

Predicate Definitions: Geometric Conditions

SPATIAL PREDICATES

is_near	$d(i,j) < 0.2m$	$0 \dashv \dashv \dashv 0$
is_above	$dz > 0.1m$	$0 \text{ (top)}$
is_below	$dz < -0.1m$	$0 \text{ (bottom)}$
is_left	$dx < -0.05m$	$< \dashv \dashv 0 \quad 0$
is_right	$dx > 0.05m$	$0 \quad 0 \dashv \dashv >$

INTERACTION PREDICATES

holding	$\text{gripper\_closed} \ \& \ d < 0.05m$	$[G] \dashv \dashv 0$
contacting	$d(i,j) < 0.05m$	$0 \dashv \dashv 0$
approaching	$v.d < 0 \text{ (toward)}$	$0 \dashv \dashv > 0$
retracting	$v.d > 0 \text{ (away)}$	$0 < \dashv \dashv 0$

Notation: d = Euclidean distance, dx/dz = coordinate difference,  
v = velocity vector, O = node (joint), [G] = gripper