Multi-Fidelity Receding Horizon Planning for Multi-Contact Locomotion

Jiayi Wang[1]   Sanghyun Kim[2]   Sethu Vijayakumar[1,3]   Steve Tonneau[1]

[1] IPAB, The University of Edinburgh, UK [2] Korea Institute of Machinery & Materials, South Korea   [3] The Alan Turing Institute, UK

- Planning uneven terrain locomotion requires multiple steps lookahead. But do we need accurate modeling for the entire horizon (computationally expensive)?

- We find the first step (to be executed) requires accurate modeling, while the rest can use **convex approximations**.

- However, **angular dynamics** should be incorporated.

- Result: **Multi-fidelity** Receding Horizon Planning, avg. 2.4x faster than the single-fidelity counterparts for planning centroidal trajectories.

Centroidal Dynamics

Relaxed Convex Dynamics

Execution Horizon Prediction Horizon