

# Navigation: Bug algorithms

Bug 1

# Bug1

The simplest correct Bug algorithm is called Bug1.

- Move toward the goal until reaching an obstacle.
- Turn left and follow the obstacle boundary.
- Follow the entire boundary of that obstacle. Keep track of which point on the boundary is closest to the goal.
- Return to this point, following the obstacle boundary in whichever direction is shorter.
- Repeat until the robot reaches the goal.

# Analysis of Bug1

How long a path does Bug1 generate?

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How long a path does Bug1 generate?

- $D$ : distance from start to goal
- $M$ : number of obstacles
- $p_i$ : perimeter of obstacle  $i$

The path length is bounded by:

$$D + \frac{3}{2} \sum_{i=1}^M p_i$$

# Hit points and leave points

As the robot follows an obstacle boundary, define:

- The **hit point**  $H$  is the point at which the robot reached the obstacle.
- The **leave point**  $L$  is the point at which the robot leaves the obstacle.