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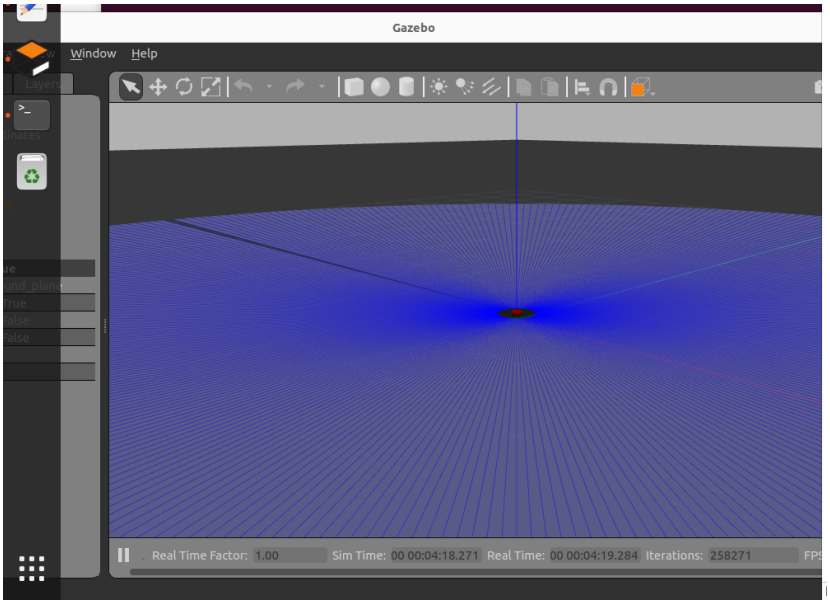
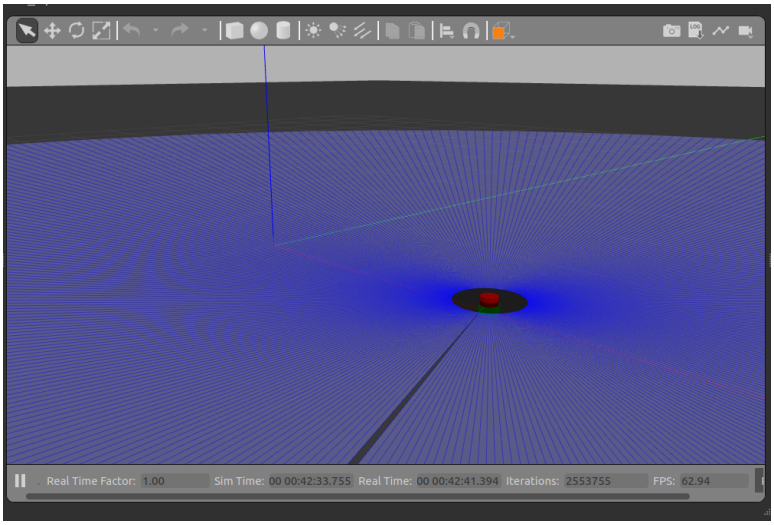
Before Movement:



After Movement:



Python File: drive_to_goal

```
import math
import numpy as np
import rclpy
from rclpy.node import Node
from rclpy.parameter import Parameter
from rcl_interfaces.msg import SetParametersResult
from nav_msgs.msg import Odometry
from geometry_msgs.msg import Twist, Pose, Point,
Quaternion
from nav_msgs.msg import Odometry

def euler_from_quaternion(quaternion):
    """
    Converts quaternion (w in last place) to euler roll,
pitch, yaw
    quaternion = [x, y, z, w]
    """
    x = quaternion.x
    y = quaternion.y
    z = quaternion.z
    w = quaternion.w

    sinr_cosp = 2 * (w * x + y * z)
    cosr_cosp = 1 - 2 * (x * x + y * y)
    roll = np.arctan2(sinr_cosp, cosr_cosp)

    sinp = 2 * (w * y - z * x)
    pitch = np.arcsin(sinp)
```

```
    siny_cosp = 2 * (w * z + x * y)
    cosy_cosp = 1 - 2 * (y * y + z * z)
    yaw = np.arctan2(siny_cosp, cosy_cosp)

    return roll, pitch, yaw


class MoveToGoal(Node):
    def __init__(self):
        super().__init__('move_robot_to_goal')
        self.get_logger().info(f'{self.get_name()}
created')

        self.declare_parameter('goal_x', 0.0)
        self._goal_x =
self.get_parameter('goal_x').get_parameter_value().doubl
e_value
        self.declare_parameter('goal_y', 0.0)
        self._goal_y =
self.get_parameter('goal_y').get_parameter_value().doubl
e_value
        self.declare_parameter('goal_t', 0.0)
        self._goal_t =
self.get_parameter('goal_t').get_parameter_value().doubl
e_value

        self.declare_parameter('max_vel', 0.2)
        self._max_vel =
self.get_parameter('max_vel').get_parameter_value().doub
le_value

        self.declare_parameter('cmd_gain', 5.0)
```

```
        self._cmd_gain =
self.get_parameter('cmd_gain').get_parameter_value().dou
ble_value


self.add_on_set_parameters_callback(self.parameter_callb
ack)
        self.get_logger().info(f"initial goal
{self._goal_x} {self._goal_y} {self._goal_t}")
        self.get_logger().info(f"maximum velocity
{self._max_vel}")

        self._subscriber =
self.create_subscription(Odometry, "/odom",
self._listener_callback, 1)
        self._publisher = self.create_publisher(Twist,
"/cmd_vel", 1)


    def _listener_callback(self, msg, vel_gain=5.0,
max_vel=0.2, max_pos_err=0.05):
        pose = msg.pose.pose
        max_vel = self._max_vel
        vel_gain = self._cmd_gain
        cur_x = pose.position.x
        cur_y = pose.position.y
        o = pose.orientation
        roll, pitchc, yaw = euler_from_quaternion(o)
        cur_t = yaw

        x_diff = self._goal_x - cur_x
        y_diff = self._goal_y - cur_y
```

```
        dist = math.sqrt(x_diff * x_diff + y_diff *
y_diff)

        twist = Twist()
        if dist > max_pos_err:
            x = max(min(x_diff * vel_gain, max_vel), -
max_vel)
            y = max(min(y_diff * vel_gain, max_vel), -
max_vel)
            twist.linear.x = x * math.cos(cur_t) + y *
math.sin(cur_t)
            twist.linear.y = -x * math.sin(cur_t) + y *
math.cos(cur_t)

        angle_diff = math.atan2(math.sin(self._goal_t -
cur_t), math.cos(self._goal_t - cur_t))


        if abs(angle_diff) > max_pos_err:
            self.get_logger().info(f"Twist
{angle_diff}")
            twist.angular.z = max(min(angle_diff *
vel_gain*4, max_vel*5), -max_vel*5)
            self.get_logger().info(f"Twist ang
{twist.angular.z}")
        self.get_logger().info(f"at
({cur_x},{cur_y},{cur_t}) goal
({self._goal_x},{self._goal_y},{self._goal_t})")
        self._publisher.publish(twist)

    def parameter_callback(self, params):
```

```
        self.get_logger().info(f'move_robot_to_goal
parameter callback {params}')
        for param in params:
            self.get_logger().info(f'move_robot_to_goal
processing {param.name}')
            if param.name == 'goal_x' and param.type_ ==
Parameter.Type.DOUBLE:
                self._goal_x = param.value
            elif param.name == 'goal_y' and param.type_
== Parameter.Type.DOUBLE:
                self._goal_y = param.value
            elif param.name == 'goal_t' and param.type_
== Parameter.Type.DOUBLE:
                self._goal_t = param.value
            else:

self.get_logger().warn(f'{self.get_name()} Invalid
parameter {param.name}')
                return
SetParametersResult(successful=False)
            self.get_logger().warn(f"Changing goal
{self._goal_x} {self._goal_y} {self._goal_t}")
        return SetParametersResult(successful=True)



def main(args=None):
    rclpy.init(args=args)
    node = MoveToGoal()
    try:
        rclpy.spin(node)
    except KeyboardInterrupt:
```

```
        pass
    rclpy.shutdown()

if __name__ == '__main__':
    main()
```