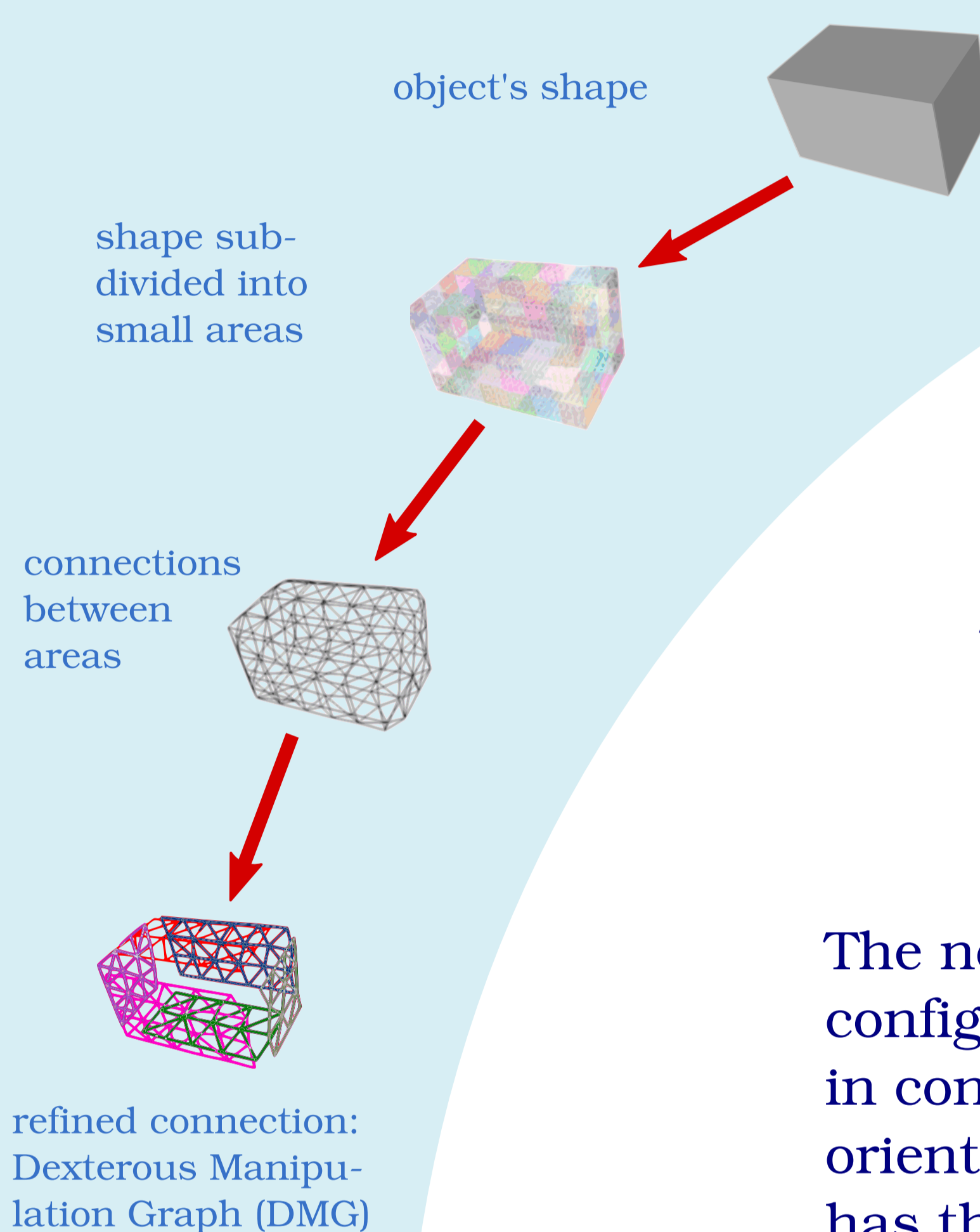


Planning In-Hand Manipulation: Dexterous Manipulation Graphs

Graph Generation

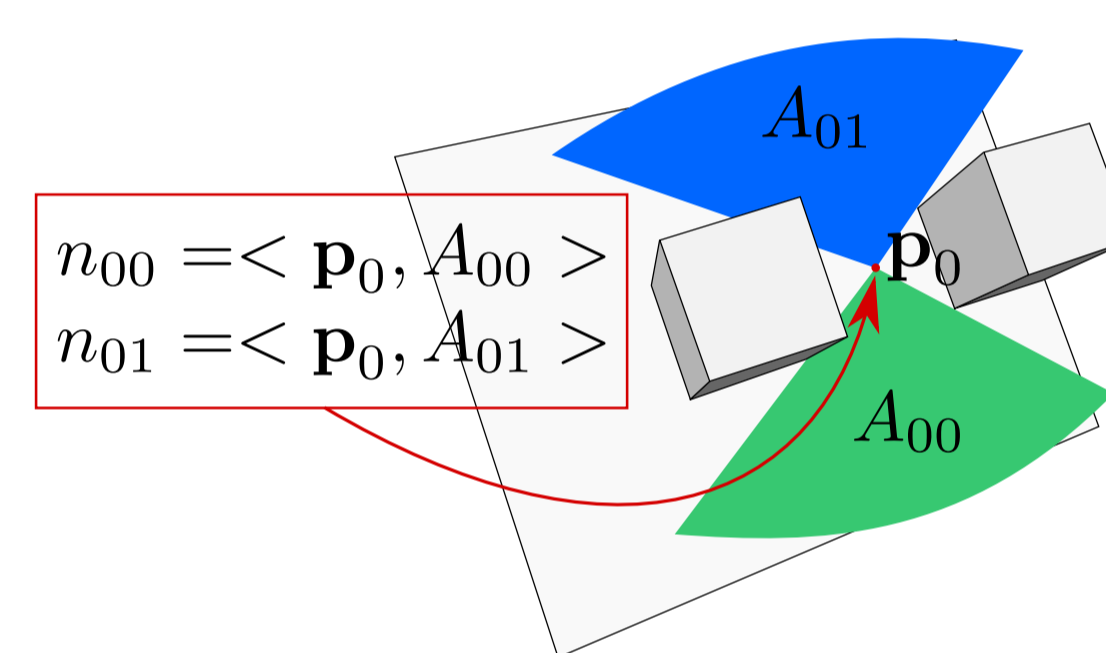
The focus is on vision based manipulation: only the information about the object's shape is used.



The Graph

The nodes of the DMG represent a configuration of the finger in contact with the object, including both position and orientation.

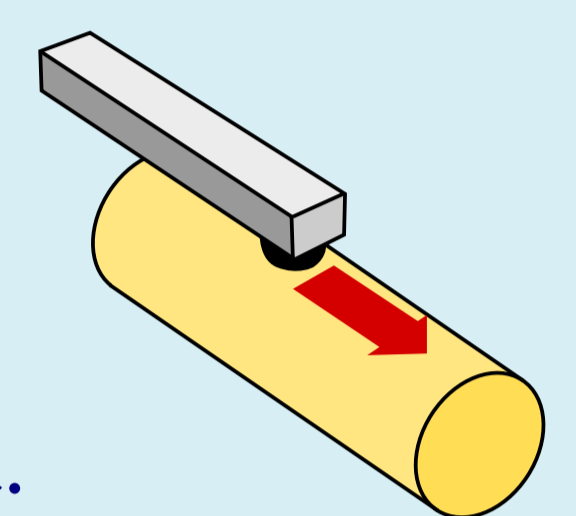
The node n_{00} corresponds to the finger configuration in which the fingertip is in contact at the point \mathbf{p}_0 and the orientation range is A_{00} . The node n_{01} has the same contact point, but a different orientation range.



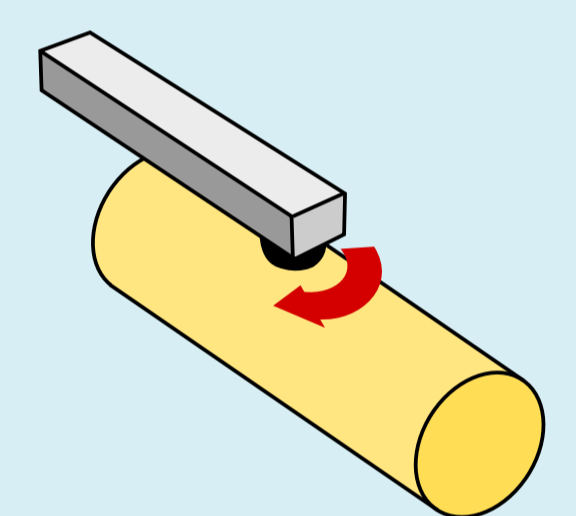
In-Hand Motions

We consider two possible ways in which a finger moves on the object's surface.

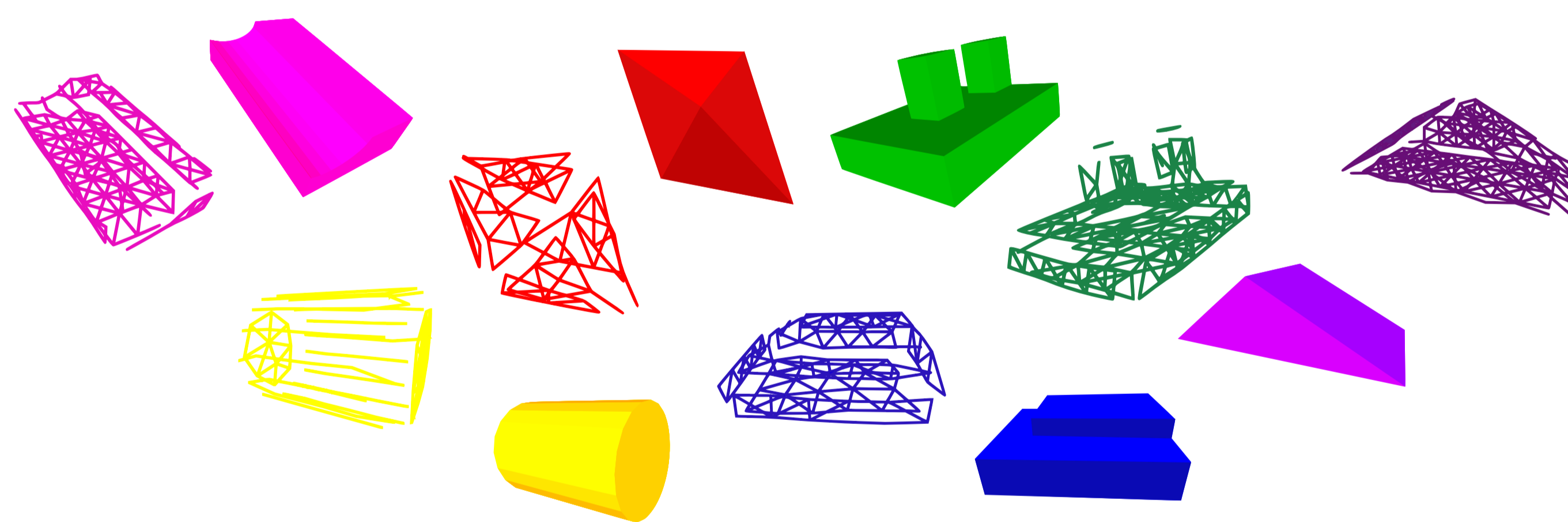
1) Translation: the contact point between the fingertip and the object slides along the object.



2) Rotation: the contact point does not move, and the finger rotates around it.

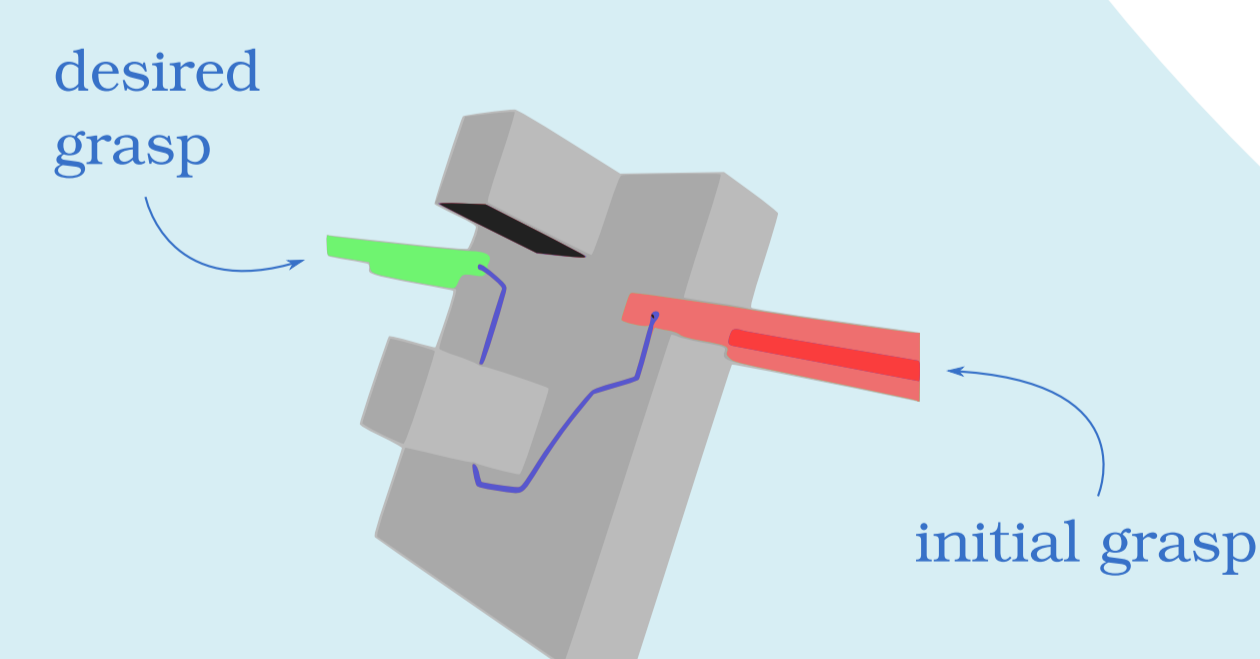
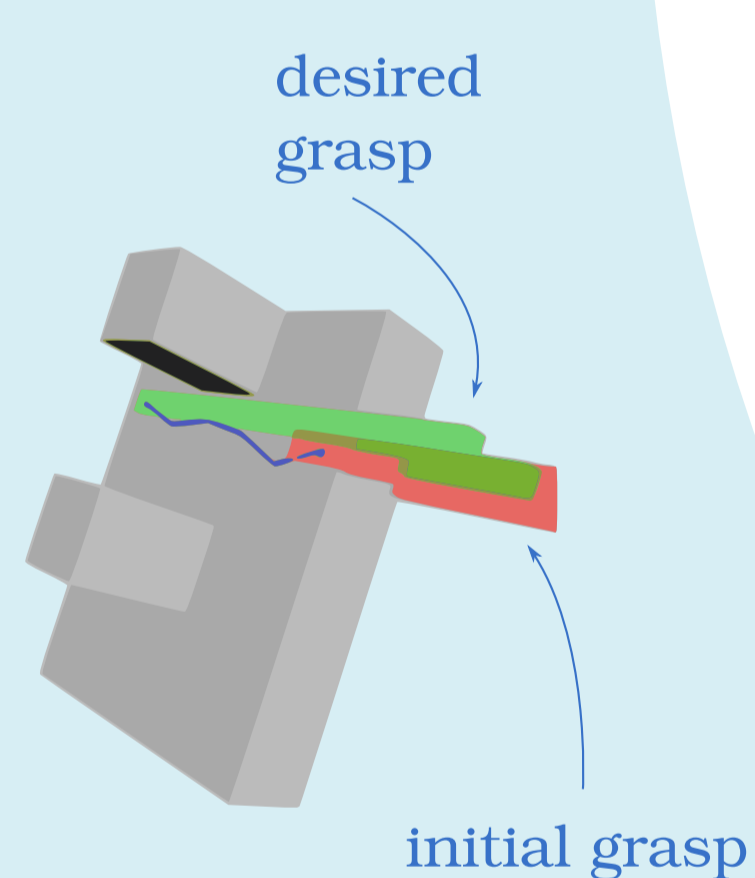


The edges connect nodes if it is possible to move the finger from one configuration to the other using rotation or translation.



For more details see:
[arXiv:1803.00346](https://arxiv.org/abs/1803.00346)

If the solution cannot be achieved without releasing the object, the DMG helps in planning the regrasp sequence and other in-hand adjustments.



The DMG plans in-hand paths that can be executed with non-prehensile pushing. Since the nodes in the graph contain orientation information, different desired angles can produce different solutions.

Solution Examples

