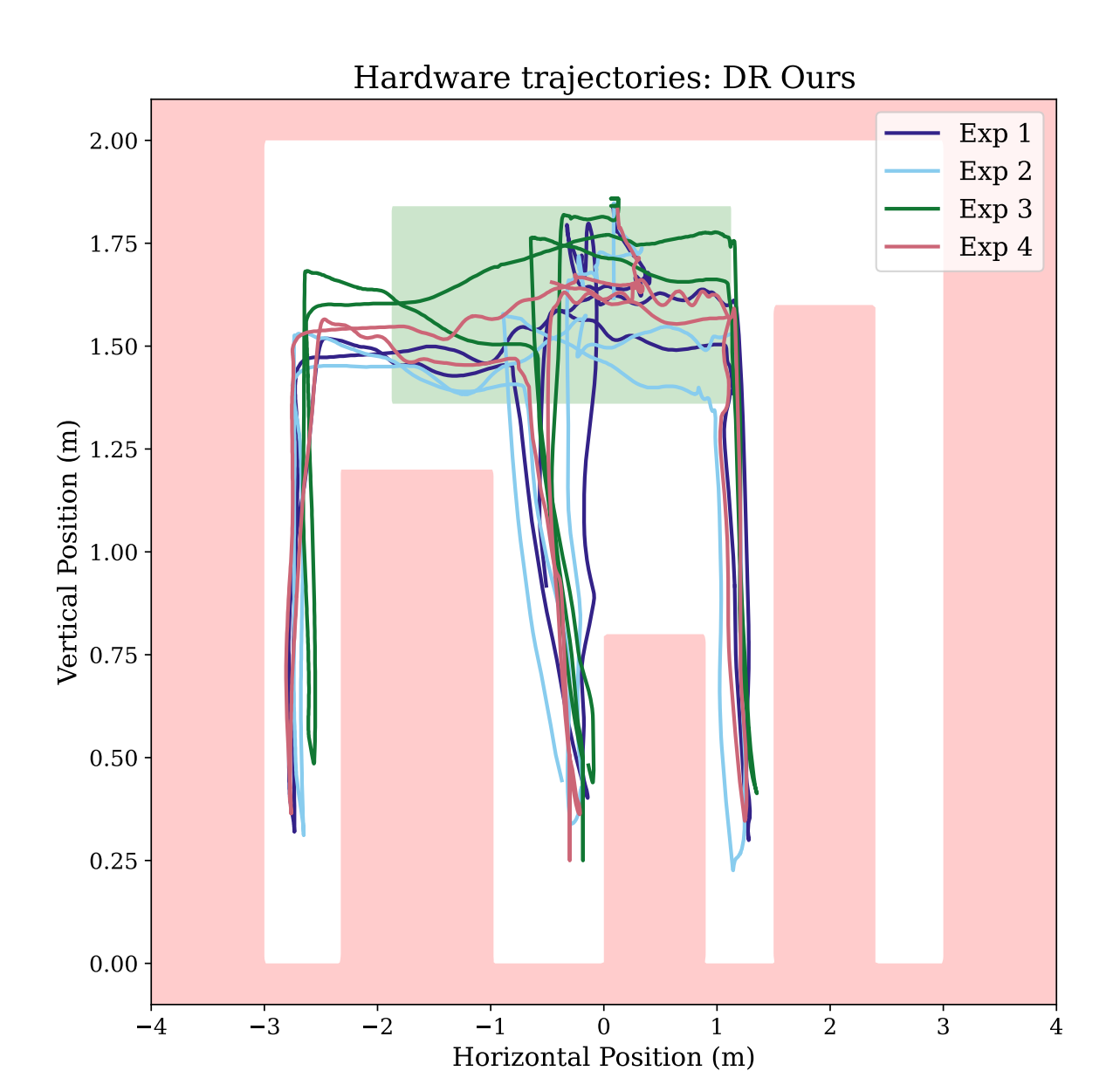
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Table of Simulation Experiments: Metrics are generated over 100 random environments with 10 goals and 1000 control steps each.

Approach	% Safety Violations ↓	Mean Goal Distance ↓	Mean Trajectory Length ↑
HJR Naive	96%	1.09	415
HJR Naive Worstcase	0%	1.95	1000
DeepReach Naive	90%	1.19	472
DeepReach Ours	34%	1.02	781
HJR Ours	2%	0.78	993



Naive Disturbance Switching



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