

# Navigation Theory

## ★ Costmap

⇒ Cost map can be divided into two:

### ① Global Costmap

⇒ Sets up path plan for navigating in the global area of the fixed map.

### ② Local Costmap

⇒ Used for path planning and obstacle avoidance in the limited area around the robot.

⇒ Although purposes are different, both Costmaps are represented in the same way.

⇒ The Cost map is expressed as a value between 0 and 255

000 ⇒ Free area where robot can move freely.

001 - 127 ⇒ Area of low collision probability.

128 - 252 ⇒ Area of high collision probability.

253 - 254 ⇒ Collision area.

255 ⇒ Occupied area: where robot cannot move.

## \* AMCL

→ Adaptive Monte Carlo Localization

⇒ The ultimate goal of Monte Carlo Pose estimation (MCL) is to determine where the robot is located in a given environment.

→ (i.e. we must get  $x, y$  and  $\theta$  of the robot on the map)

## \* Dynamic Window Approach (DWA)

⇒ DWA is a popular method for obstacle avoidance planning and avoiding obstacles.

⇒ This is a method of selecting a speed that can quickly reach a target point while avoiding the obstacles.

⇒ In DWA the objective function  $G$  is used to calculate the translational velocity  $v$  and the rotational velocity  $\omega$  and maximizes the objective function which considers the direction, velocity and collision of the robot.