Cornell Chronicle: A robot learns how to tidy up after you

Presentation by Nathan Tung

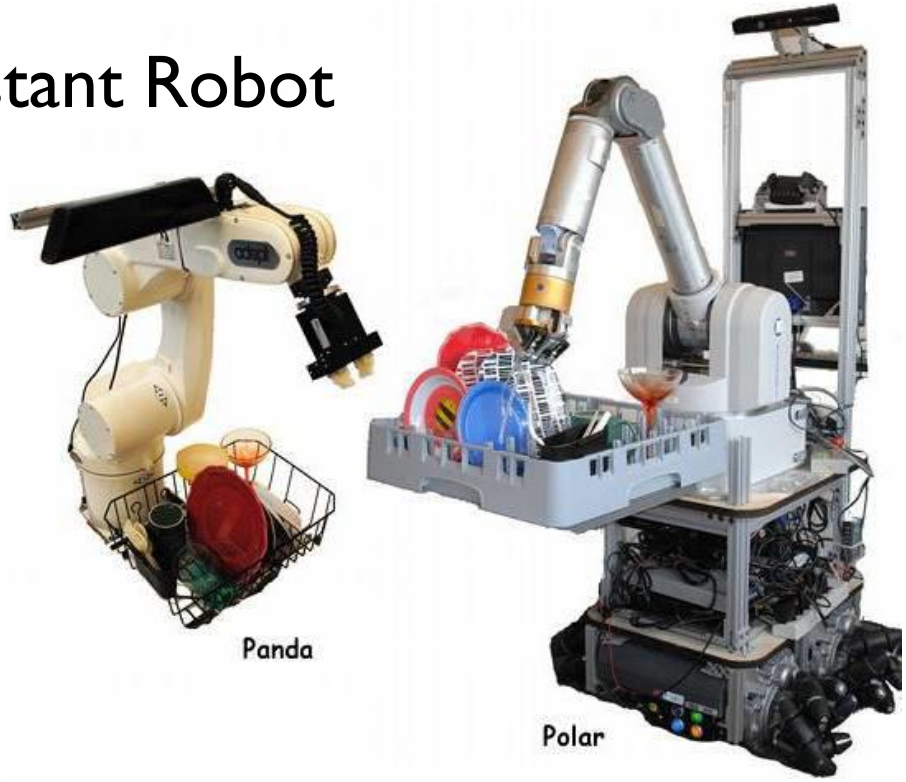
CS35 Lab 1

Background Information

- Cornell's Personal Robotics Lab created a robot that can clean up after people
- The robot basically:
  - 1. Evaluates the room
  - 2. Identifies the objects
  - 3. Puts each object where [it thinks] it belongs
- Robots in the past could only place single objects on flat surfaces

Cornell's Robots

- PANDA
  - PersonAI Non-Deterministic Arm
- POLAR
  - PersOnaL Assistant Robot



Latest Algorithm

- Considers nature of the object
- Determines where to put the object
- Learns from previous experiences
  - Example: it doesn't put a shoe in refrigerator
  - Also, it has to distinguish between flat surfaces like the floor and a table

Robot Performance

- 98% successful in identifying and placing objects it had seen before
- 80% successful for placing new objects
- Objects with ambiguous shapes are hardest to place
  - Clothes, shoes, etc.

Evaluating and Identifying

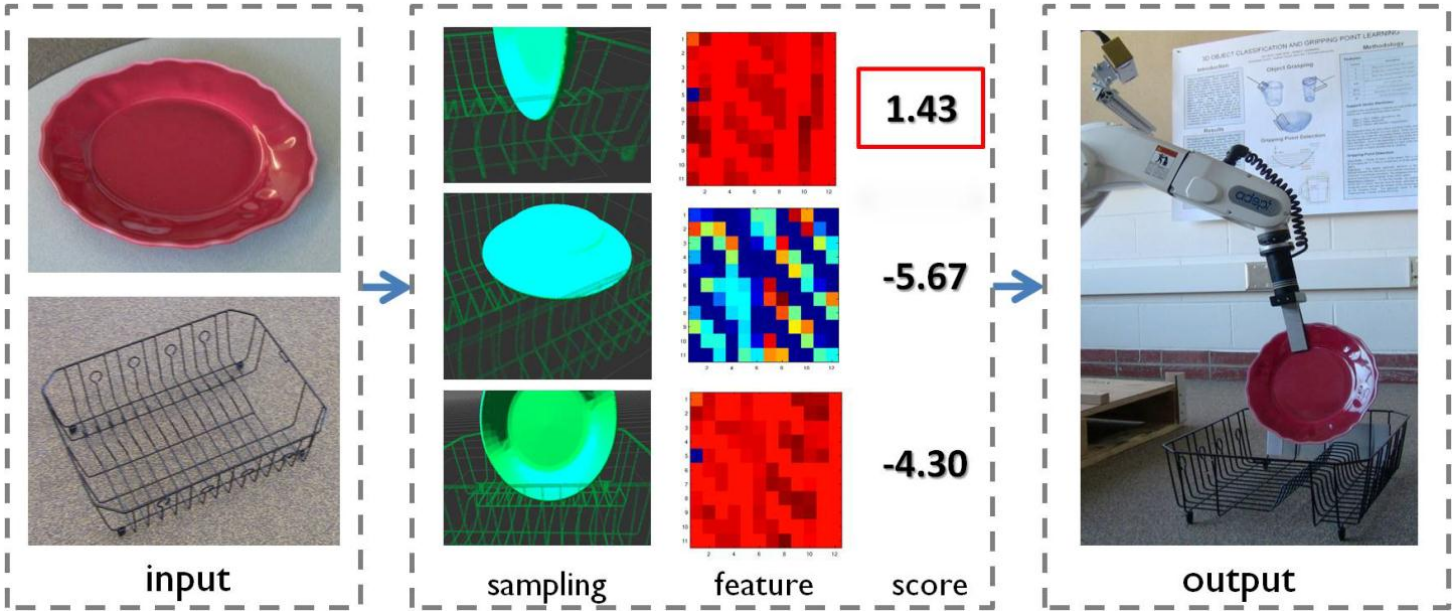
- Microsoft Kinect 3-D camera scans room
- Robot's computer breaks image up into chunks based on different colors/shapes
  - Can be trained to store different objects and their common characteristics
- Groups of blocks converted to objects
  - Based on closest-matching blocks in database

Determining Placement

- Computer breaks image up into blocks of potential, stable target spaces
  - Can be fed images as examples of either good or bad placement sites for future reference
- Chooses placement space with best stability and fit

Moving the Object

- Simulates a graphic of moving object to placement destination
- Follows those movements robotically

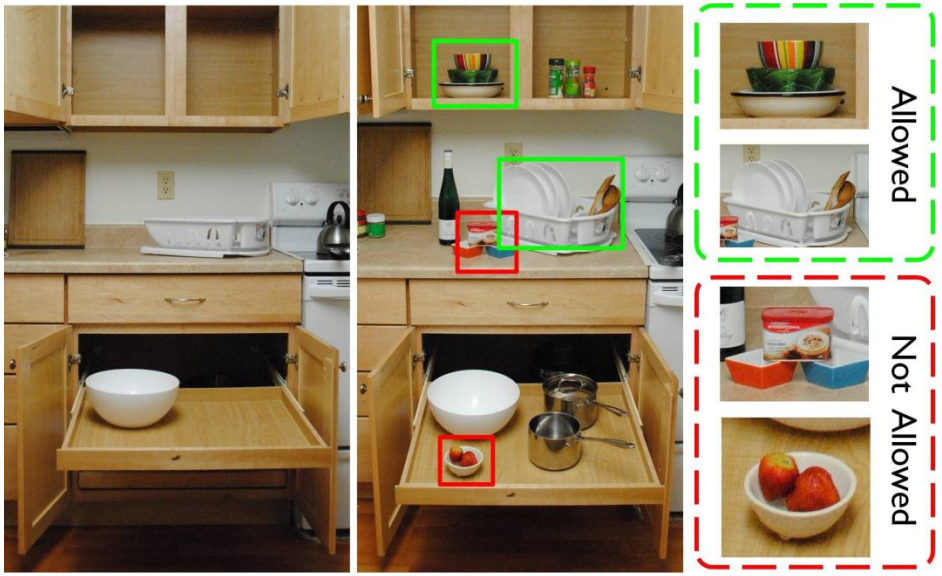


Throwing away trash.

Stacking dishes.

My Opinion:

This is absolutely amazing…



Reliability?

- Robot can still break fragile objects
- Robot only screenshots parts of the object, so it relies heavily on shape

- Are there any possible improvements?
  - Higher-resolution camera to better identify
  - Pre-program robot with 3D models of objects
  - Use touch feedback to verify object is stable

Sources

Steele, Bill. "A robot learns how to tidy up after you." Cornell Chronicle 21 May 2012. 1 June 2012. <http://www.news.cornell.edu/stories/May12/PlacingNewObjects.html>.

Jiang, Saxena et al. *Learning to Place New Objects in a Scene*. Cornell University. 2012. Web. 1 June 2012.