```
import numpy as np
import matplotlib.pyplot as plt
import matplotlib.animation as animation

# Robot parameters
class Robot:
    def __init__(self, x=0, y=0, theta=0,
speed=1.0):
        self.x = x
        self.y = y
        self.theta = theta  # orientation in
radians
        self.speed = speed  # units per time
step

    def move(self, steering_angle):
        # Update heading
        self.theta += steering_angle
        # Move forward
        self.x += self.speed *
np.cos(self.theta)
```



```
        self.y += self.speed * np.sin(self.theta)

    def position(self):
        return self.x, self.y
```

```
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np.cos(self.theta)
```



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        self.y += self.speed * np.sin(self.theta)

    def position(self):
        return self.x, self.y

# Simulation parameters
robot = Robot()
trajectory_x, trajectory_y = [robot.x],
[robot.y]

# Generate random steering inputs for
demonstration
np.random.seed(0)
steering_angles = np.random.uniform(-0.1,
0.1, 100)

# Animation setup
fig, ax = plt.subplots()
line, = ax.plot([], [], 'b-', lw=2)
robot_dot, = ax.plot([], [], 'ro')
```



```
def init():
    ax.set_xlim(-50, 50)
```

```
def init():
    ax.set_xlim(-50, 50)
    ax.set_ylim(-50, 50)
    return line, robot_dot

def update(frame):
    steering = steering_angles[frame]
    robot.move(steering)
    x, y = robot.position()
    trajectory_x.append(x)
    trajectory_y.append(y)

    line.set_data(trajectory_x, trajectory_y)
    robot_dot.set_data(x, y)
    return line, robot_dot

ani = animation.FuncAnimation(fig, update,
frames=len(steering_angles),
                              init_func=init, blit=True,
interval=100)
```

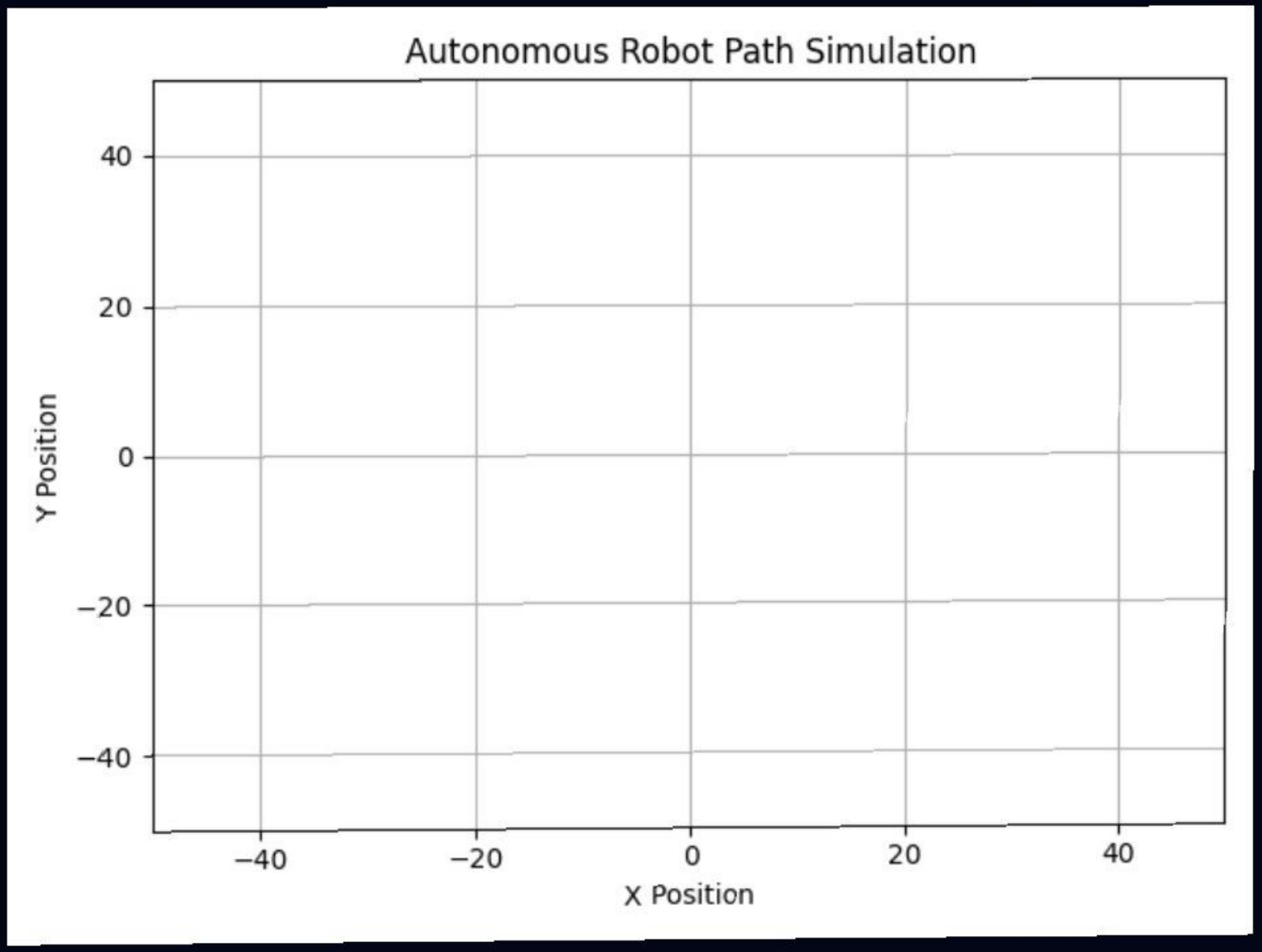


```
plt.title("Autonomous Robot Path
Simulation")
```

```
frames=len(steering_angles),
                    init_func=init, blit=True,
interval=100)
```



```
plt.title("Autonomous Robot Path
Simulation")
plt.xlabel("X Position")
plt.ylabel("Y Position")
plt.grid(True)
plt.show()
```


Autonomous Robot Path Simulation
40
20
0
−20
−40
Y Position
−40
−20
0
20
40
X Position