



A Continuous Material Cutting Model with Haptic Feedback for Medical Simulations

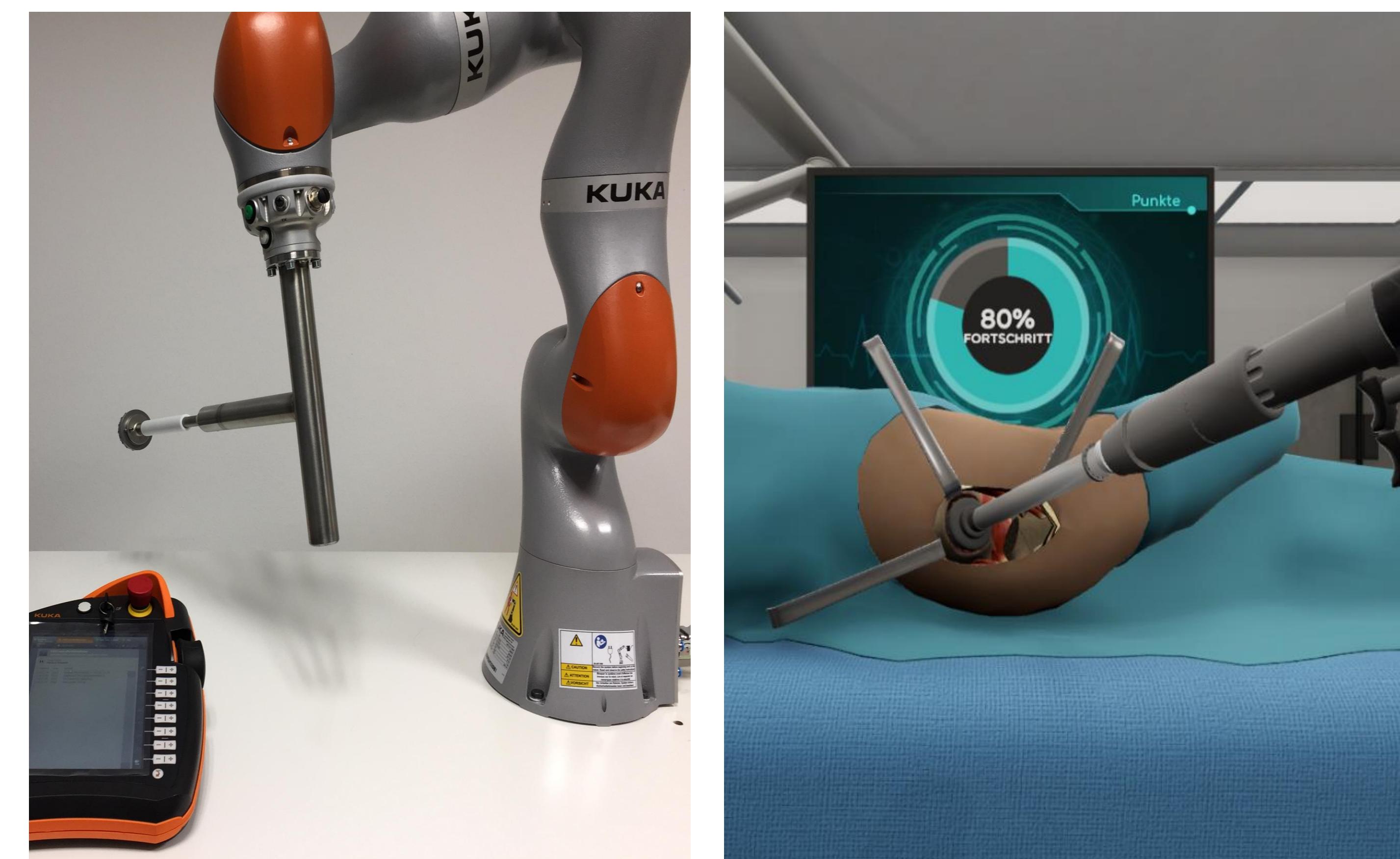
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Motivation

- Medical procedures depend on surgeon's skill
- Frequent effective skill acquisition paramount
- Cutting surgery especially difficult to simulate
- Haptic feedback enables generating authentic feeling to surgery student
- Traditional training methods are either
 - **costly**: rare organ donor parts
 - **unrealistic**: dummy organs that have different physical properties (i.e. false teeth)



Methods

- Inner sphere representation
- Multi-pass algorithm (*see overview on the right*)
 1. Continuous collision detection of moving tool spheres against drillable spheres
 2. Neighbourhood based normal estimation
 3. Drilling along continuous movement path
- Constraint-based haptic feedback
- Virtual coupling for torque computation
- Massively-parallel GPU implementation
- Implicit metaball surface over spheres
- Coulomb friction model

