6DOF Grasp Planning by Optimizing a Deep Learning Scoring Function

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Objective function used during optimization:

\[ f(g) = x_1(g, I) + \frac{\alpha}{\epsilon + \text{distance(hand, object)}} \]

Figure 6: Abstract illustration of the multi-valued problem space (left). We propose learning a classification score and applying a gradient-based control on the pose dimensions (right).

Figure 9: Example sequences for locally optimizing a failed grasp to a robust grasp. After optimization, (top) the hand can successfully grasp the plane by the tail, (middle) the hand moves closer to the Batman and grasps from the side; (bottom) the hand changes to the opposite side of the dragon to better grasp it.

Table 2: Grasp status after optimization. The initial pose is the hand being “pulled away” from a robust grasp pose.

Robust Loose Failed
81% 12% 7%

References


Future Work

• Explore the performance of other CNN architectures for learning [6];
• Explore the performance of other orientation representation (e.g., quaternion); and
• Build the concept of collision avoidance implicitly into the model so that optimization does not require the explicit model.