Modeling and Control of a Hybrid Wheeled Jumping Robot

Traiko Dinev\textsuperscript{1}, Songyan Xin\textsuperscript{1,3}, Wolfgang Merkt\textsuperscript{1,2}, Vladimir Ivan\textsuperscript{1} and Sethu Vijayakumar\textsuperscript{1}

\textsuperscript{1}University of Edinburgh, UK \textsuperscript{2}University of Oxford, UK \textsuperscript{3}AIRS-Shenzhen, China

- Propose a Model Predictive Control pipeline for the control of hybrid wheel-jumping robots.
- Derive an analytical template model of the system dynamics and use in a direct transcription motion-planning framework.
- Demonstrated dynamic motions, such as jumping, in simulation, using PyBullet.
- Tested robustness to sensor noise and rough terrain locomotion.

The hybrid robot jumping over a gap. Dynamic behaviors emerge from first principles of optimization.