Impact-Aware Task-Space Quadratic-Programming Control

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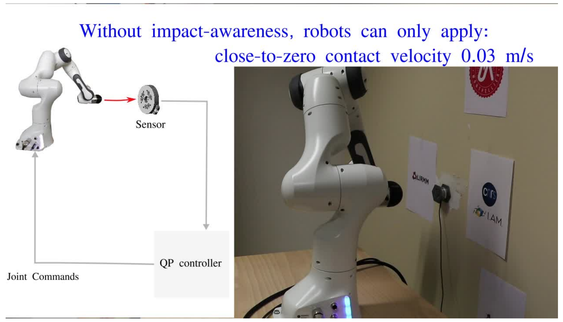
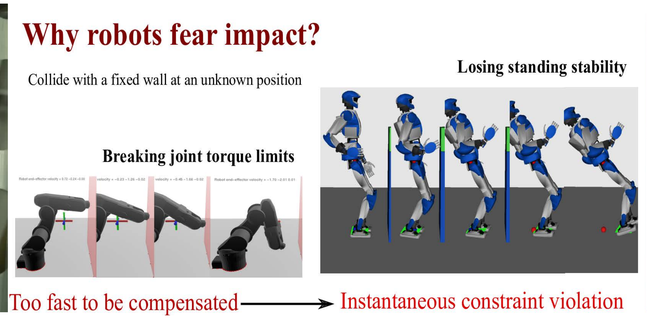
Logistics demand human-level swift motions

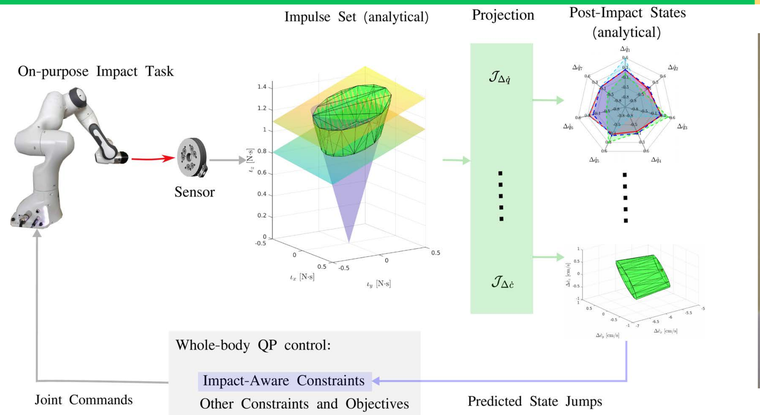
Safe contact transition with near-zero velocity



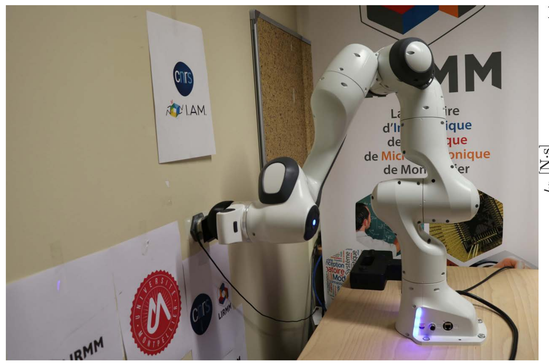
Robot fear impacts

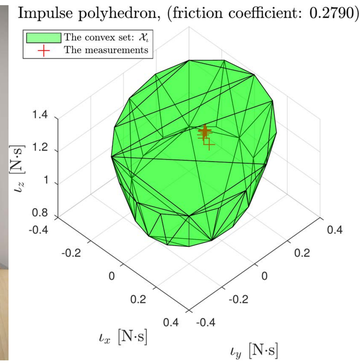


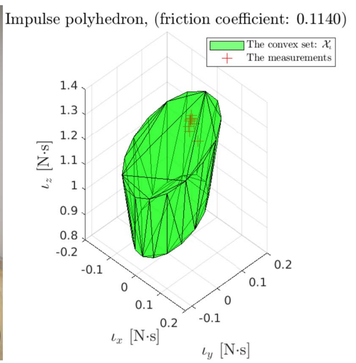
Model-based impact-aware control design



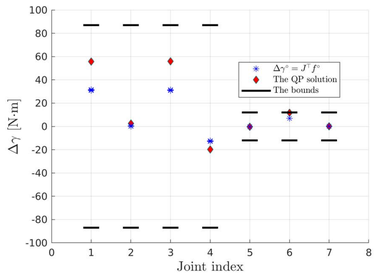
Impact-model validation

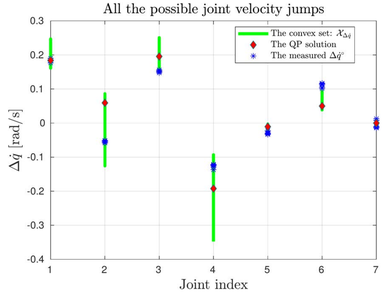






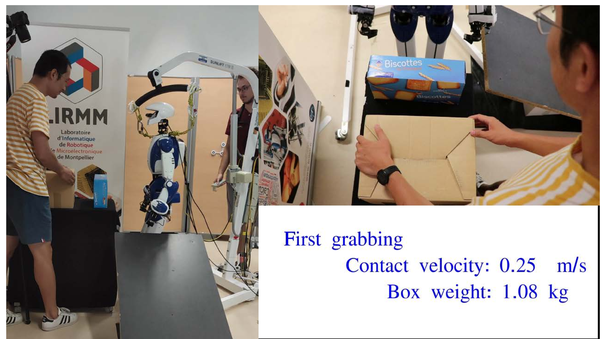
Active joint-torque constraint

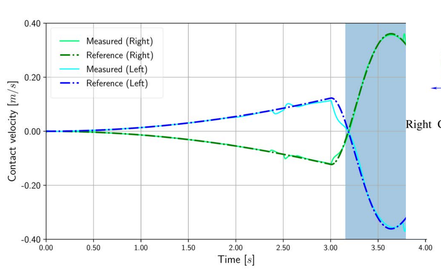


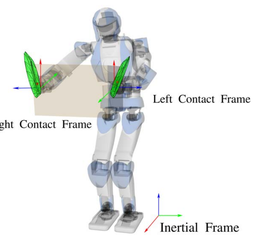


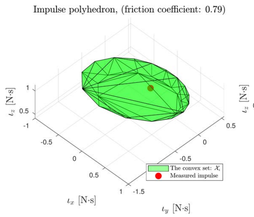
The measured and predicted joint velocity and torque jumps of the Panda manipulator during different trials.
The joint torque constraint was active since the QP solution of joint 6 reached the bound.

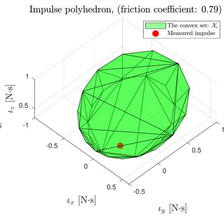
Impact exploitation











The light-blue areas indicate the period during which the impact-aware constraints were active. By accurately tracking the reference contact velocities, the HRP-4 grabbed the box with two simultaneous impacts. Both measured impulses are constrained within the impulse set.