Filled macaroni

Task Step Decomposition and Process Control

Grasp

Align macaroni and bowl

Tilt Container

Filled with macaroni?

Put on table

Release

Geometric Component Identification

Geometry Component Facts

Example

Scheme

Geometry Constraints Generation

Geometry Facts

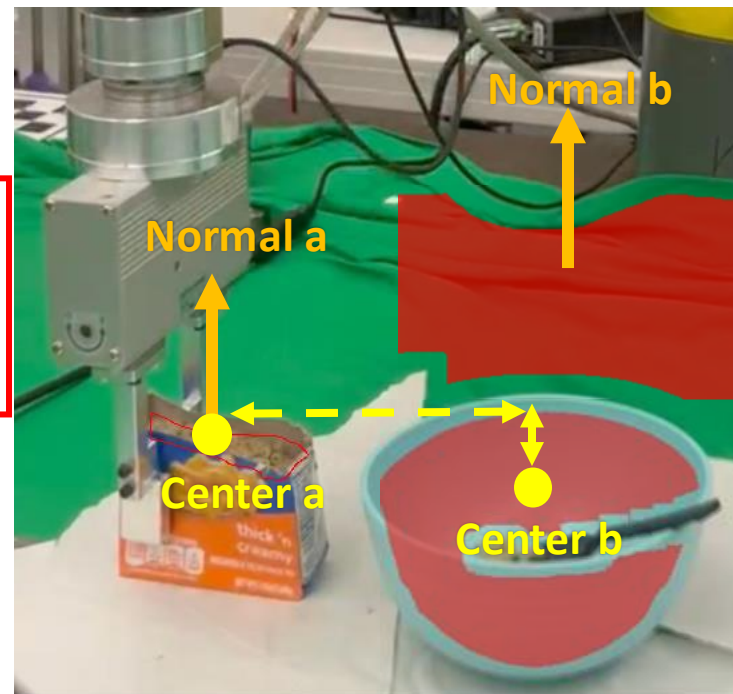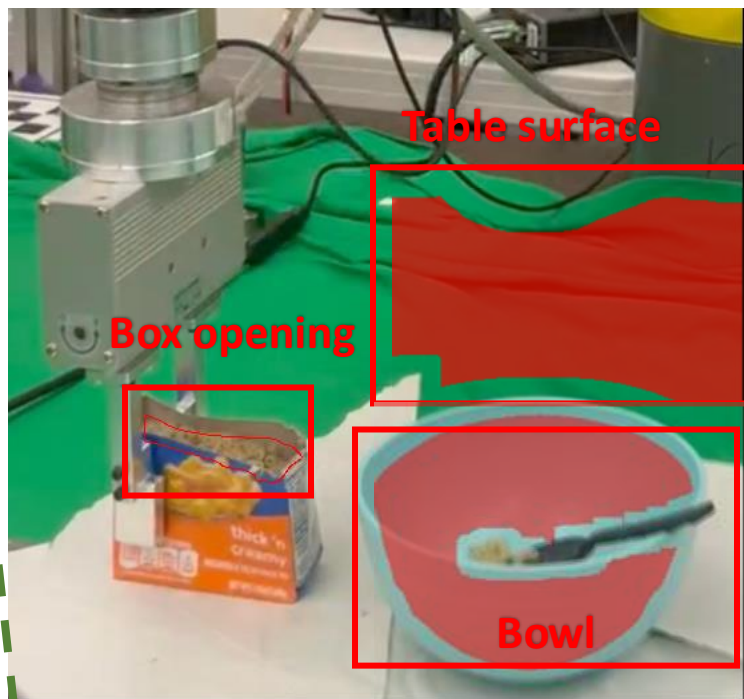Examples

Scheme

Solving Trajectory

cost
= abs(**Normal a** • **Normal b**)
+ abs(**Center a**[2] − **Center b**[2] − 0.2)
+ abs(||**Center a**[:2] − **Center b**[:2]||₂)
min cost + regularization
R, t

Execution

Table surface

Box opening

Bowl

Normal a

Normal b

Center a

Center b