
a Navigation functions
Perception
Sensor observations
Environment features
Localization
Pose estimation
Map-relative position
Planning
Goal and map
Collision-free path
Motion control
Path tracking
Actuator commands
Sensor feedback during execution
b Representative roadmap constructions
Visibility / tangent
Obstacle-derived vertices
Geometric connections
Voronoi-based
Clearance-based structure
Equidistant free-space loci
Probabilistic roadmap
Sampled configurations
Local connection attempts
Study scope
Visibility-based candidates; persistent and query-specific collision validation