Robot Autonomy
HW1

Group 3

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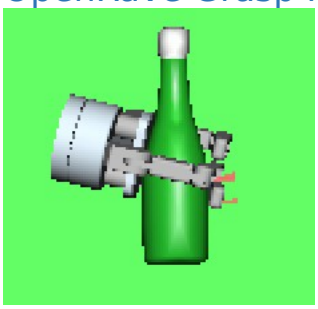
Grasp Metric

OpenRave Grasp Metric



The openRave GraspModule.testGrasp function evaluates the grasp with a series of perturbations and determines if the object is within force closure (minDist < specified threshold). It appears to produce usable grasps.

Our Grasp Metric

Our grasp metric uses a weighted average of the minimum singular value, grasp isotropy, and wrench matrix volume. We then normalize each of these metrics across all computed grasps and apply experimentally determined weights to each.

Random Perturbations

Generation

We used a Gaussian distributed random noise (Sigma determined experimentally) to generate 10 grasps + the original unperturbed state. In general, the output cases for 'black plastic mug' and the 'champagne' bottle moreover remained the same after adding random noise, but we observed improvements in cases with the wine goblet (as displayed in the figures below).

Combining Scores

For each grasp we individually computed a normalized [0-1] score for each of the three grasp metrics. We then used a weighted average to combine each score from all 11 grasps based on the probability of that particular perturbation occurring. The three combined scores were then averaged as described above.

Assignment Time

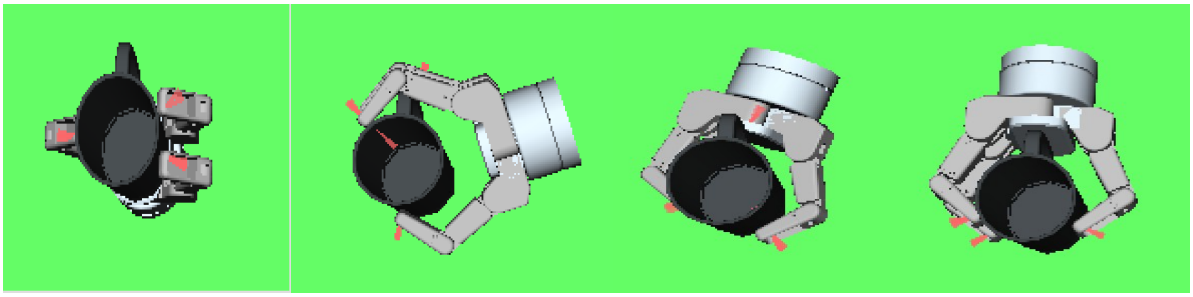
The assignment required ~10 hours per student.

Results

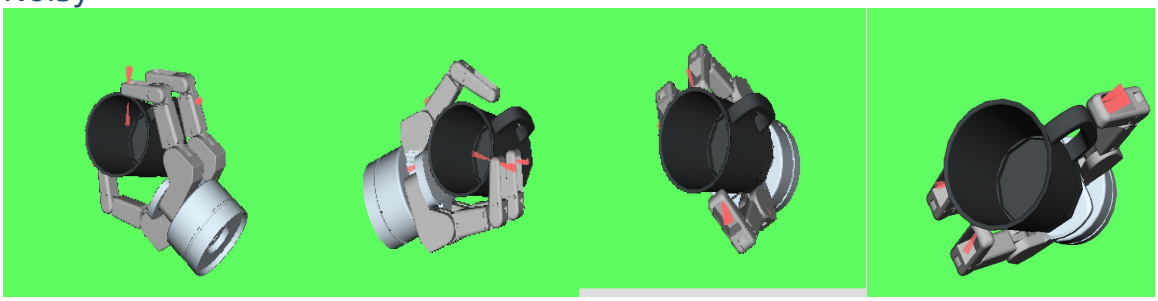
From Left to Right: 1st through 4th best ranked grasp

Black Plastic Mug

Normal



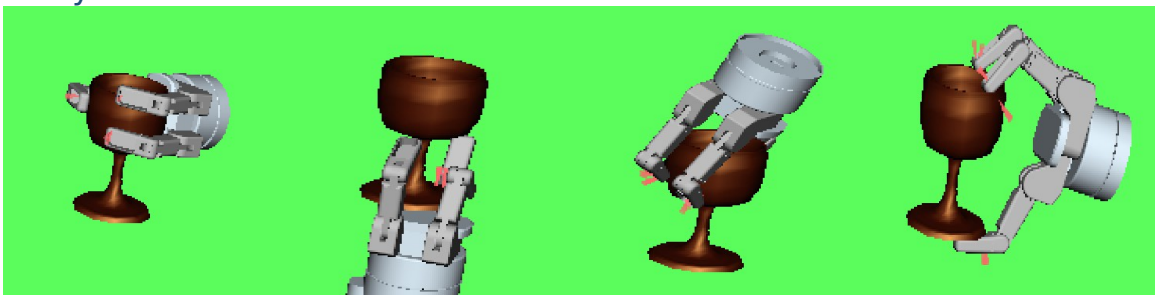
Noisy



Wine Goblet

Normal

Noisy



Champagne

Normal

Noisy