Obstacle Avoidance

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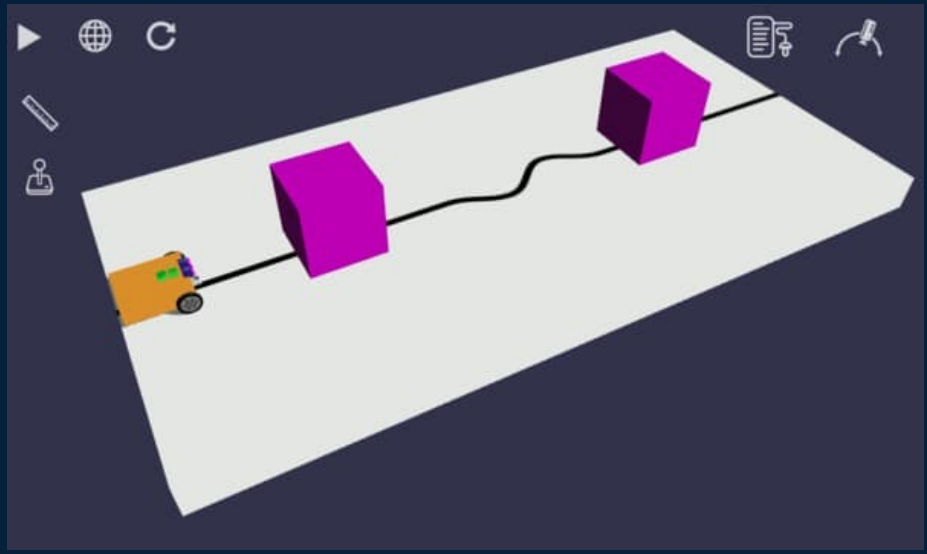
Play · Experience · Learn



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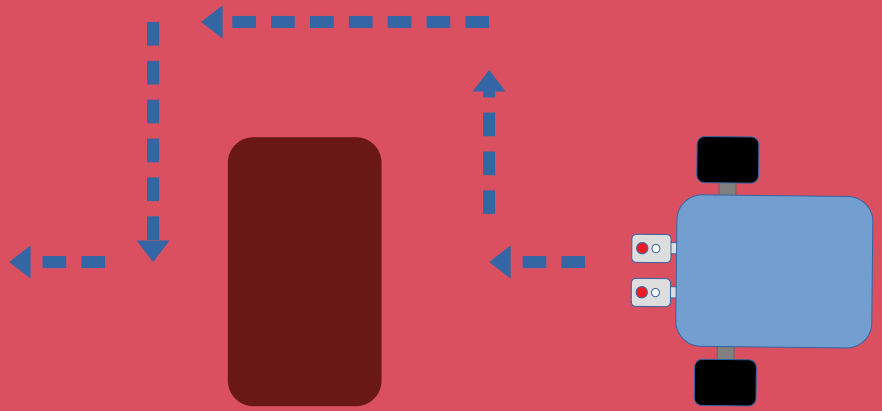
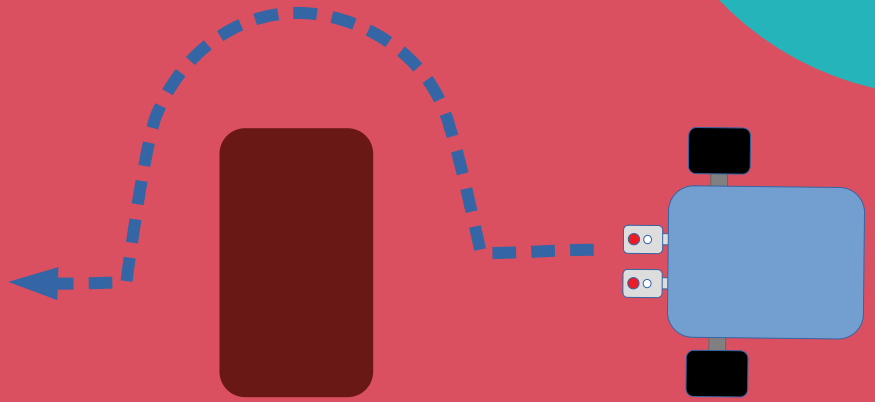
Before We Start

- Robot
  - Use either the Single or Double Sensor Line Follower robot
- World
  - Use “Line Following Challenges” world
  - Start with the “Obstacles 1” challenge

Navigating Around Obstacles



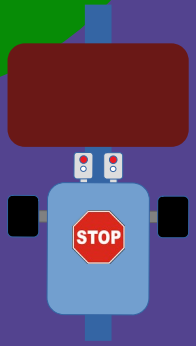
Straight Path



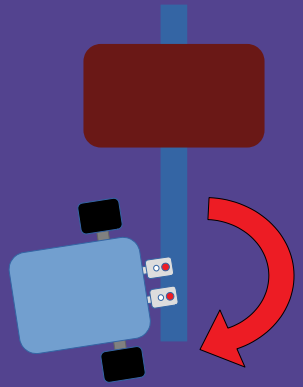
Arc Path

Both methods are workable.
Both methods can be improved with the use of side facing sensors.

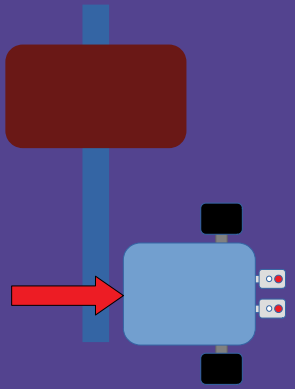
Naive Approach



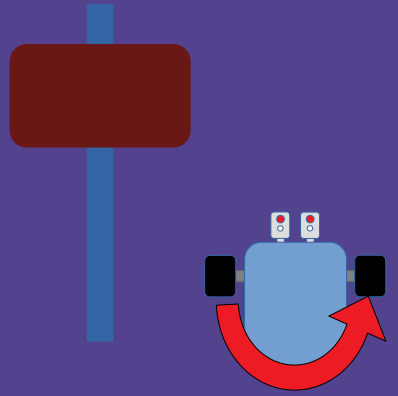
1) Stop



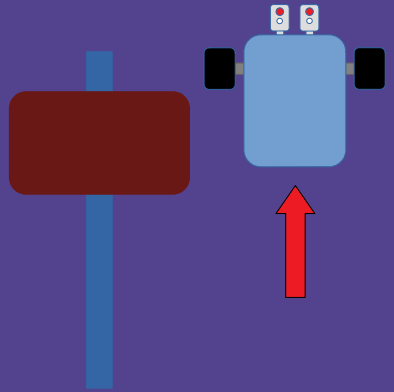
2) Turn



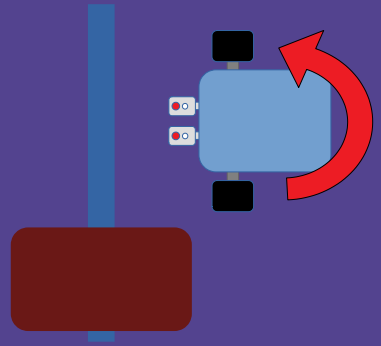
3) Straight



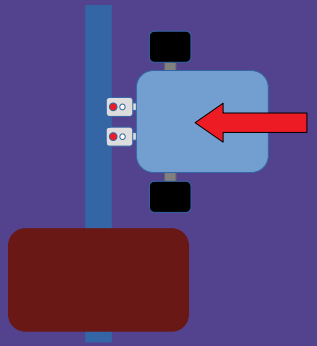
4) Turn



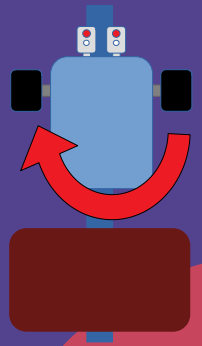
5) Straight



6) Turn



7) Straight



8) Turn

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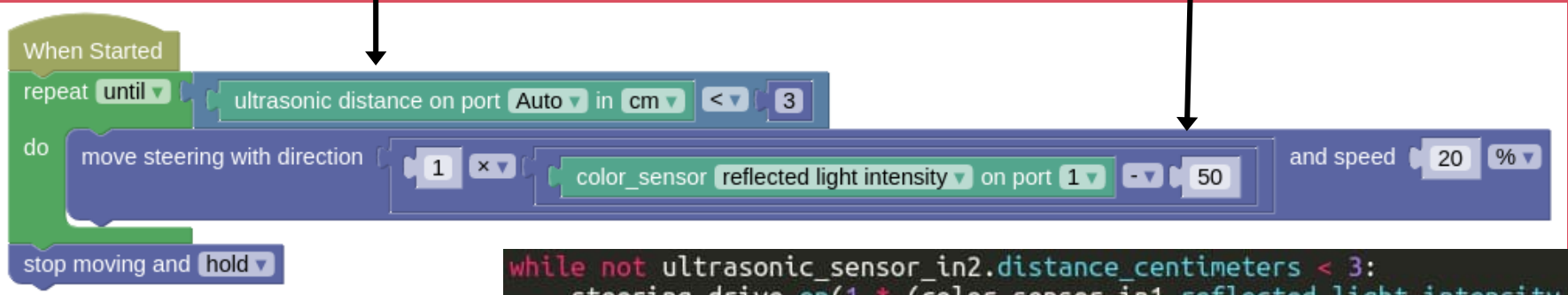
Naive Approach

Repeat until less than 3cm from obstacle

Proportional line follower

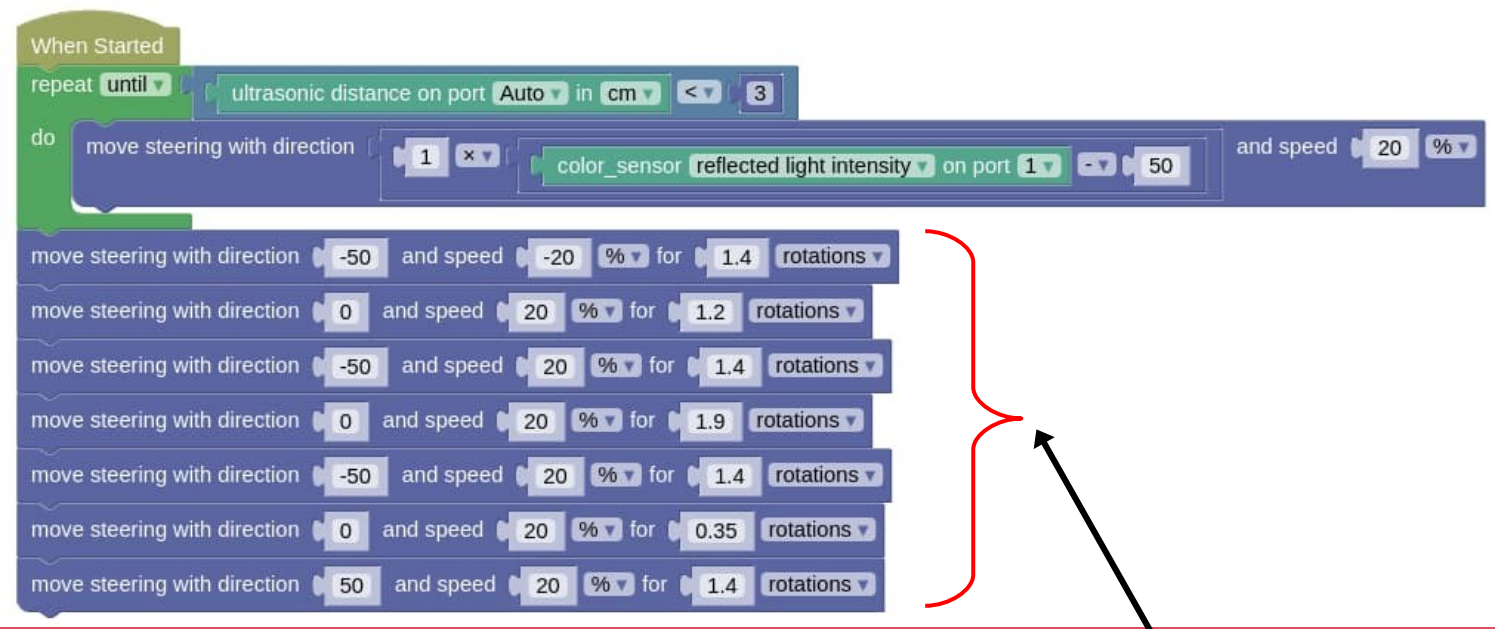



```
while not ultrasonic_sensor_in2.distance_centimeters < 3:
    steering_drive.on(1 * (color_sensor_in1.reflected_light_intensity - 50), 20)
tank_drive.off(brake=True)
```

Need to tell the robot to stop, or it'll continue moving even after the program ends

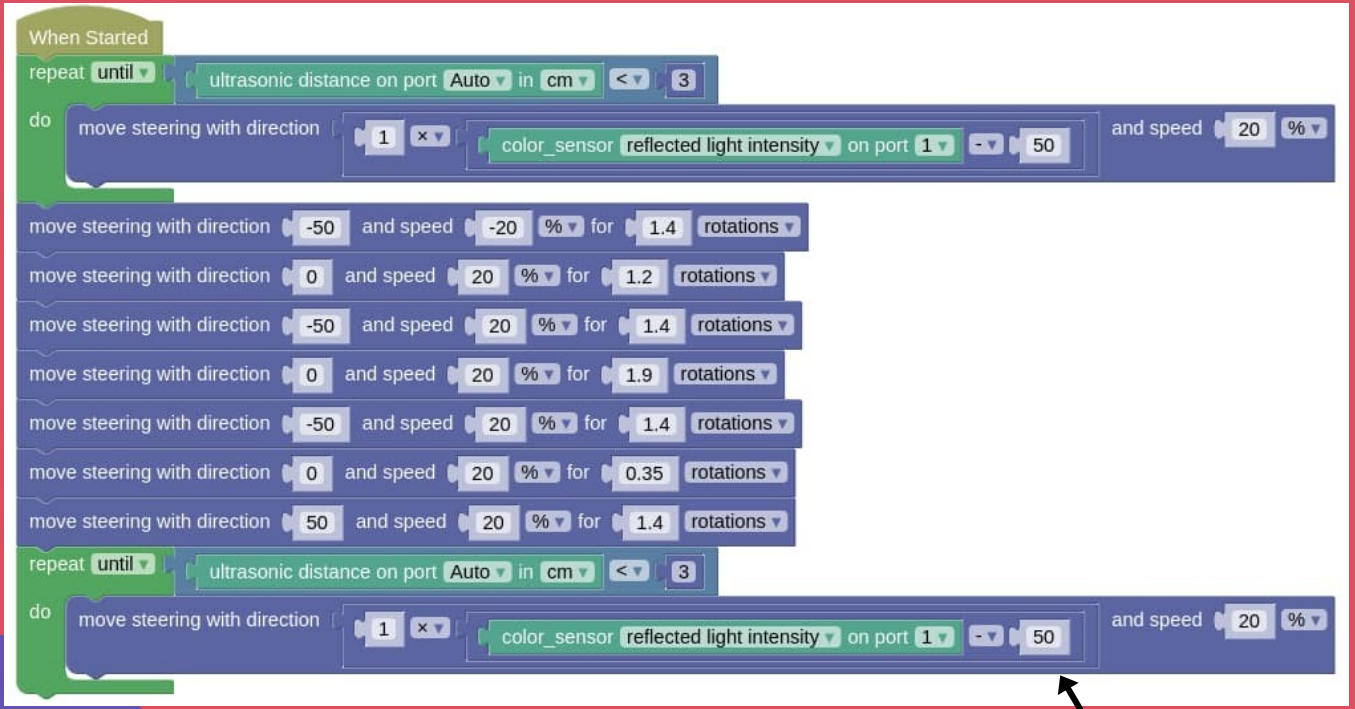
1) Our first step is to line follow until we are close to the obstacle, then stop

Naive Approach



2) Navigate around the obstacle. These are basically step 2 to 8 in the naive approach.

Naive Approach



3) Resume line following

Naive Approach

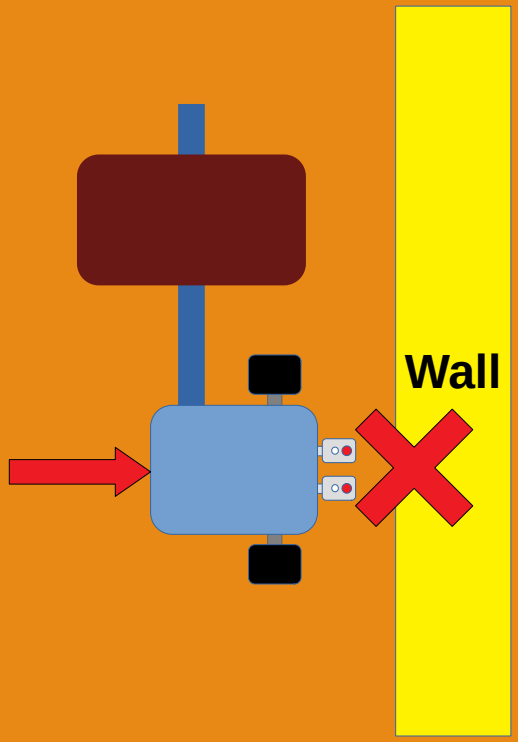
- It’s “naive”, because it assumes...
  - Robot can turn and move accurately
  - Path on the right is unobstructed
  - No gaps in the floor
  - Obstacle is a fixed size
  - The line continues on the opposite side of the obstacle

Inaccurate Turns and Moves

- Robots won’t turn and move accurately, due to...
  - Uneven ground
  - Tires slipping
  - Motors inaccuracies

- Solve this by...
  - Using the gyro to control your turns
  - Using a gyro follower code to control your moves
  - Turning slower
  - Reducing acceleration (ie. Change speed gradually)

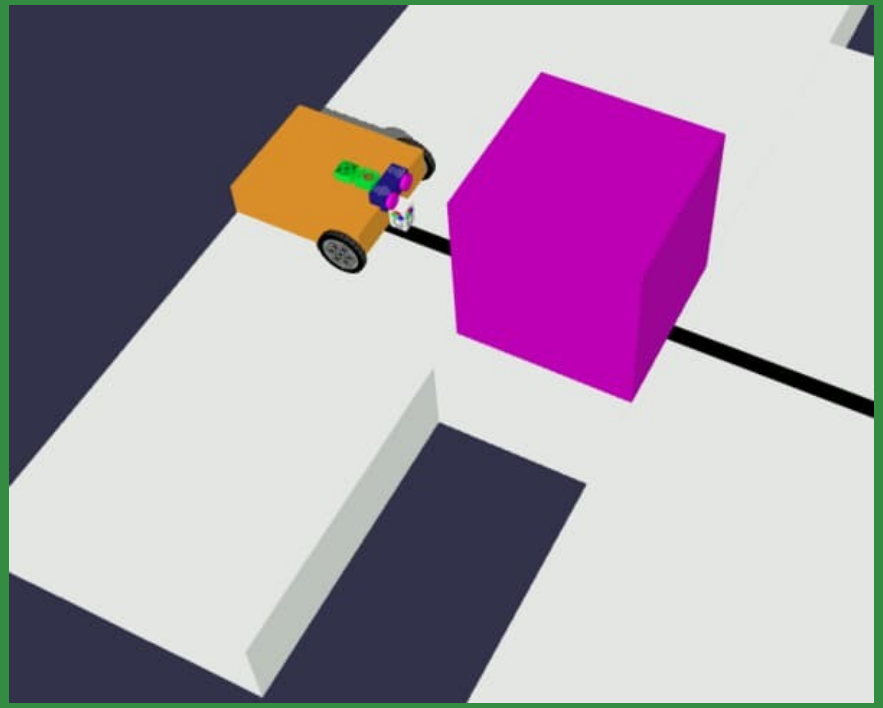
Obstructions on Path



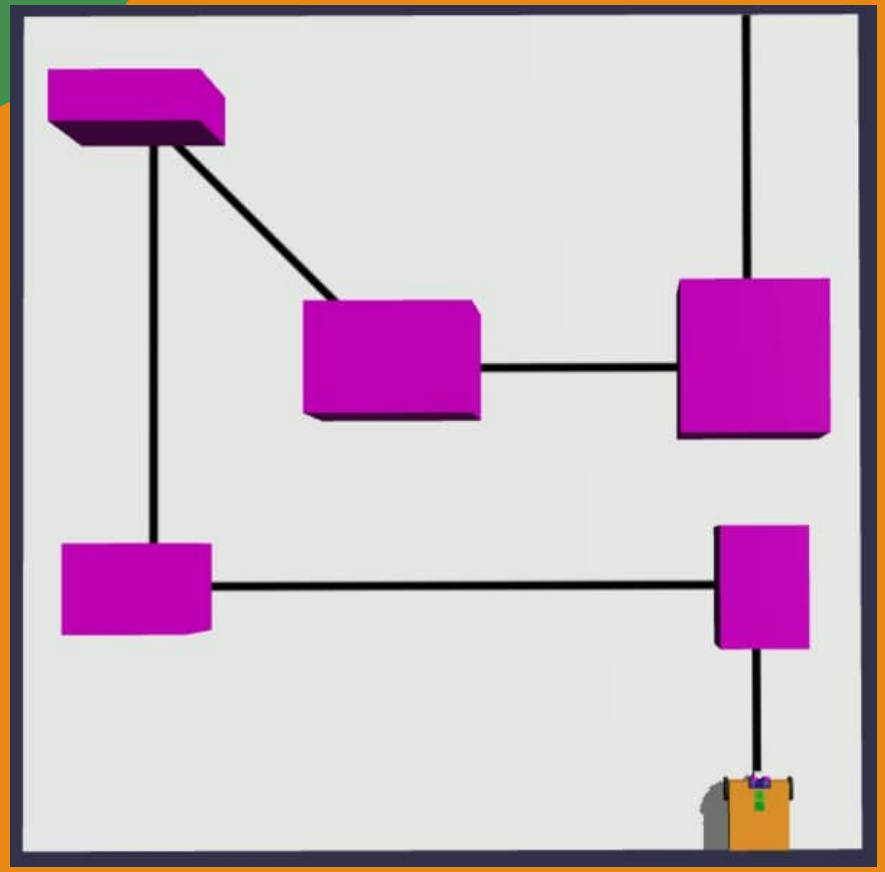
- One side of the obstacle may be blocked
- Solve by...
  - Detect obstructions with ultrasonic
  - Backtrack to starting position if detected
  - Navigate around using the other path (ie. Going left instead of right)

Gaps in Floor

- There may be a gap in the floor on one side
- Solve by...
  - Detect floor gaps using color sensor or downward facing ultrasonic
  - Backtrack to starting position if detected
  - Navigate around using the other path (ie. Going left instead of right)



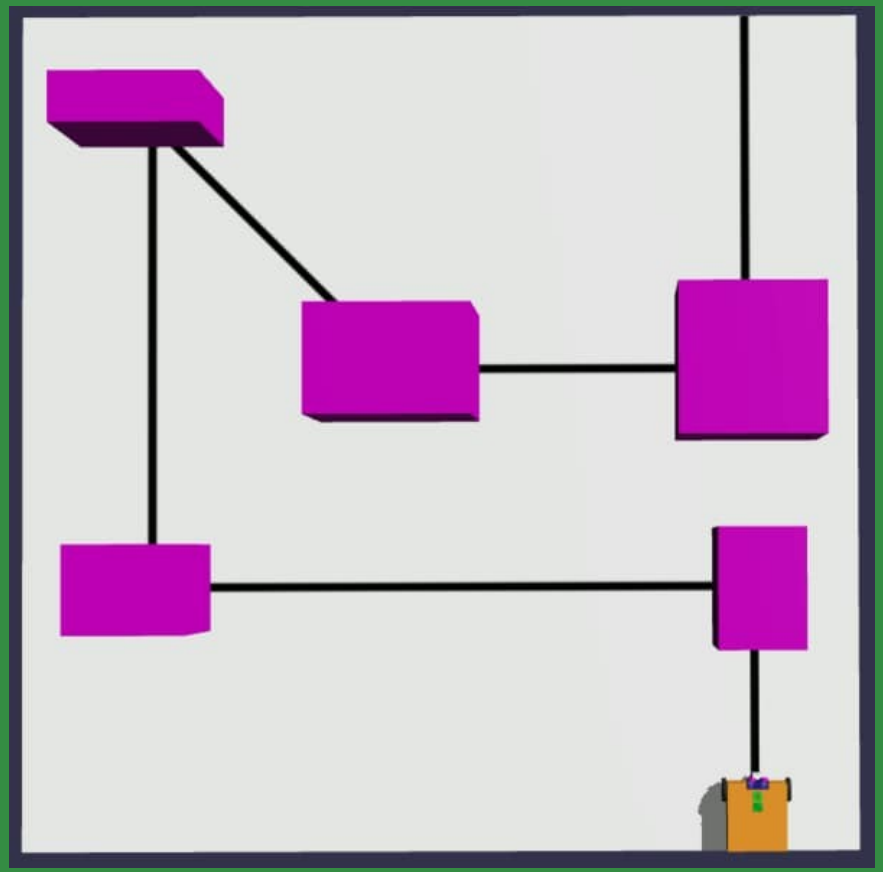
Random Size Obstacles



- Obstacle may not be a fixed size
- Solve by...
  - Use a sidewards facing ultrasonic to detect obstacle; this will let you know when it’s safe to turn
  - You can also try using a wall following algorithm to navigate around the obstacle

Line not on Opposite Side

- The line may not always continue on the opposite side of the obstacle
- Solve by...
  - Check for the line using the color sensor as you navigate around the obstacle
  - Stop navigating as soon as you detect the line



Challenges

- Program your robot to complete these challenges
  - Obstacles 1
  - Obstacles 2
  - Obstacles 3
  - Obstacles 4

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