

04_03_wall_following_student

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Part of the InnovatED STEM and DroneBlocks Land, Air, and Sea Robotics Curriculum
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1 Wall Following with MultiRanger – Student Version

In this notebook, you'll learn how to follow a wall using the **Crazyflie drone** and its **MultiRanger sensors**.

We'll break down the code step-by-step to help you understand the logic behind autonomous wall following.

1.1 Setup

Import and initialize the drone simulator. ## Command Reference Table | Command | Description | Parameters (units/type) |

Command	Description	Parameters (units/type)
<code>takeoff()</code>	Drone takes off and hovers	height (m/float), speed (m/s/float)
<code>land()</code>	Lands the drone	speed (m/s/float)
<code>forward()</code>	Move forward	distance (m/float), speed (m/s/float)
<code>left()</code> / <code>right()</code>	Move sideways (strafe)	distance (m/float), speed (m/s/float)
<code>get_distances()</code>	Returns dictionary of sensor distances	None
<code>get_distances()['left']</code>	Distance to the wall on the left	(m/float)
<code>get_distances()['right']</code>	Distance to the wall on the right	(m/float)

```
[ ]: import time
from crazyflie_sim import CrazyflieSimulator

drone = CrazyflieSimulator(real=False)
```

1.2 Step 1: Take Off

Let's take off to 1.0 meter altitude at 0.3 m/s.

```
[ ]: drone.takeoff(1.0, 0.3)
time.sleep(2)
```

1.3 Step 2: Wall Following Logic (Right Wall)

Goal: Stay about 0.5m from the right wall - If too far from the wall ($> 0.6\text{m}$), turn right - If too close to the wall ($< 0.4\text{m}$), turn left - Otherwise, move forward

1.3.1 Step 3: One Loop Iteration

Read distances and react based on right wall.

```
[ ]: distances = drone.get_distances()
right_dist = distances['right']

if right_dist > 0.6:
    print("Too far from wall - adjusting right")
    drone.rotate(-10, 0.5)
elif right_dist < 0.4:
    print("Too close to wall - adjusting left")
    drone.rotate(10, 0.5)
else:
    print("Maintaining distance")

drone.forward(0.1, 0.2)
time.sleep(1)
```

1.3.2 Step 4: Loop it!

Now let's run that logic for 10 steps.

```
[ ]: for _ in range(10):
    distances = drone.get_distances()
    right_dist = distances['right']

    if right_dist > 0.6:
        print("Too far from wall - adjusting right")
        drone.rotate(-10, 0.5)
    elif right_dist < 0.4:
        print("Too close to wall - adjusting left")
        drone.rotate(10, 0.5)
    else:
        print("Maintaining distance")

    drone.forward(0.1, 0.2)
    time.sleep(1)
```

1.4 Exercise 1: Follow the Left Wall Instead

Modify the loop to follow the **left wall** instead of the right. - If **left** > 0.6: rotate **left** - If **left** < 0.4: rotate **right** - Then move forward.

```
[ ]:
```

1.5 Exercise 2: Stop if a Wall is Ahead

If the drone sees a wall **closer than 0.5 meters in front**, it should stop and print a warning.

```
[ ]:
```

1.6 Land and Close

Always finish your flight cleanly.

```
[ ]: drone.land(0.3)  
     drone.close()
```