



# Haptic Exploration for Navigation Tasks using a Visuo-Haptic Sensor

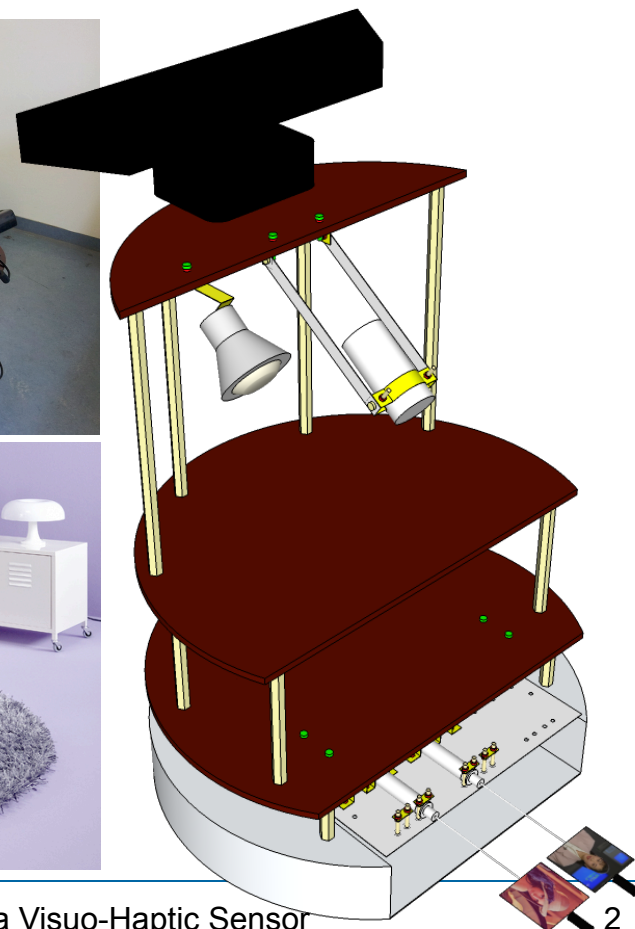
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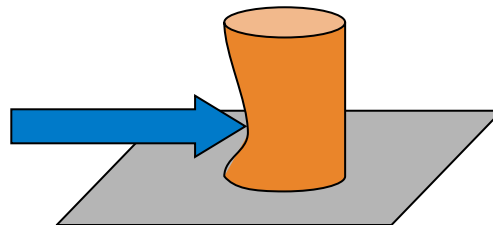
# Motivation

- Small household robot, e.g. vacuum cleaner
  - Limited manipulation capabilities
  - Obstacles block navigation path or access to a room
- ➔ Simplified haptic model of obstacles for navigation

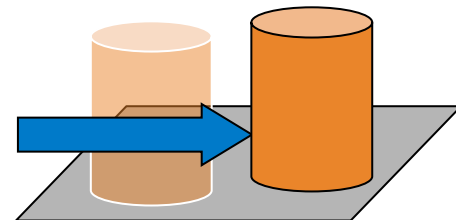


# Haptic Tags

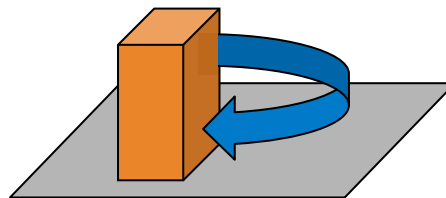
- Tags attached to objects/ obstacles
- Haptic behavior on object-level
- Acquisition with single-tip sensor
- Augment (visually acquired) maps for navigation
- Required information for simple interaction like freeing a path by pushing



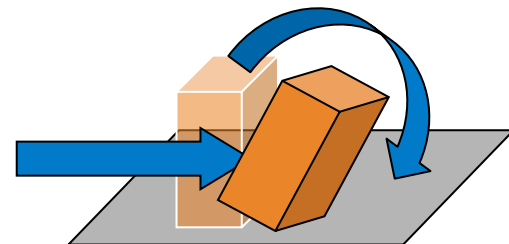
Deformation



Static/Dynamic Friction

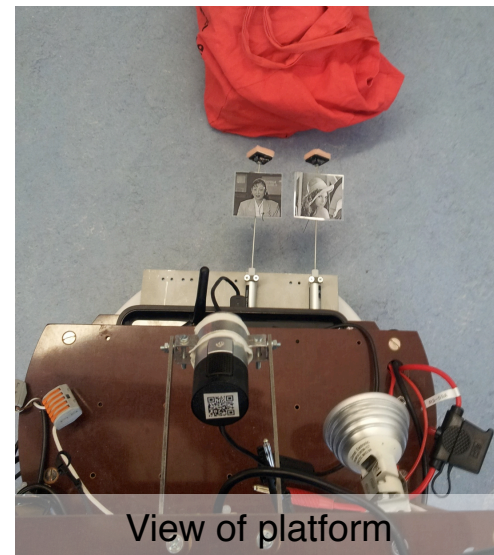
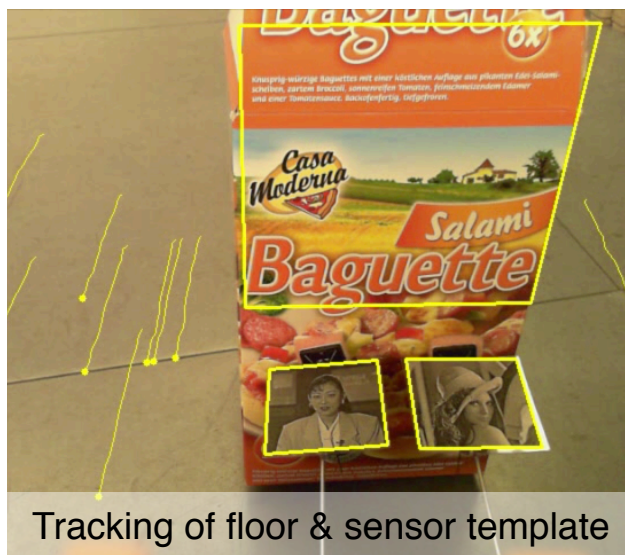
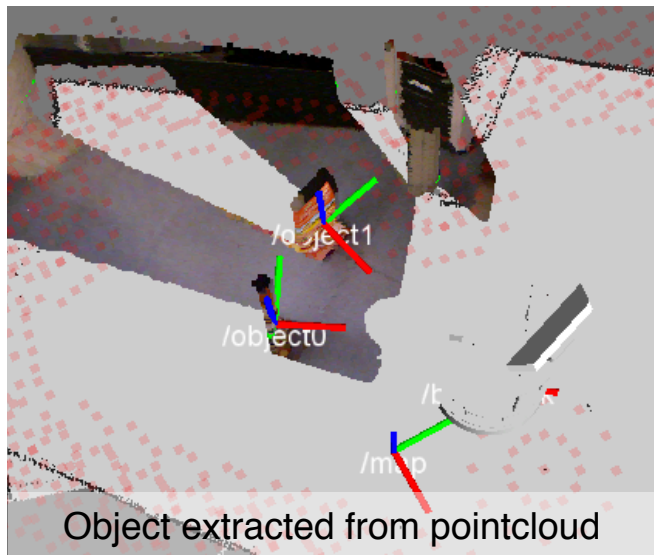


Unstable Manipulation



Fall/Destruct

# Visuo-Haptic Sensor



# Navigation

- If path is blocked by manipulable object:
- Push object to the closest wall
- Repeat path planning on new map
- Future: Global path optimization under consideration of Haptic Tags

