Interactive Generalized Penetration Depth Computation for Rigid and Articulated Models using Object Norm

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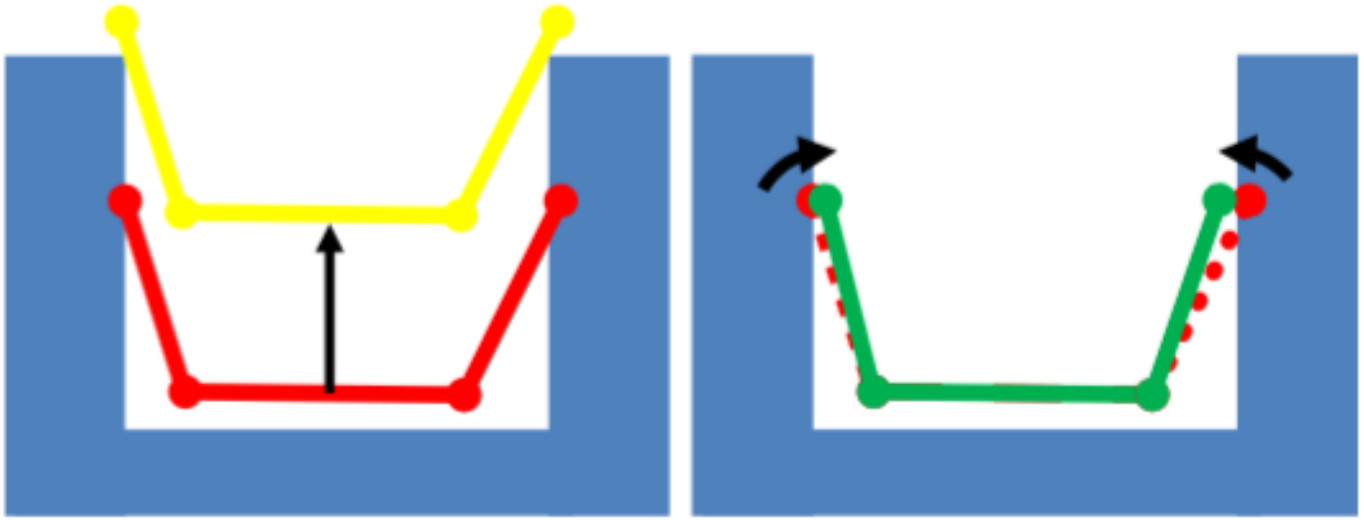
28.10.2015

Overview – key topics

- Penetration depth
- Collision detection
- Articulated models (having joints)
- Algorithms
- Object norm metric

Introduction – Main problem



(a) Translational PD (b) Generalized PD

Main goal

- Create algorithm to accurately approximate generalized penetration depth (PDg) between two overlapping rigid or articulated models

Previous work

- Translational Penetration Depth
  - relatively slow
  - do not run at interactive rates
- Generalized Penetration Depth
  - rather slow for interactive applications
  - not clear whether they are applicable to articulated models

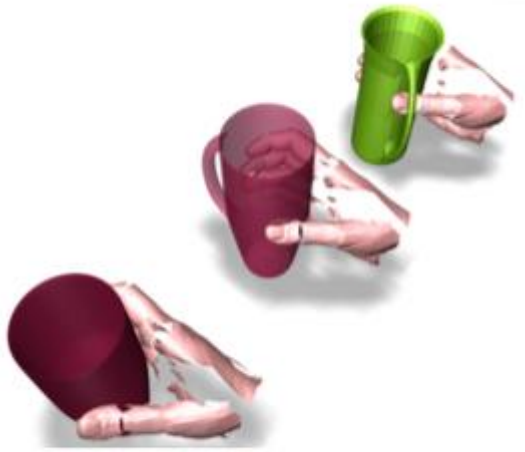
Algorithm

Suggested applications

- retraction-based motion planning
- physically-based animation
- data-driven grasping

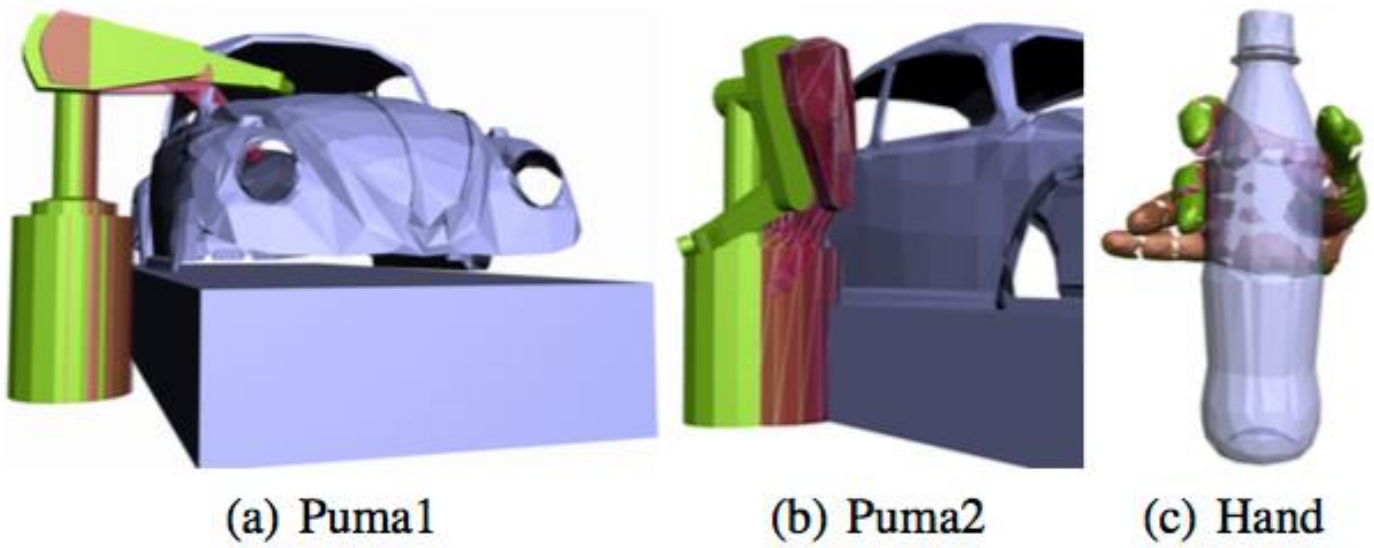
Interactive Generalized Penetration Depth (PDg) Computation

(a) Spoon/Cup



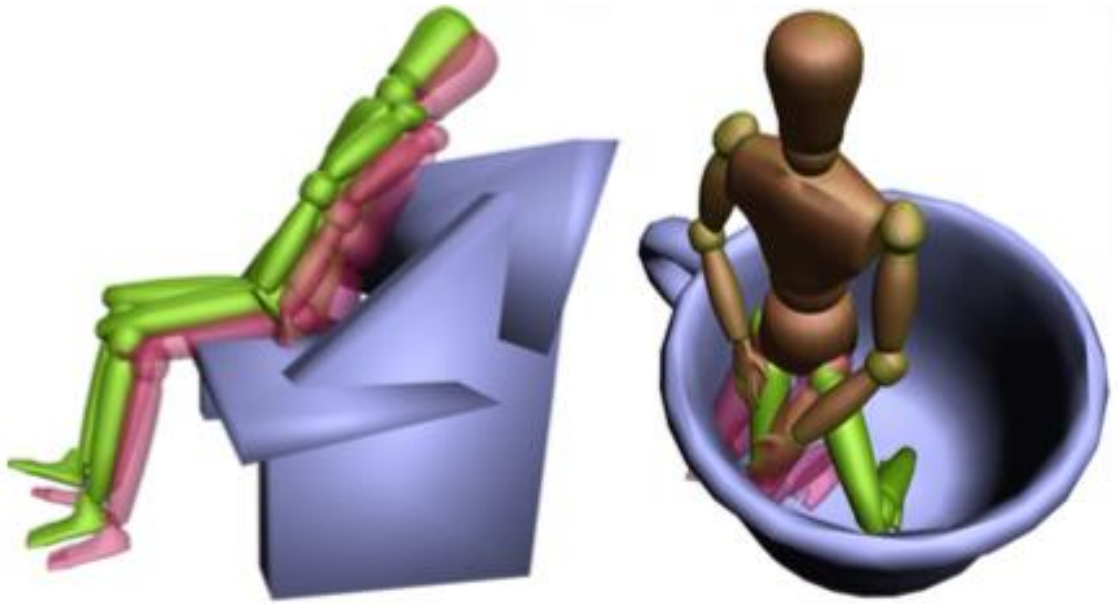
(e) Grasping

PDg Computation for Articulated Models



(a) Puma1 (b) Puma2 (c) Hand

Finding Collision-free Configurations for Articulated-body Dynamics



(a) Bench (b) Cup