

Interactive Motion and Wrench in Instrument Manipulation

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Purpose



- Characterize physical interaction in manipulation tasks
- Generate right grasp for the manipulations

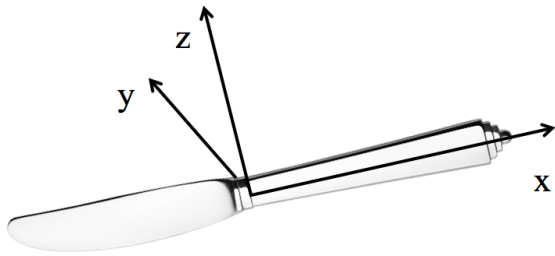
Motivation



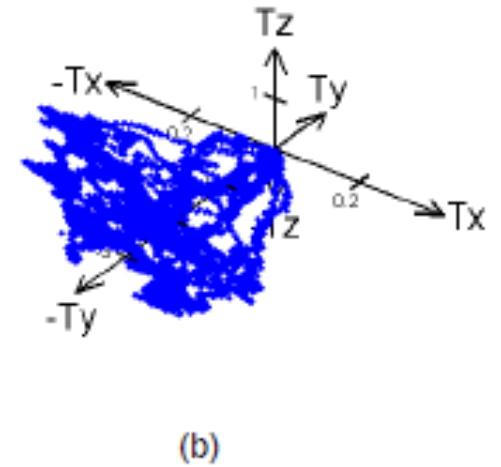
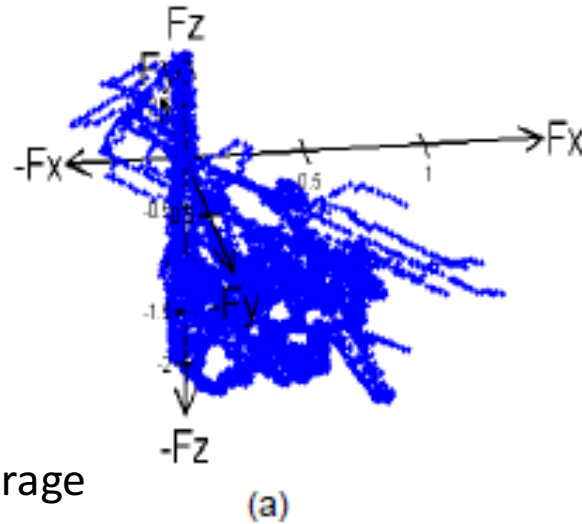
From WikiHow

Use a Knife

Task 1: cutting

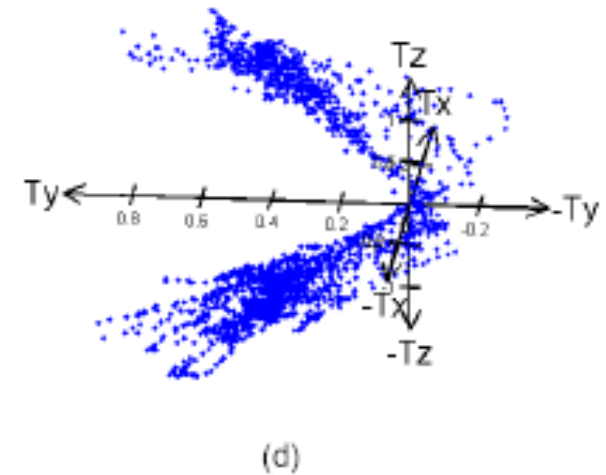
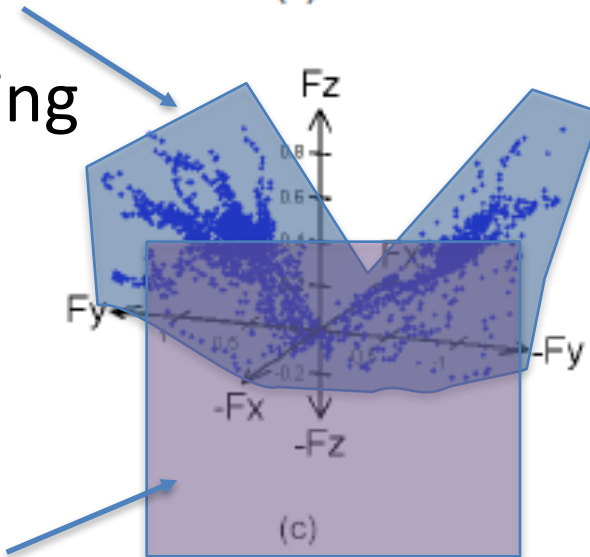


Task Coverage



Task 2: butter spreading

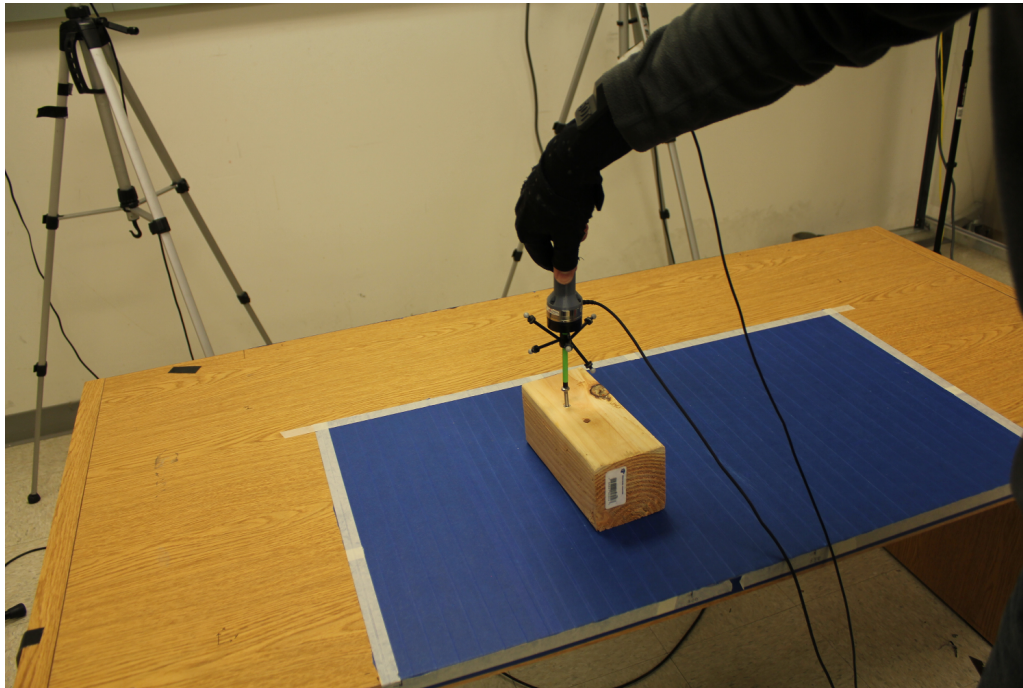
Force closure



Data Collecting Environment



Motion and Wrench of Instrument



Equipment and Modalities

- Motion tracking
 - NaturalPoint OptiTrack MoCap
 - 100 Hz
- RGBD sensor
 - Primesense
 - RGBD, 25 ftp
- Force/torque sensor
 - ATI Nano17 and Mini40
 - XYZ force and torque, 1000 Hz.
- Dataglove
 - 5DT dataglove
 - 14 DOF, 60 Hz

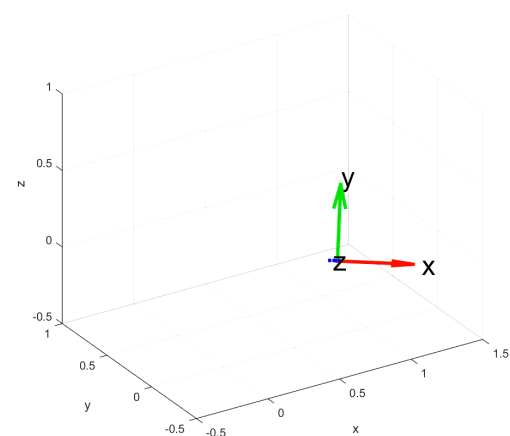
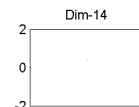
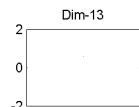
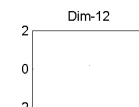
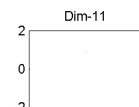
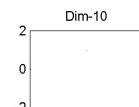
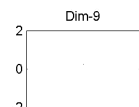
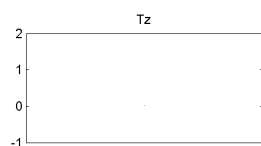
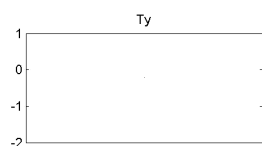
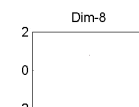
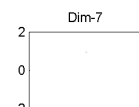
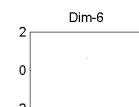
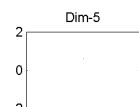
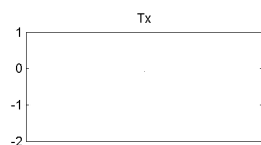
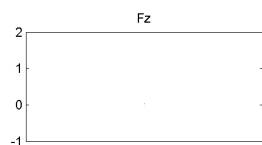
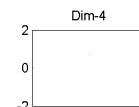
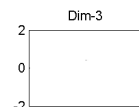
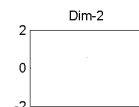
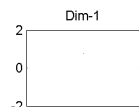
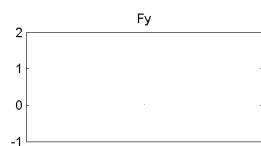
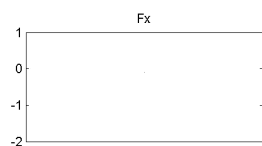
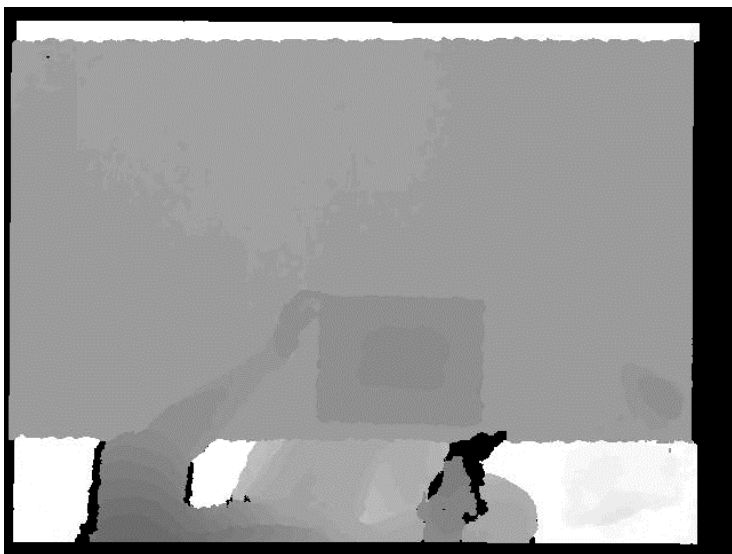
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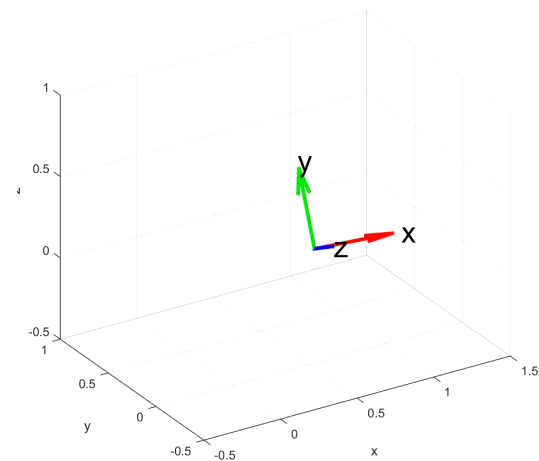
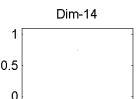
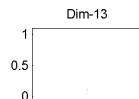
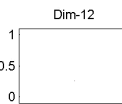
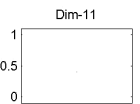
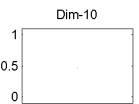
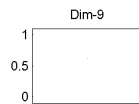
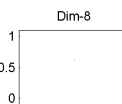
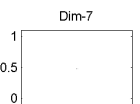
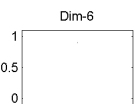
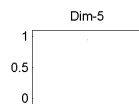
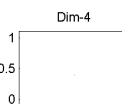
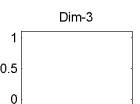
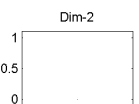
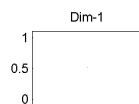
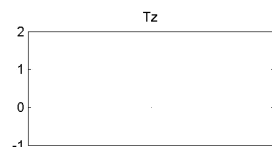
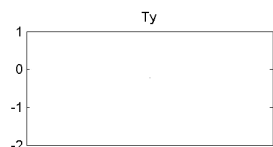
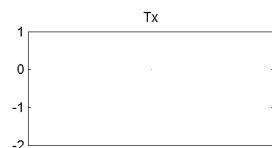
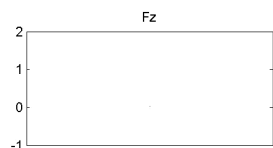
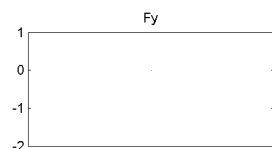
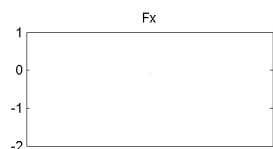
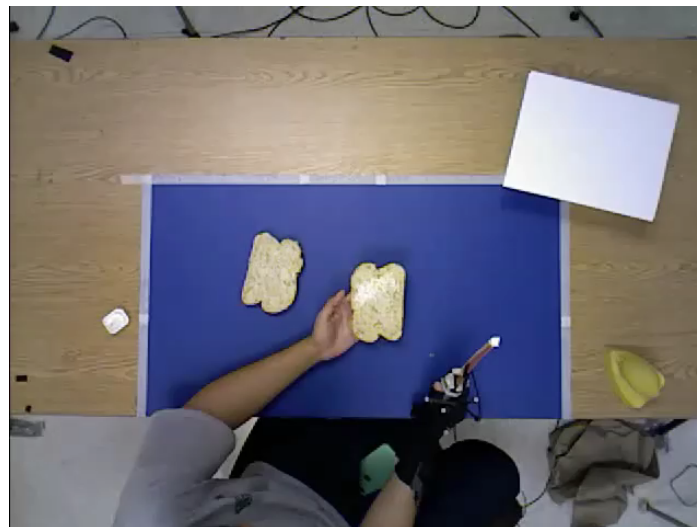
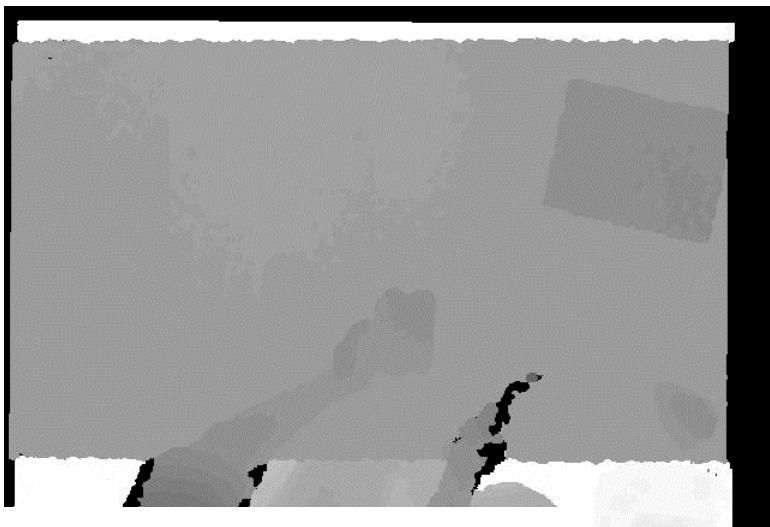
Nine Initial Tasks

- Developmental skills for a five-year-old child
- Cutting across pretend clay pieces such as pancakes with a plastic knife
- Spreading butter or frosting on crackers with a plastic knife
- Poking or examining objects with a stick
- Putting a key into a keyhole and turning it
- Using small crayons to draw squares and triangles
- Using a spoon to stir water in a cup
- Using a spoon to pick up peas
- Screwing and unscrewing a jar lid
- Putting on or removing bolts from nuts with a screw driver.

Instrumental ADLs

- Food preparation
- Basic house maintenance
- Basic housework
- Personal hygiene
- Total: 36 manipulation tasks





Dataset

- Working progress
- RGBD, finger motion, instrument motion and wrench
- 3D models of instruments
- 25 Objects
- 36 manipulation tasks
- Five participants repeat three times
- 60 second each, 10 MB to 50 MB

Credit

- Students
 - Yongqiang Huang
 - Jeanine Sam
- This material is based upon work supported by the National Science Foundation under Grants No. 1421418 and No. 1560761.

IROS2016 Robotic Grasping and Manipulation Competition

- Two tracks
 - Hand-in-hand grasping (no robotic arm)
 - Autonomous grasping (with robotic arm)
- Two stages
 - Grasp for pick-and-place
 - Grasp for manipulation
- Tentative timeline:
 - Competition: October 11-12, 2016
 - Call for participation. LOI (Team description and video) deadline: August 1
 - Release object and task sets: July 1
 - Call for object and task sets. Submission deadline: June 15

IROS2016 Robotic Grasping and Manipulation Competition

- Travel support:
 - Up to 10 teams
 - For teams in fully autonomous track
 - \$500 for Korean teams, \$1000 for Asian teams, \$1500 for International teams
- Call for competition organizing committee members
 - Kickoff meeting: 2:30pm this afternoon, in room 31

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