

Assignment 2

DS685

A.I. for Robotics

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1. Camera Feed Publication

Task Objective:

Publish the robot's camera feed into the topic /camera/image_raw using either a real or simulated camera.

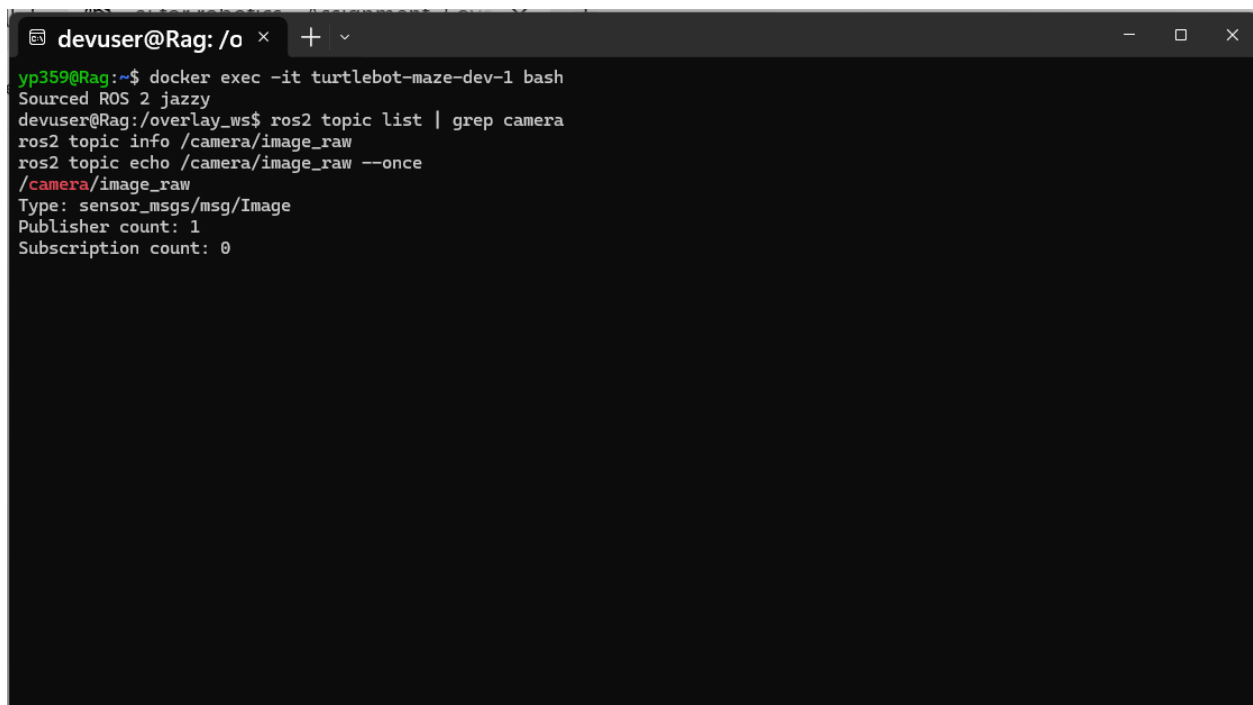
Commands used:

```
ros2 topic list | grep camera
```

```
ros2 topic info /camera/image_raw
```

```
ros2 topic echo /camera/image_raw --once
```

Screenshot:



```
devuser@Rag: /o × + v
yp359@Rag:~$ docker exec -it turtlebot-maze-dev-1 bash
Sourced ROS 2 jazzy
devuser@Rag:/overlay_ws$ ros2 topic list | grep camera
ros2 topic info /camera/image_raw
ros2 topic echo /camera/image_raw --once
/camera/image_raw
Type: sensor_msgs/msg/Image
Publisher count: 1
Subscription count: 0
```

Observation & Proof:

The topic /camera/image_raw appeared in the list, and ros2 topic info showed Publisher count: 1.

This confirms that the simulated camera sensor is actively publishing images to the ROS topic.

A screenshot of this terminal output demonstrates successful camera feed publication.

Result:

Camera feed successfully published and verified.

2. 3D Assets Integration

Task Objective:

Design and embed 3-D models (benches and COCO-class objects) into the simulation world so that the robot can see them.

Commands used:

-To view all models created

```
ls /overlay_ws/src/tb_worlds/models
```

-To inspect model definitions (geometry and materials)

```
cat /overlay_ws/src/tb_worlds/models/bench_1/model.sdf |  
head -n 20
```

```
cat /overlay_ws/src/tb_worlds/models/bottle/model.sdf |  
head -n 20
```

```
cat /overlay_ws/src/tb_worlds/models/book/model.sdf |  
head -n 20
```

-Confirm every model has a configuration file

```
find /overlay_ws/src/tb_worlds/models -name  
"model.config"
```

-Check that world file includes these models

```
grep -A5 "<include>"  
/overlay_ws/src/tb_worlds/worlds/sim_house.sdf.xacro
```

```
devuser@Rag:/overlay_ws$ ls /overlay_ws/src/tb_worlds/models  
bench_1 bench_2 blue_block book bottle green_block red_block sim_house  
devuser@Rag:/overlay_ws$ cat /overlay_ws/src/tb_worlds/models/bench_1/model.sdf | head -n 20  
<?xml version="1.0" ?>  
<sdf version="1.6">  
  <model name="bench_1">  
    <pose>2 1 0 0 0 0</pose>  
    <static>true</static>  
    <link name="link">  
      <visual name="visual">  
        <geometry>  
          <box>  
            <size>1.5 0.5 0.5</size>  
          </box>  
        </geometry>  
        <material>  
          <ambient>0.3 0.2 0.1 1</ambient>  
          <diffuse>0.4 0.3 0.2 1</diffuse>  
        </material>  
      </visual>  
    </link>  
  </model>  
</sdf>
```

Fig. :List of models and bench model geometry

```

devuser@Rag:/overlay_ws$ cat /overlay_ws/src/tb_worlds/models/bottle/model.sdf | head -n 20
cat /overlay_ws/src/tb_worlds/models/book/model.sdf | head -n
<?xml version="1.0" ?>
<sdf version="1.6">
  <model name="bottle">
    <pose>2.2 1.1 0.6 0 0 0</pose>
    <static>true</static>
    <link name="link">
      <visual name="visual">
        <geometry>
          <cylinder>
            <radius>0.05</radius>
            <length>0.25</length>
          </cylinder>
        </geometry>
        <material>
          <ambient>0.1 0.8 0.1 1</ambient>
          <diffuse>0.2 0.9 0.2 1</diffuse>
        </material>
      </visual>
    </link>
  </model>
head: option requires an argument -- 'n'
Try 'head --help' for more information.
devuser@Rag:/overlay_ws$ cat /overlay_ws/src/tb_worlds/models/book/model.sdf | head -n
head: option requires an argument -- 'n'
Try 'head --help' for more information.
devuser@Rag:/overlay_ws$ cat /overlay_ws/src/tb_worlds/models/book/model.sdf | head -n 20
<?xml version="1.0" ?>
<sdf version="1.6">
  <model name="book">
    <pose>-1.8 -1.0 0.6 0 0 0</pose>
    <static>true</static>
    <link name="link">
      <visual name="visual">
        <geometry>
          <box>
            <size>0.3 0.2 0.05</size>
          </box>
        </geometry>
        <material>
          <ambient>0.8 0.2 0.2 1</ambient>
          <diffuse>0.9 0.3 0.3 1</diffuse>
        </material>
      </visual>
    </link>
  </model>
</sdf>

```

Fig.: Book and Bottle model geometry

```
devuser@Rag:/overlay_ws$ find /overlay_ws/src/tb_worlds/models -name "model.config"
/overlay_ws/src/tb_worlds/models/bench_1/model.config
/overlay_ws/src/tb_worlds/models/blue_block/model.config
/overlay_ws/src/tb_worlds/models/book/model.config
/overlay_ws/src/tb_worlds/models/green_block/model.config
/overlay_ws/src/tb_worlds/models/bench_2/model.config
/overlay_ws/src/tb_worlds/models/sim_house/model.config
/overlay_ws/src/tb_worlds/models/red_block/model.config
/overlay_ws/src/tb_worlds/models/bottle/model.config
```

Fig.: Model configuration files confirmation

```
devuser@Rag:/overlay_ws$ grep -A5 "<include>" /overlay_ws/src/tb_worlds/worlds/sim_house.sdf.xacro
<include>
  <uri>model://bench_1</uri>
  <pose>2 1 0 0 0 0</pose>
</include>

<include>
  <uri>model://bench_2</uri>
  <pose>-2 -1 0 0 0 1.57</pose>
</include>

<include>
  <uri>model://bottle</uri>
  <pose>2.2 1.1 0.6 0 0 0</pose>
</include>

<include>
  <uri>model://book</uri>
  <pose>-1.8 -1.0 0.6 0 0 0</pose>
</include>

</world>
devuser@Rag:/overlay_ws$
```

Fig.: Checking world file includes these models

Observation and Proof

The screenshots confirm that all 3D models (bench_1, bench_2, bottle, book, and colored blocks) are real Gazebo assets with valid SDF and configuration files defining geometry, materials, and poses, and that these models are correctly included in the sim_house.sdf.xacro

world file—proving successful creation and integration of tangible simulation objects.