Computationally Generated Grippers

This technology offers a custom gripper that can pick up a wide range of objects through the calculation of the optimal lifting points.

What is the Problem?

Passive gripping is a co-design problem between the shape of the object to be grasped, the gripper, and the grasping trajectory. As you hold one of them fixed, there are limitations placed on the other two. Forklifts freeze the gripper and grasp trajectory, forcing a particular shape onto a pallet. Robotic arm grasping tasks are limited, in part, through the degrees of freedom provided by the gripping and robotic arm. As shape complexity increases this constraint becomes more prevalent.

What is the Solution?

The solution is a novel gripper that can pick up a wide range of objects. This was done by jointly optimizing the gripper geometry and the trajectory for a given input part. The algorithm for gripper design focuses on three key objectives: 1) collision avoidance during approach, 2) grasp stability, 3) payload capacity. The interdependence between design of the gripper geometry and the path planning of the robot arm during insertion is optimized to enable this approach. A collision-free trajectory given the gripper geometry is calculated, and a degree of freedom can be generated for the grippers. Clustering of designs of grasp points and trajectories for picking of objects to generate families of zero DOF grippers that can then be generated by placing linear actuators to generate lines of grasping points. This allows for a low DOF gripper to pick up a wide range of objects.

What is the Competitive Advantage?

Existing solutions are limited in the objects they can pick up due to the grasp trajectory and degrees of freedom offered by the robotic arm and gripper. This innovation addresses the limitation through generation of a custom gripper through the calculation of the optimal lifting points. This allows for a low degree of freedom gripper that is capable of picking up a variety of objects with various form factors.

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