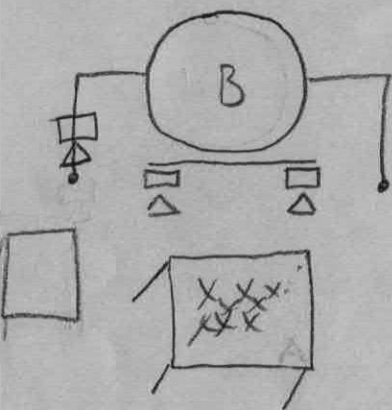


Goal: Use wrist-mounted sensor to verify/improve grasp pose candidates.

Hardware / Experiment:



Software:

- GPD
- Intin: TAM (ICP @ framerate)
- trajopt (motion planning)

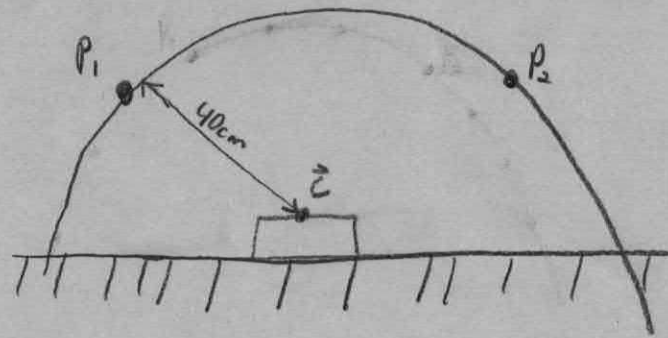
Alg: Grasp Hypothesis Verification.

REPEAT:

1. Acquire point cloud C_b from base sensors.
2. User selects a point \vec{c} .
3. Find grasps G in $\vec{c} + r$. (GPD)
- 4. $G' = \text{ViewPlan}(G, \vec{c}, C_b)$
5. Select $g^* \in G$. $(d_c, \begin{pmatrix} 0 \\ 0 \end{pmatrix} \cdot \vec{a}, w)$
6. Perform grasp and transport object.

$$\underline{\text{Alg: } G' = \text{ViewPlan}(G, \tilde{c}, C_b)}$$

1. Sample pairs of sensor placements $(p_1, p_2) \in P$ about \tilde{c} .
- 2. Rank each $p \in P$ according to $f(p, G, \tilde{c})$.
- 3. Plan and execute trajectory visiting $p^* = (p_1^*, p_2^*)$.
4. $G' =$ Find grasps about \tilde{c} in new point cloud.



$$f(p, G, \tilde{c}) = \underbrace{d_c \cdot d_w \cdot v_1 \cdot v_2}_{\text{Infi:AM track has visible } G \text{ is}} \cdot S$$

Infi:AM track has visible G is

$$S = \frac{\sum_{g \in G} u_1 \cdot u_2}{|G|}$$

$$\min_{x \in \mathbb{R}^{n \times 7}} \left\{ \sum_{i=2}^n \|x_{i-1} - x_i\| \right\}$$

s.t.

$$-x_0 = \text{current}$$

$$-x_7 = p_2^*$$

- x is collision-free
- x is within joint limits
- Sensor min-range is maintained (from $p_1^* \rightarrow p_2^*$)
- sensor targets \tilde{c} (from $p_1^* \rightarrow p_2^*$)