

Cibertísico de un Robot Manipulador Móvil Omnidireccional

Diseño Mecatrónico

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- **Manuel Piña Olivas 201060**

Diseño mecánico CAD

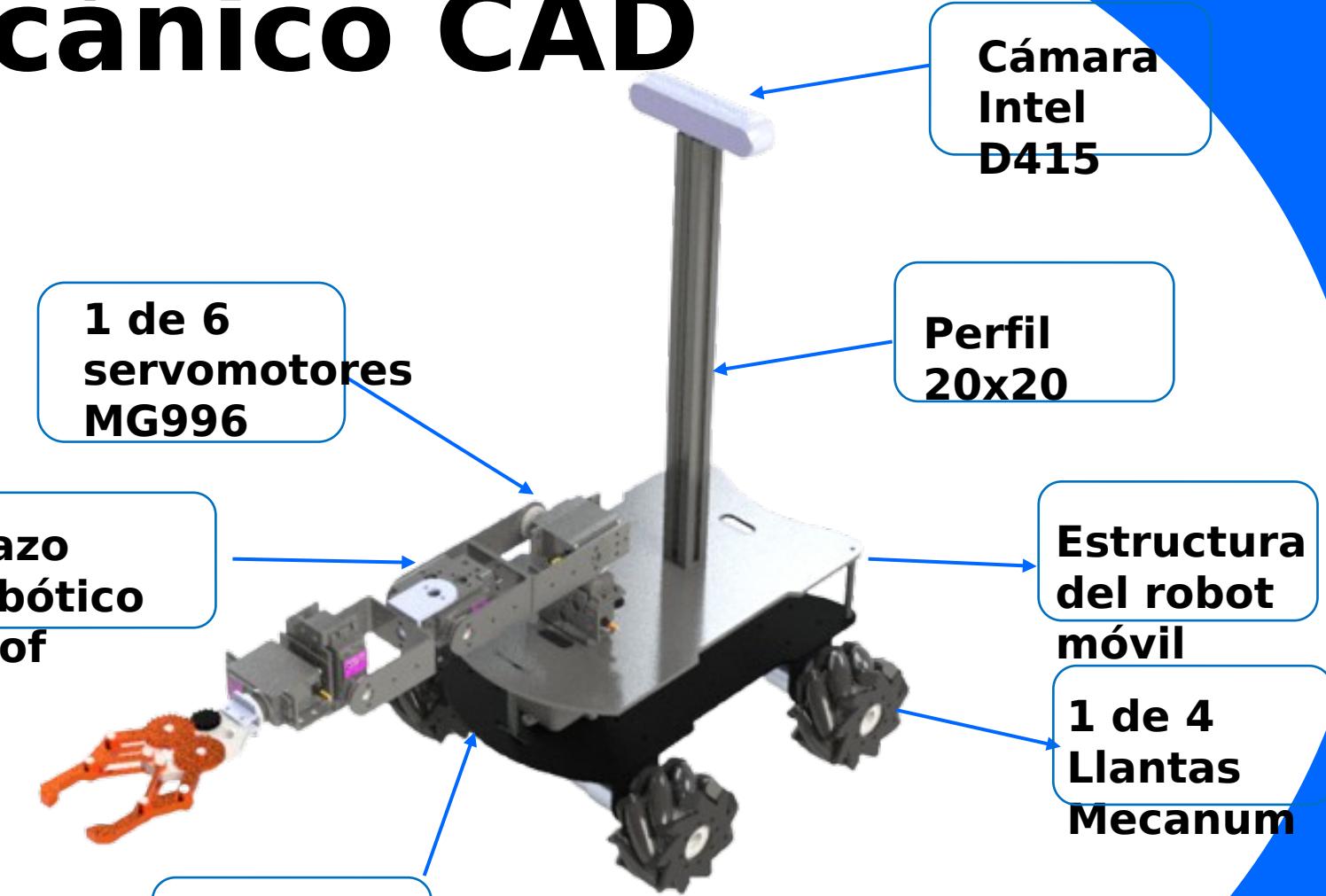
Raspberry
Pi5



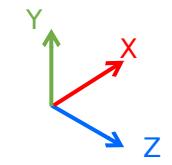
Arduino
Mega Uno



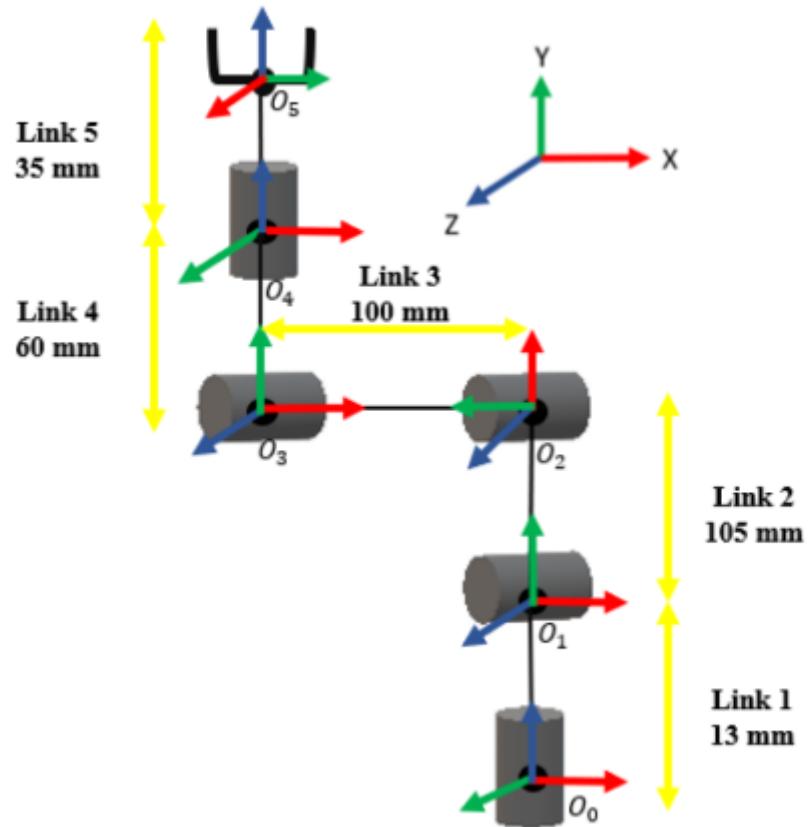
Baterías
Recargables



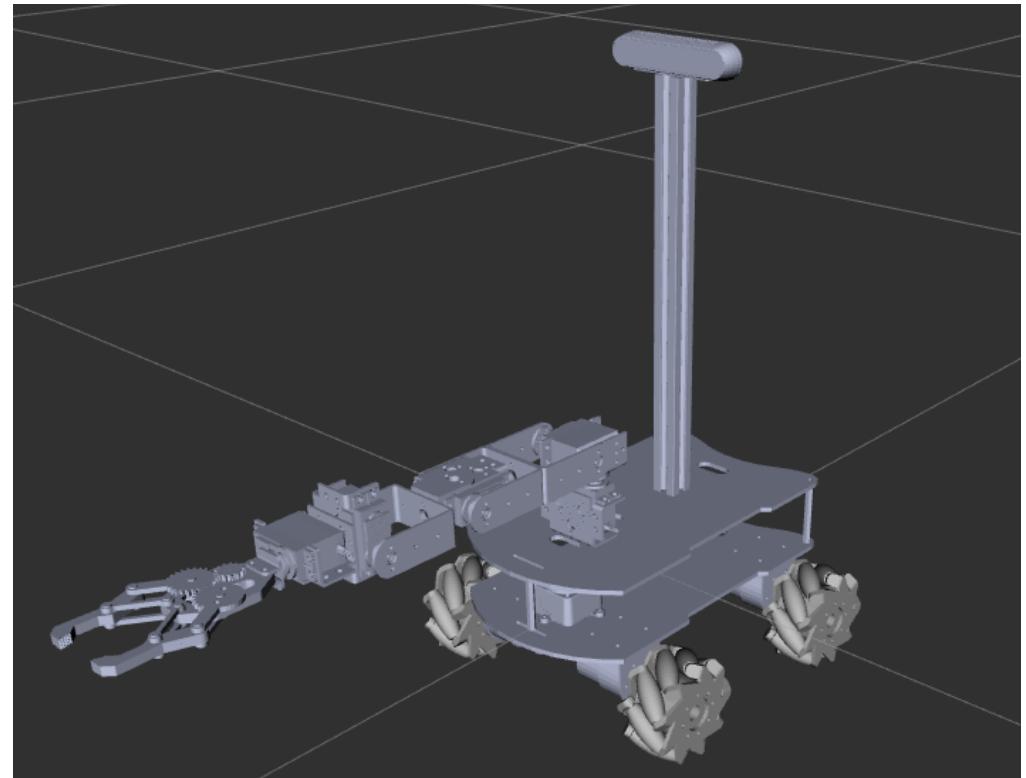
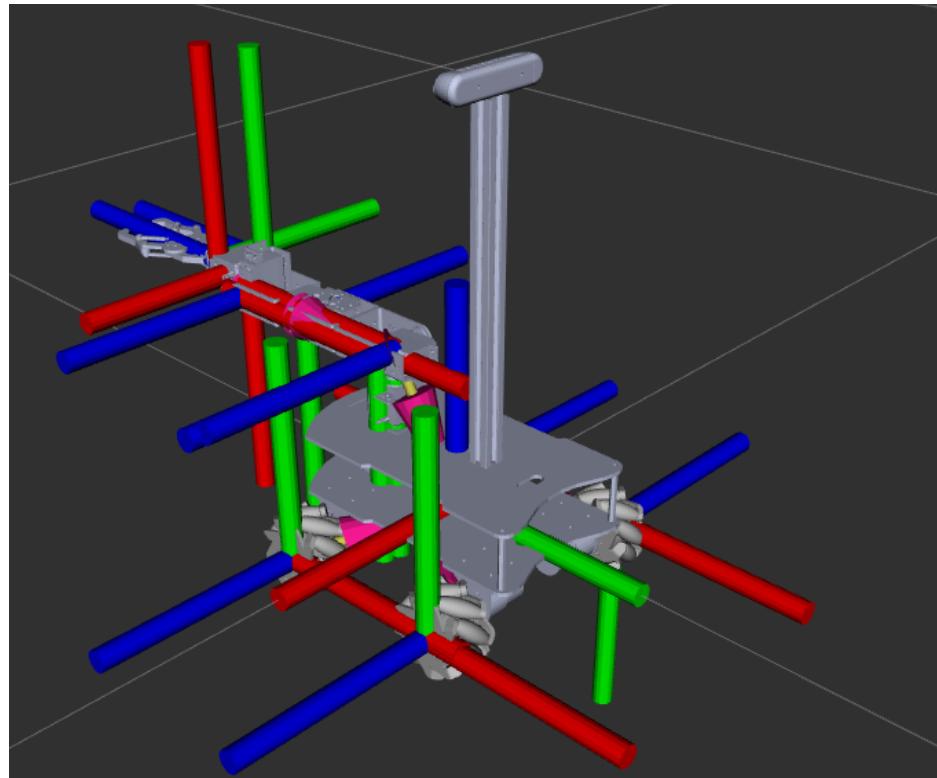
Diseño URDF



Marcos de referencia del manipulador.



Rviz



Cinemática directa de la parte omnidireccional

```
alan@alan-Predator-PH315-52: ~/ros2_ws 91x21
[INFO] [1747059040.048978191] [kinematics_node]: Velocidad del robot [vx, vy, ω]: [0.05 0.
  0. ]
[INFO] [1747059041.048500297] [kinematics_node]: Velocidad del robot [vx, vy, ω]: [0.05 0.
  0. ]
[INFO] [1747059042.048706131] [kinematics_node]: Velocidad del robot [vx, vy, ω]: [0.05 0.
  0. ]
[INFO] [1747059043.048687784] [kinematics_node]: Velocidad del robot [vx, vy, ω]: [0.05 0.
  0. ]
[INFO] [1747059044.049028944] [kinematics_node]: Velocidad del robot [vx, vy, ω]: [0.05 0.
  0. ]
[INFO] [1747059045.049867820] [kinematics_node]: Velocidad del robot [vx, vy, ω]: [0.05 0.
  0. ]
[INFO] [1747059046.048783508] [kinematics_node]: Velocidad del robot [vx, vy, ω]: [0.05 0.
  0. ]
[INFO] [1747059047.048691070] [kinematics_node]: Velocidad del robot [vx, vy, ω]: [0.05 0.
  0. ]
[INFO] [1747059048.048683599] [kinematics_node]: Velocidad del robot [vx, vy, ω]: [0.05 0.
  0. ]
[INFO] [1747059049.048761176] [kinematics_node]: Velocidad del robot [vx, vy, ω]: [0.05 0.
  0. ]
```

Cinemática inversa de la parte omnidireccional

```
alan@alan-Predator-PH315-52: ~/ros2_ws 91x21
[INFO] [1747059072.722480608] [inverse_kinematics_node]: Entradas vx=0.20, vy=0.10, ω=0.30
-> Ruedas: [-1.6 9.6 2.4 5.6]
[INFO] [1747059073.722659728] [inverse_kinematics_node]: Entradas vx=0.20, vy=0.10, ω=0.30
-> Ruedas: [-1.6 9.6 2.4 5.6]
[INFO] [1747059074.722232084] [inverse_kinematics_node]: Entradas vx=0.20, vy=0.10, ω=0.30
-> Ruedas: [-1.6 9.6 2.4 5.6]
[INFO] [1747059075.722131939] [inverse_kinematics_node]: Entradas vx=0.20, vy=0.10, ω=0.30
-> Ruedas: [-1.6 9.6 2.4 5.6]
[INFO] [1747059076.722133796] [inverse_kinematics_node]: Entradas vx=0.20, vy=0.10, ω=0.30
-> Ruedas: [-1.6 9.6 2.4 5.6]
[INFO] [1747059077.722172315] [inverse_kinematics_node]: Entradas vx=0.20, vy=0.10, ω=0.30
-> Ruedas: [-1.6 9.6 2.4 5.6]
[INFO] [1747059078.722416328] [inverse_kinematics_node]: Entradas vx=0.20, vy=0.10, ω=0.30
-> Ruedas: [-1.6 9.6 2.4 5.6]
[INFO] [1747059079.722603052] [inverse_kinematics_node]: Entradas vx=0.20, vy=0.10, ω=0.30
-> Ruedas: [-1.6 9.6 2.4 5.6]
[INFO] [1747059080.722316654] [inverse_kinematics_node]: Entradas vx=0.20, vy=0.10, ω=0.30
-> Ruedas: [-1.6 9.6 2.4 5.6]
[INFO] [1747059081.722243531] [inverse_kinematics_node]: Entradas vx=0.20, vy=0.10, ω=0.30
-> Ruedas: [-1.6 9.6 2.4 5.6]
```

Sistema de Mapeo Basado en ROS 2 con Control de Servomotores y Subscripción de Datos

```
josue@josue-Victus-by-HP-Gaming-Laptop-15-fa0xxx: ~
josue@josue-Victus-by-HP-Gaming-Laptop-15-fa0xxx: ~ 80x24
(dim=[], data_offset=0), data=[90, 45, 120, 60, 30, 180])

publishing #7: std_msgs.msg.Int32MultiArray(layout=std_msgs.msg.MultiArrayLayout
(dim=[], data_offset=0), data=[90, 45, 120, 60, 30, 180])

publishing #8: std_msgs.msg.Int32MultiArray(layout=std_msgs.msg.MultiArrayLayout
(dim=[], data_offset=0), data=[90, 45, 120, 60, 30, 180])

publishing #9: std_msgs.msg.Int32MultiArray(layout=std_msgs.msg.MultiArrayLayout
(dim=[], data_offset=0), data=[90, 45, 120, 60, 30, 180])

publishing #10: std_msgs.msg.Int32MultiArray(layout=std_msgs.msg.MultiArrayLayout
(dim=[], data_offset=0), data=[90, 45, 120, 60, 30, 180])

publishing #11: std_msgs.msg.Int32MultiArray(layout=std_msgs.msg.MultiArrayLayout
(dim=[], data_offset=0), data=[90, 45, 120, 60, 30, 180])

publishing #12: std_msgs.msg.Int32MultiArray(layout=std_msgs.msg.MultiArrayLayout
(dim=[], data_offset=0), data=[90, 45, 120, 60, 30, 180])

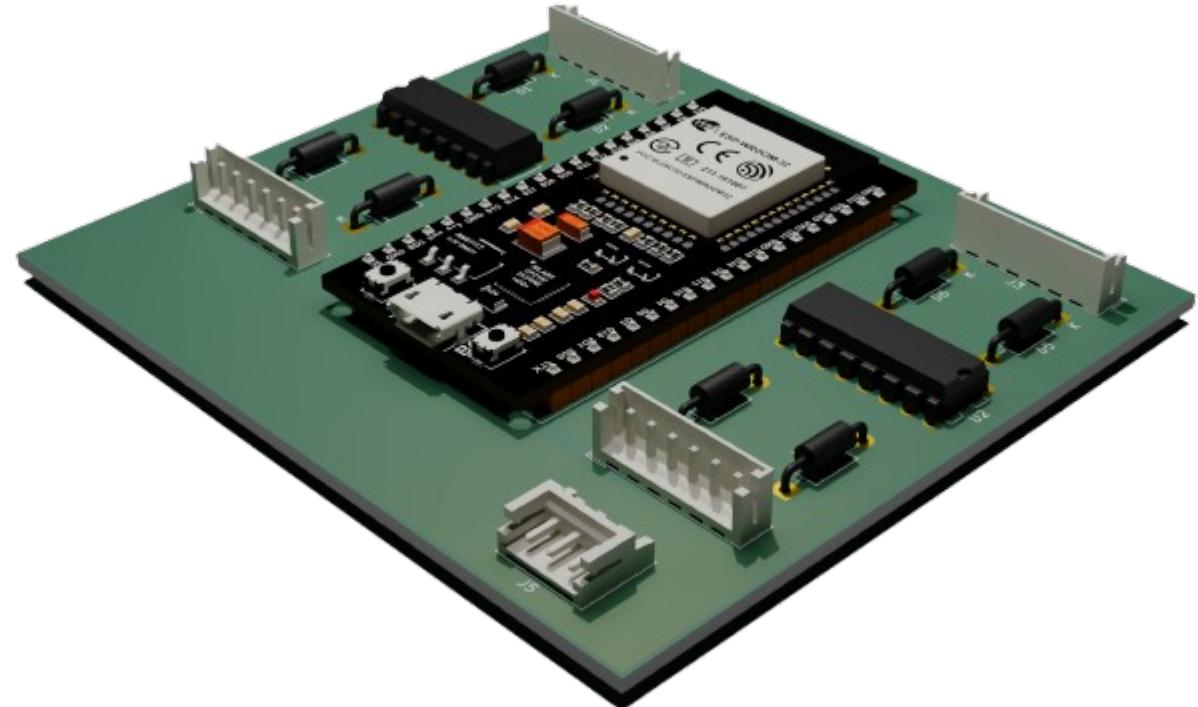
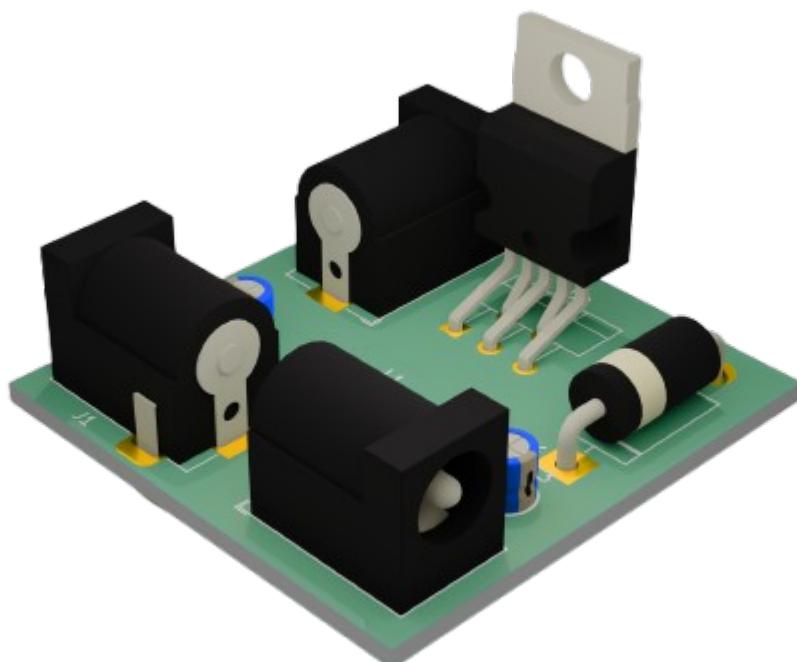
publishing #13: std_msgs.msg.Int32MultiArray(layout=std_msgs.msg.MultiArrayLayout
(dim=[], data_offset=0), data=[90, 45, 120, 60, 30, 180])
```

```
josue@josue-Victus-by-HP-Gaming-Laptop-15-fa0xxx: ~
josue@josue-Victus-by-HP-Gaming-Laptop-15-fa0xxx: ~ 80x24
---
layout:
  dim: []
  data_offset: 0
data:
- 90
- 45
- 120
- 60
- 30
- 180
---
layout:
  dim: []
  data_offset: 0
data:
- 90
- 45
- 120
- 60
- 30
- 180
---
```

Impresión de piezas



PCB'S



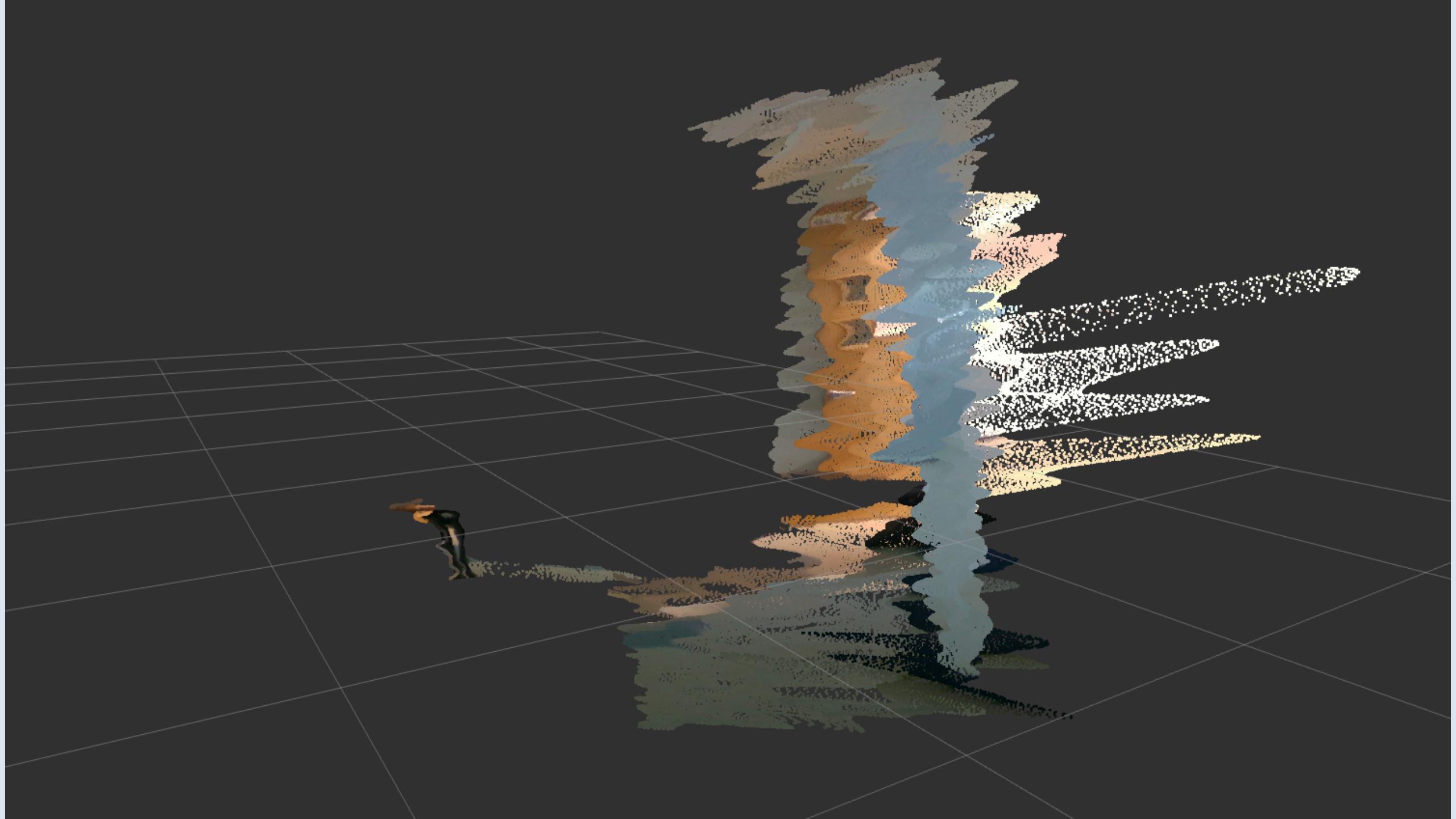
Sensores

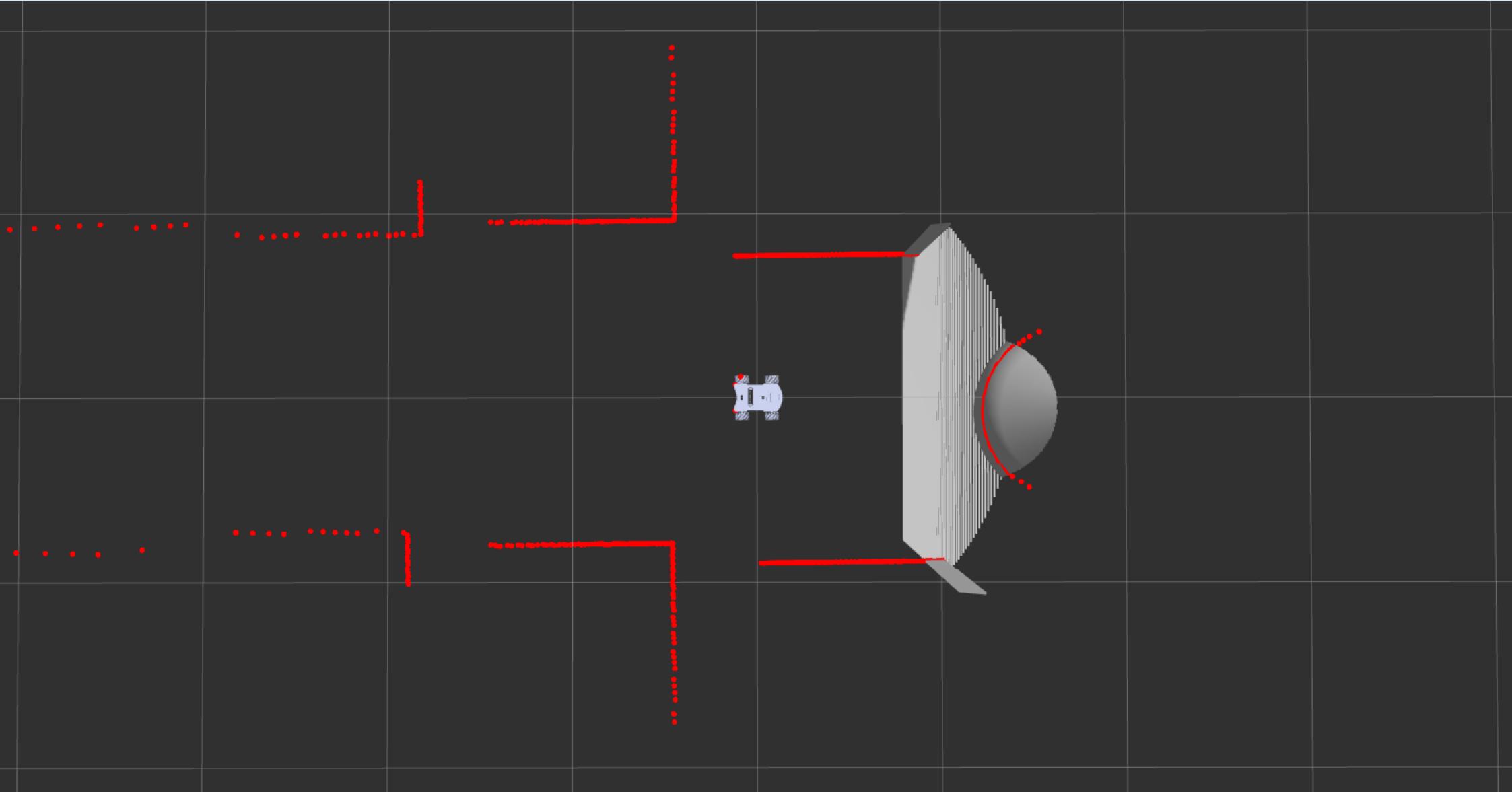
Sensor LiDAR LD19



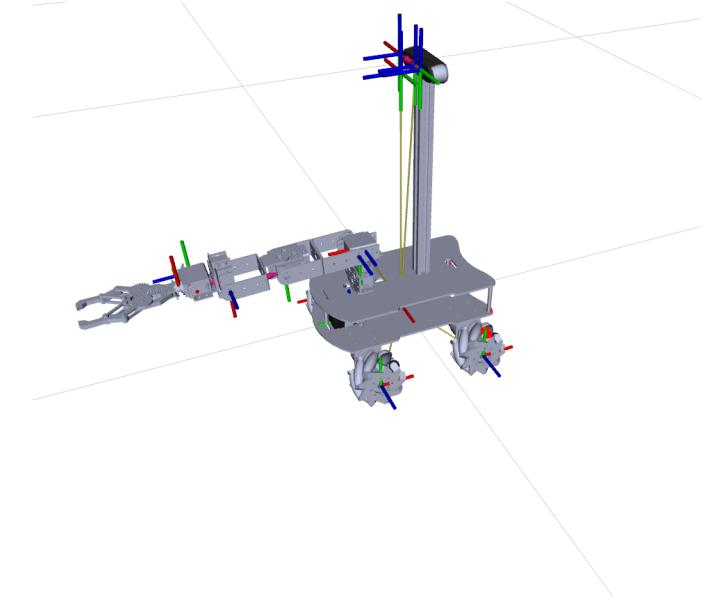
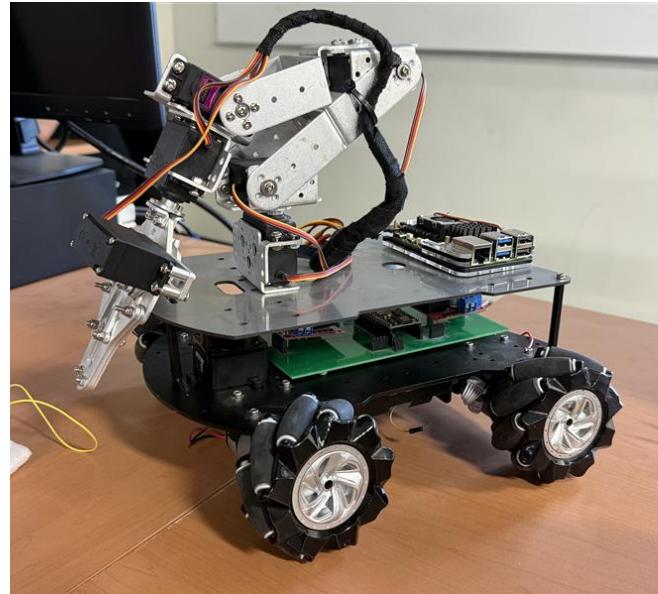
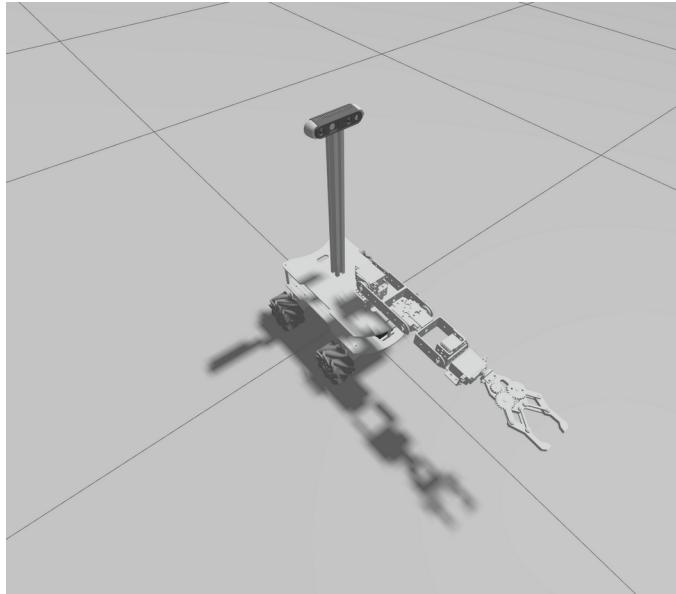
Camara Intel Realsense D415

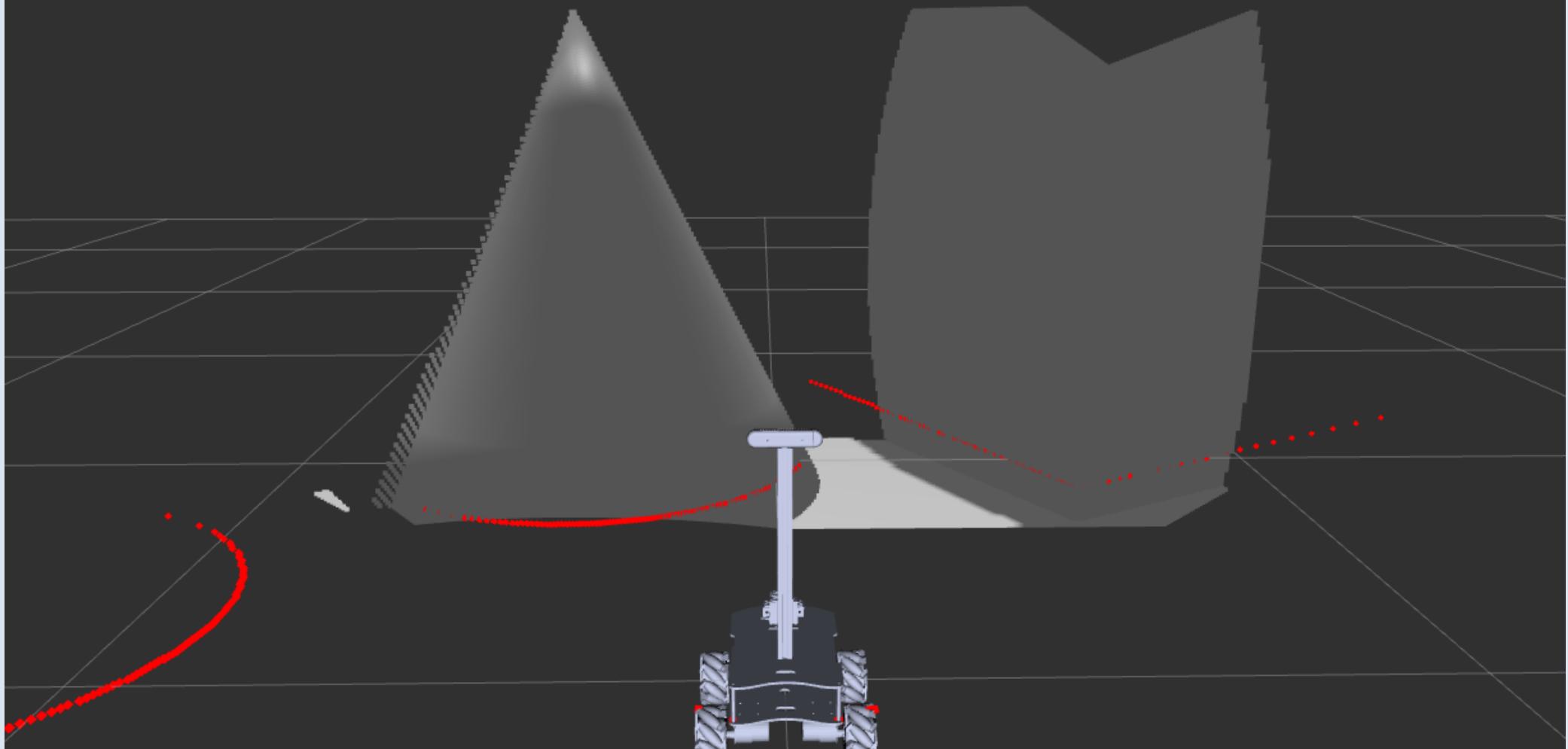


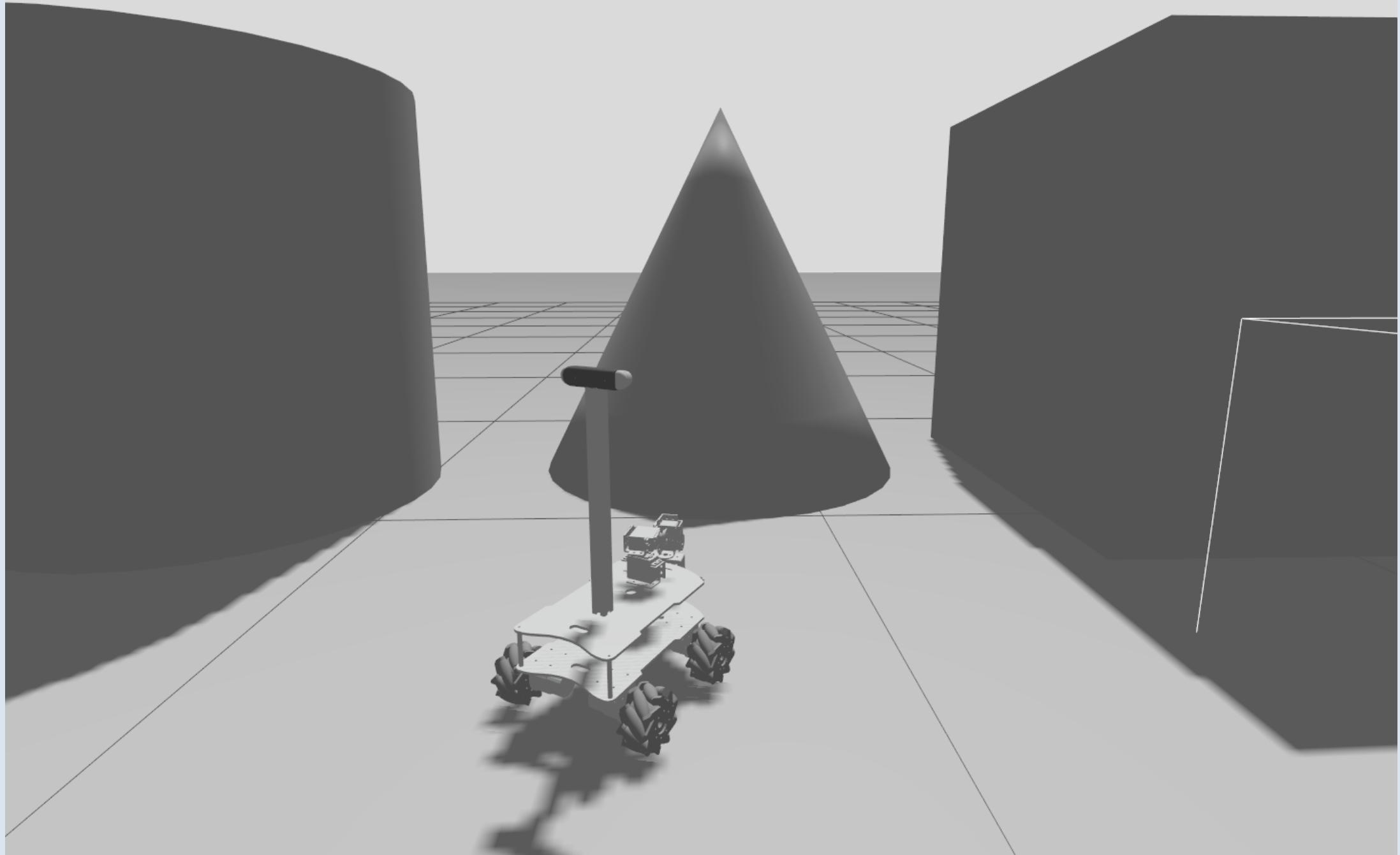


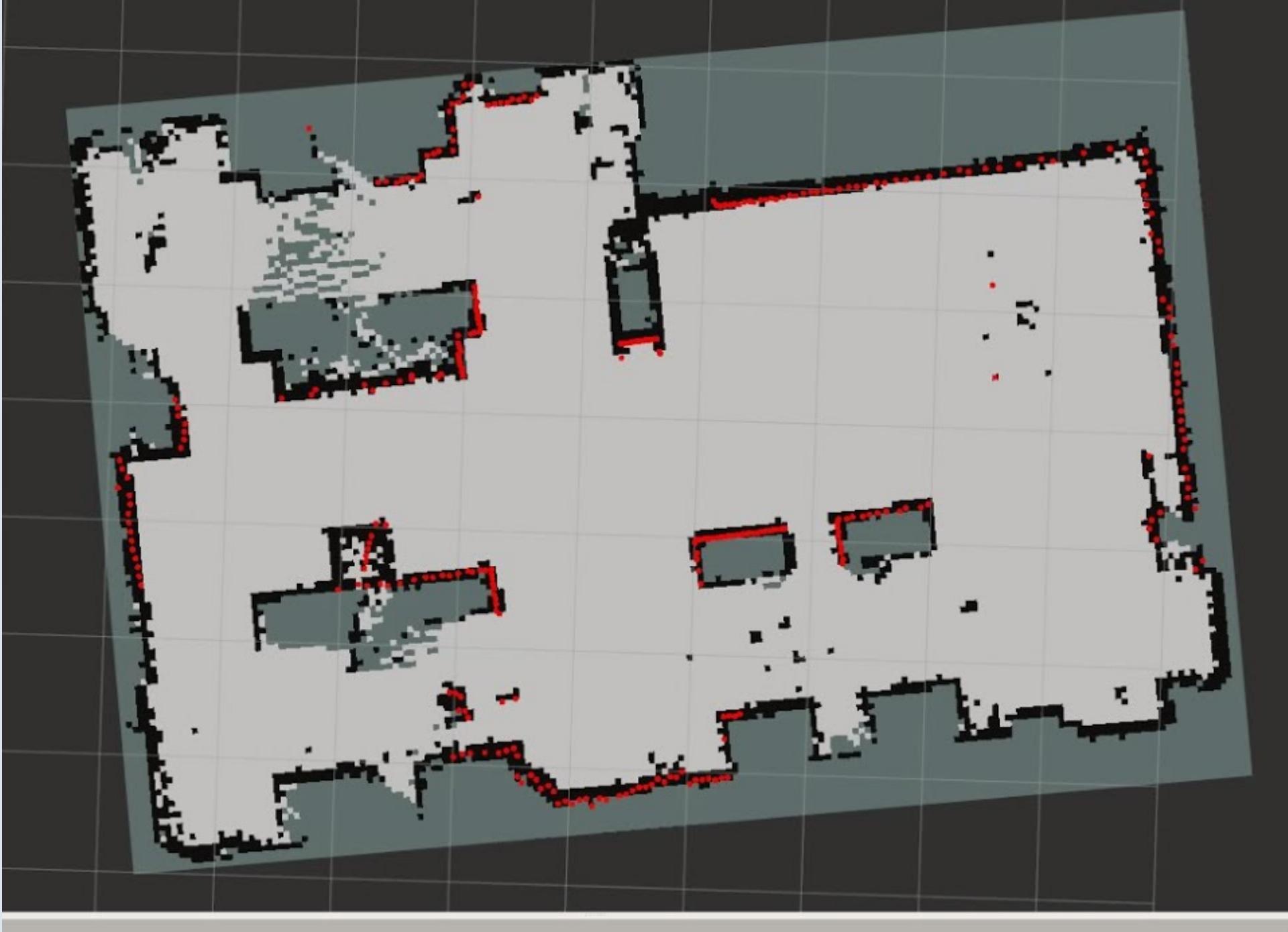


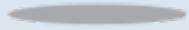
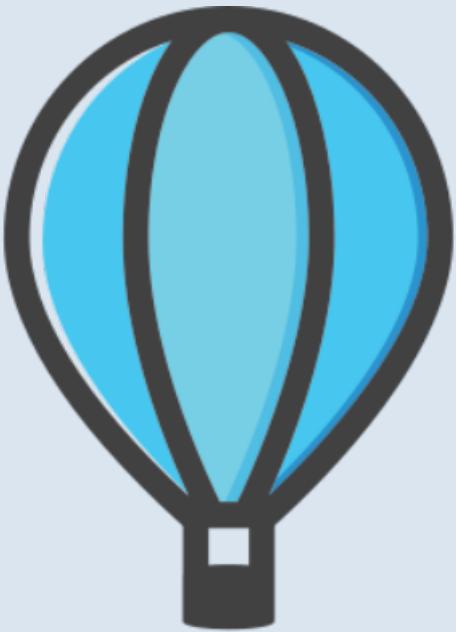
Funcionamiento ciberfísico









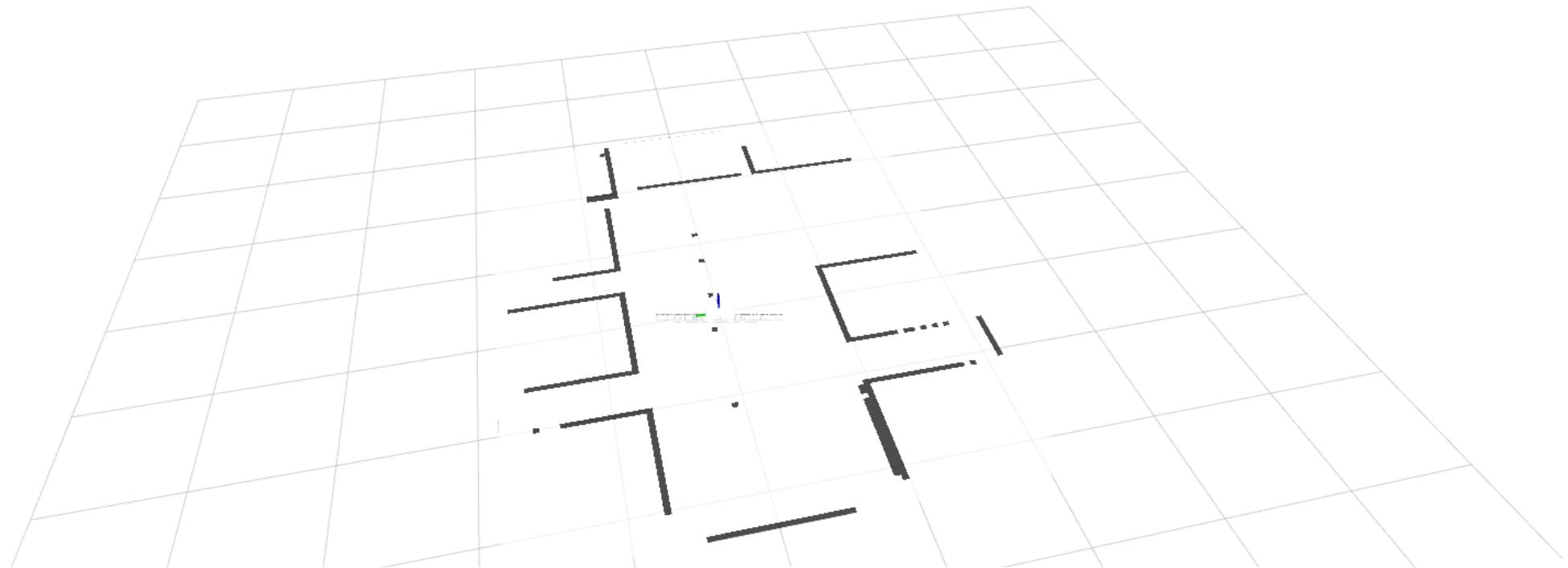


N A V 2

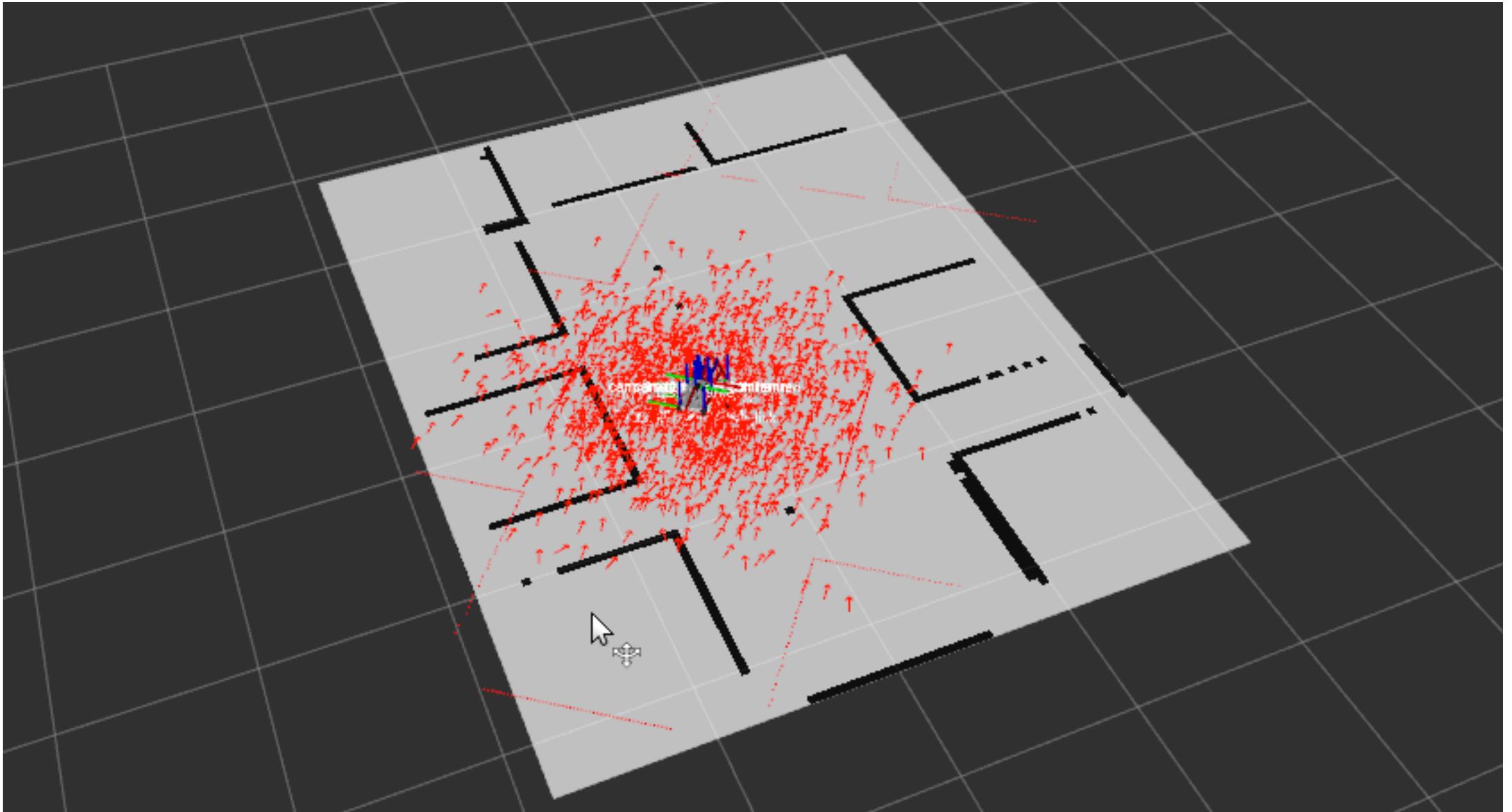
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NAVIGATION**



05/22/2025



Comandos

- ros2 run micro_ros_agent micro_ros_agent serial -dev /dev/ttyUSB0
- z topic -t "/cmd_man" -m gz.msgs.Actuators -p "velocity: [0.0, 0.0, 0.0, 0.0, 0.0]"
- ros2 launch mec_mobile_gazebo spawn.launch.py
- ros2 run teleop_twist_keyboard teleop_twist_keyboard
- ros2 launch mec_mobile_navigation spawn.launch.py
- ros2 launch mec_mobile_navigation localization.launch.py
- ros2 launch mec_mobile_navigation navigation.launch.py

Paquetes

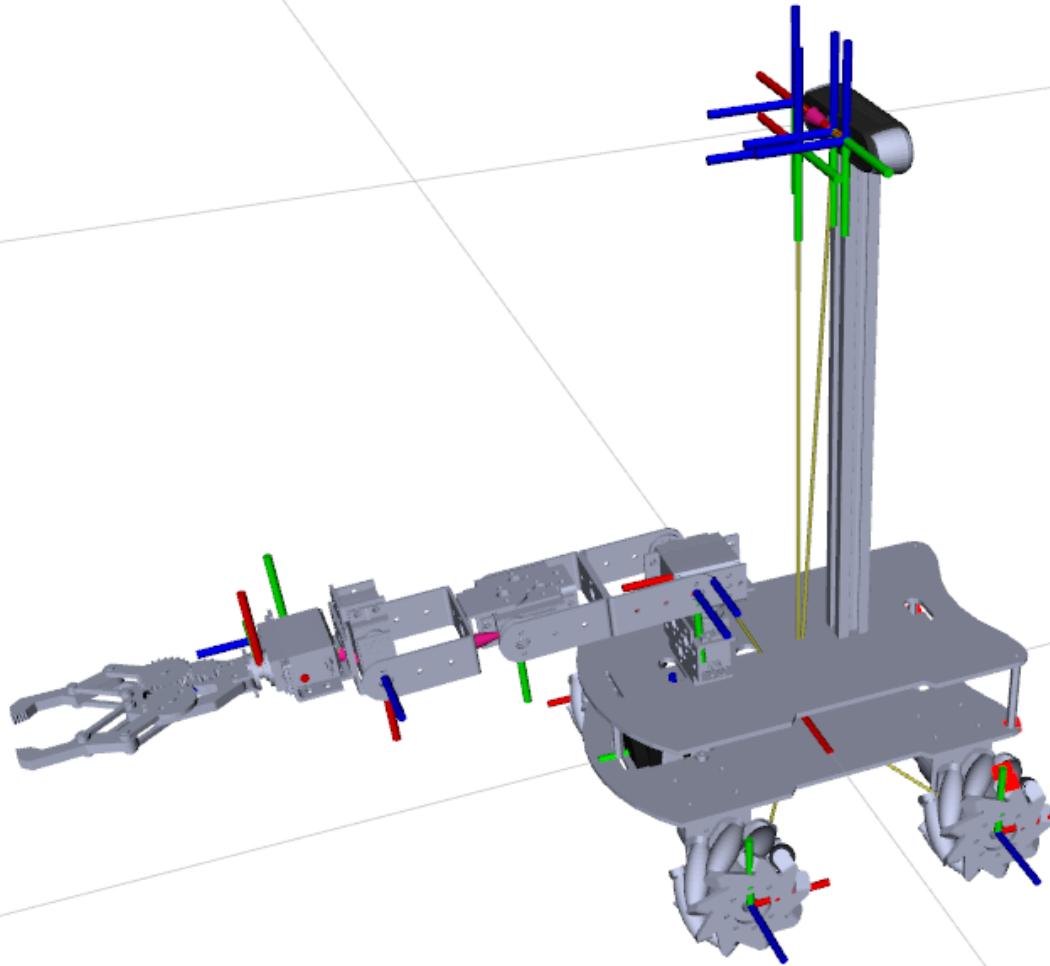
- `gz::sim::systems:MecanumDrive`
- `gz::sim::systems:JointController`
- `gz::sim::systems:MecanumDrive`
- `gz::sim::systems:OdometryPublisher`
- `gz::sim::JointStatePublisher`
- `Slam Toolbox`

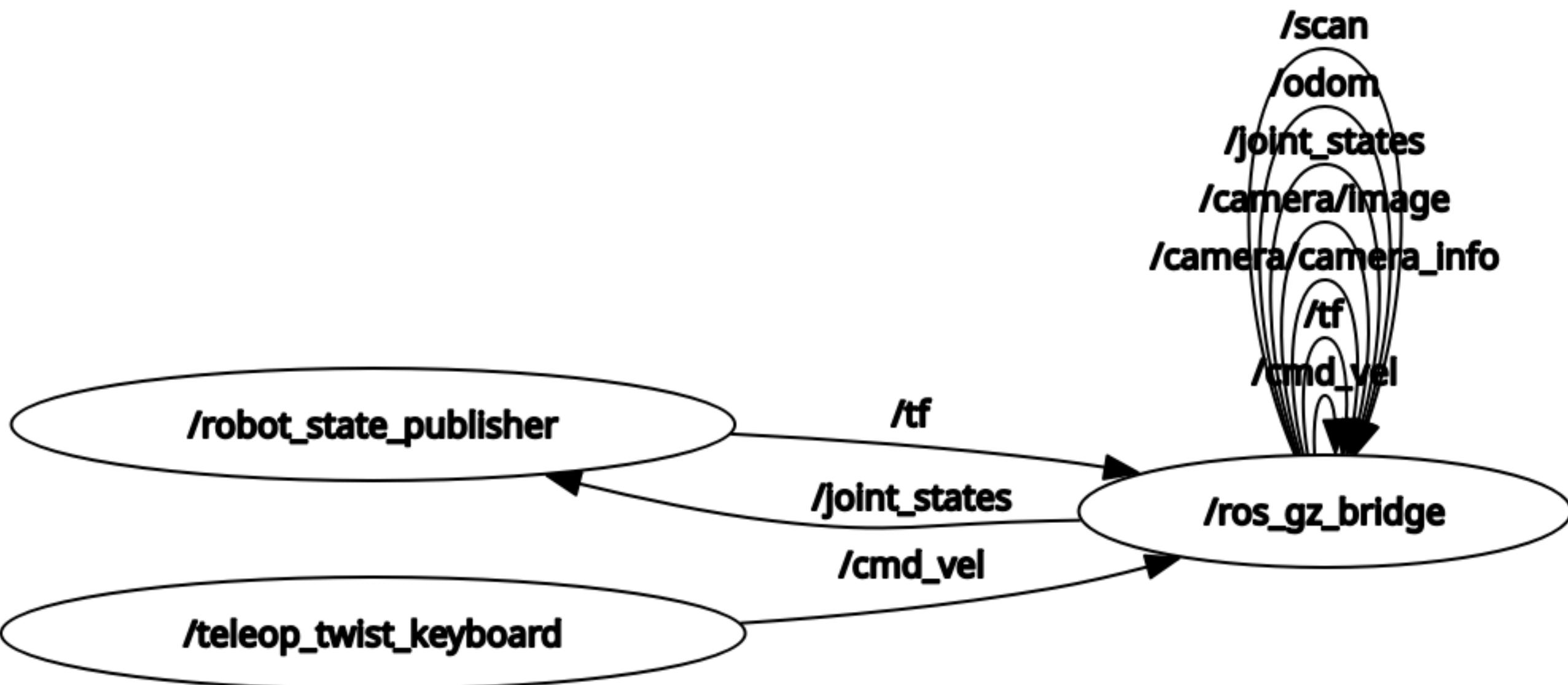
Tópicos

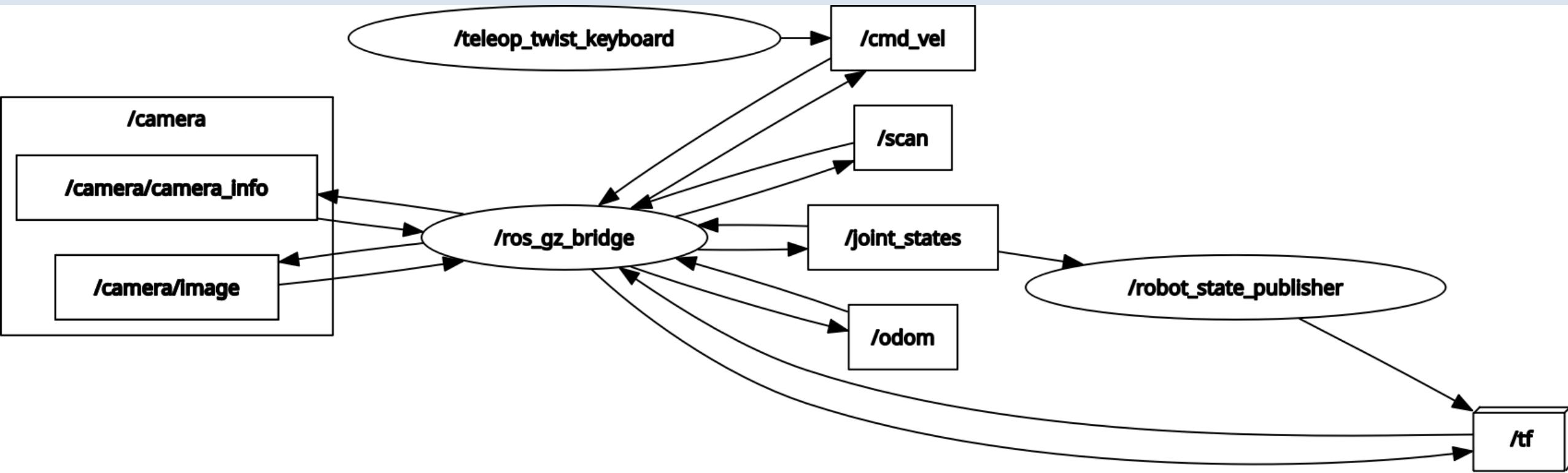
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- "/cmd_vel@geometry_msgs/msg/Twist@gz.msgs.Twist",
- "/odom@nav_msgs/msg/Odometry@gz.msgs.Odometry",
- "/joint_states@sensor_msgs/msg/
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- "/tf@tf2_msgs/msg/TFMessage@gz.msgs.Pose_V",

Tópicos

- "/camera/image@sensor_msgs/msg/Image@gz.msgs.Image",
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- "/cam_1/points@sensor_msgs/msg/
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Gracias

