

Section 1 : Ros and its Communications

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S#1 :: ROS : Robot Operating System

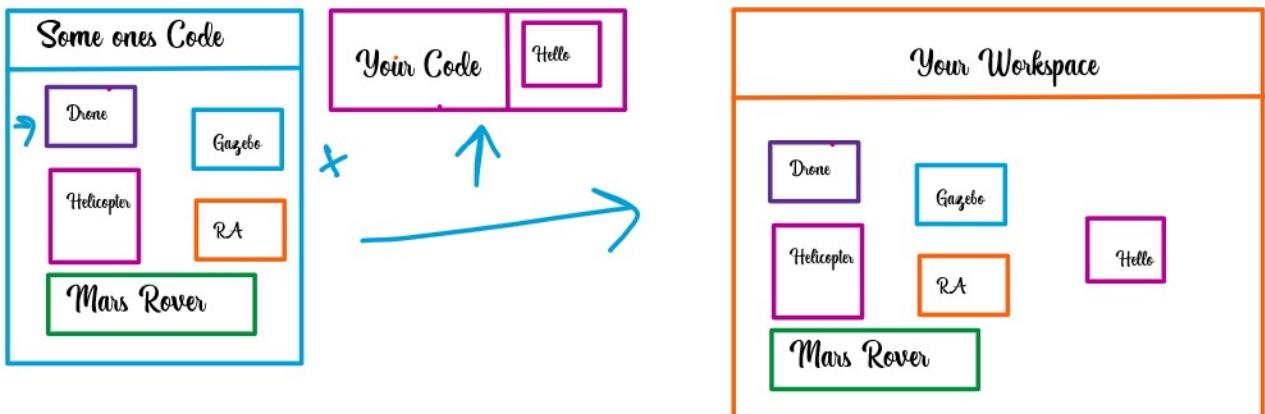
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WHY

- Career Opportunities



- Access to World's Knowledge



Why I Learned ROS

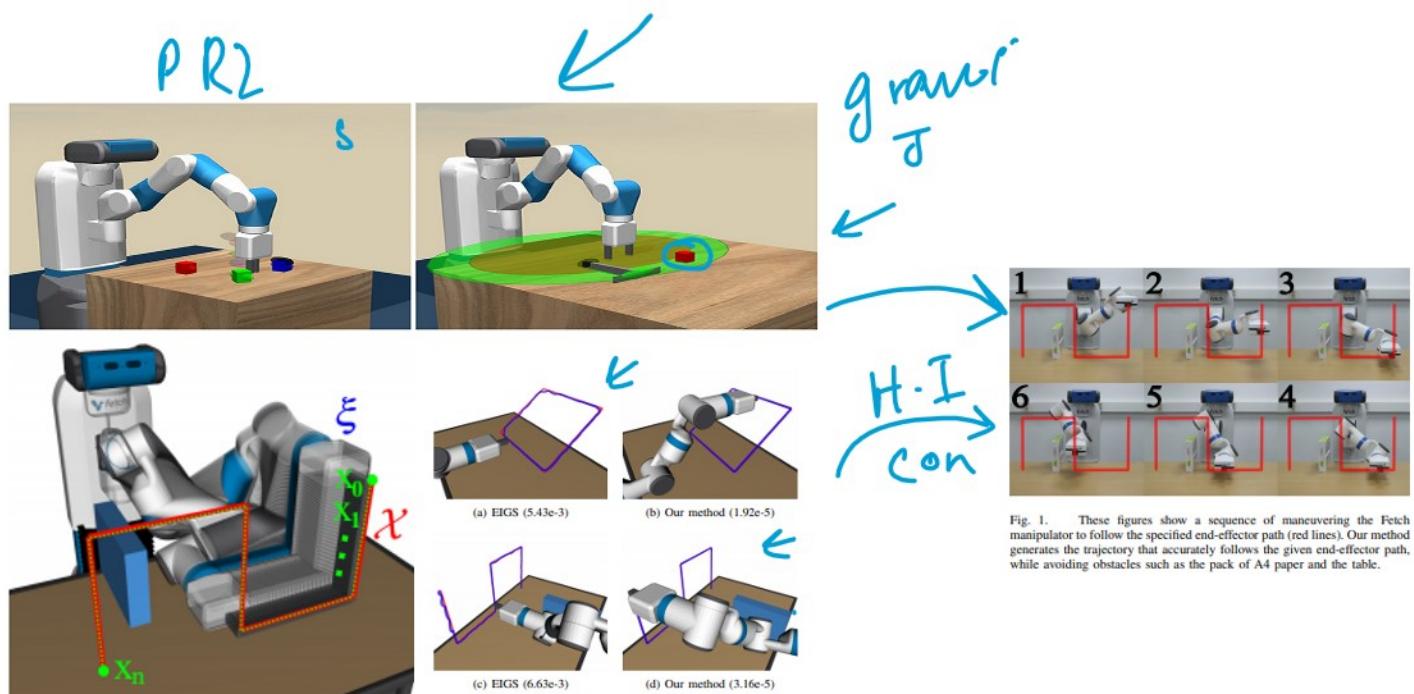


Fig. 1. These figures show a sequence of maneuvering the Fetch manipulator to follow the specified end-effector path (red lines). Our method generates the trajectory that accurately follows the given end-effector path, while avoiding obstacles such as the pack of A4 paper and the table.

<https://arxiv.org/pdf/1909.12517.pdf>

- Library
- Framework



U 20.4

18.4

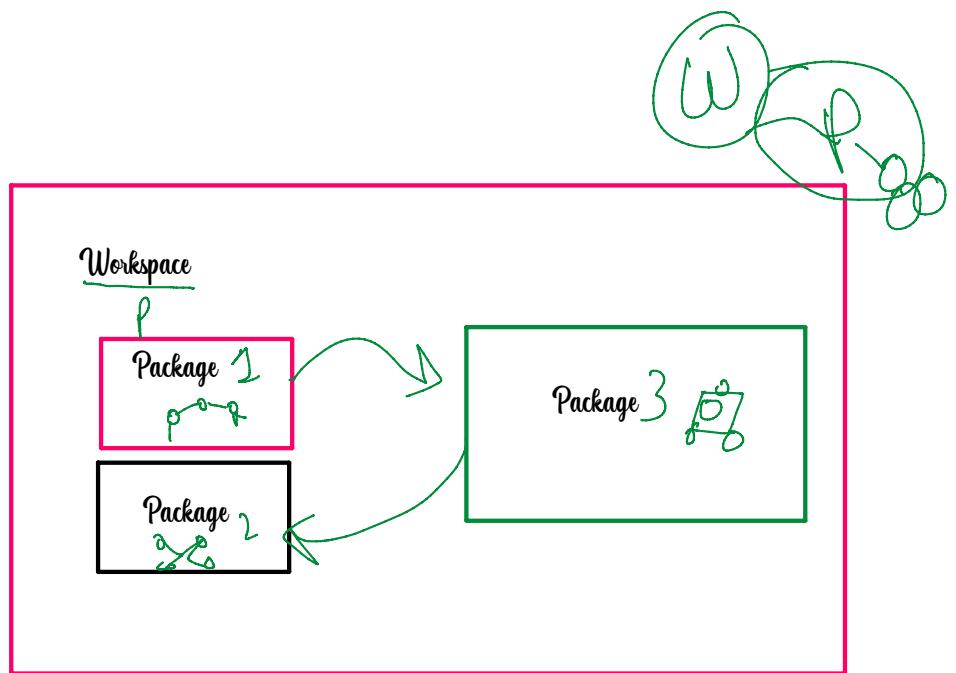
U 16.4 ←

ROS 1 Distribution Releases [52]			
Distribution	Release date	Poster	EOL date
Noetic Ninjemys (last ROS 1 release)	23 May 2020		<u>May 2025</u>
Melodic Morenia	23 May 2018		2023-05-30
Lunar Loggerhead	23 May 2017		2019-05-30
Kinetic Kame	23 May 2016		<u>2021-05-30</u>
Jade Turtle	23 May 2015		2017-05-30
Indigo Igloo	22 July 2014		2019-04-30
Hydro Medusa	4 September 2013		2014-05-31
Groovy Galapagos	31 December 2012		2014-07-31

Let's Install **ROS Noetic**

S#1 :: Work-Space and Custom Package

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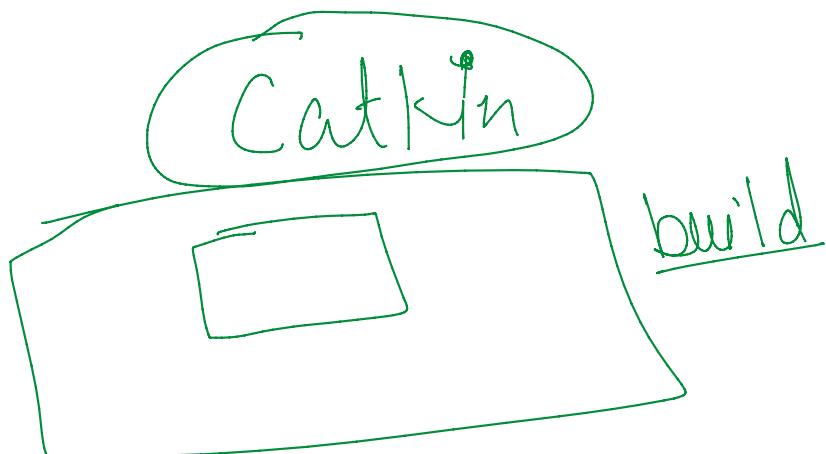
Custom Workspace and Package

Workspace

- Single / Multiple Workspaces

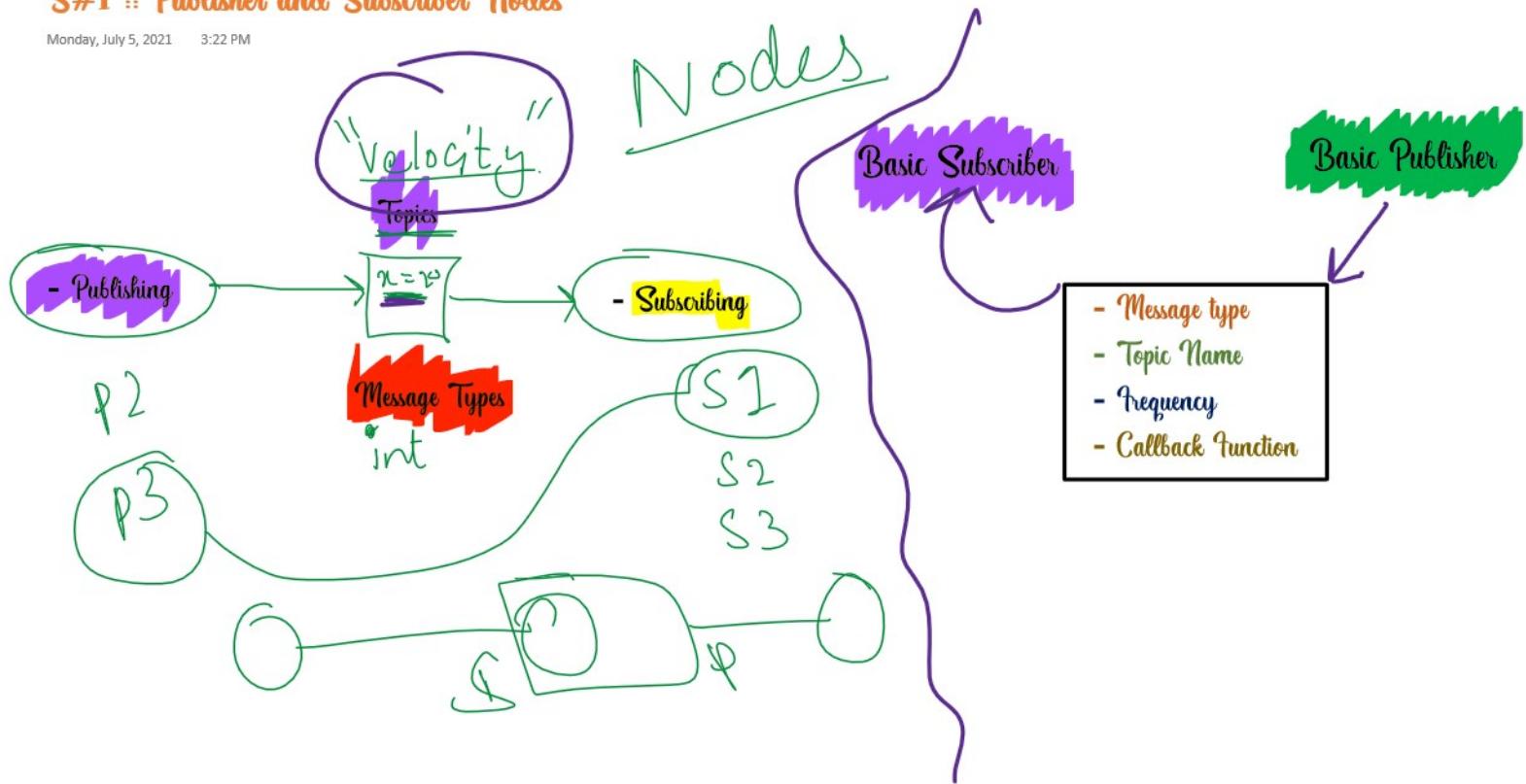
Python Package

- Create with dependencies (`rospy`, `std_msgs`)

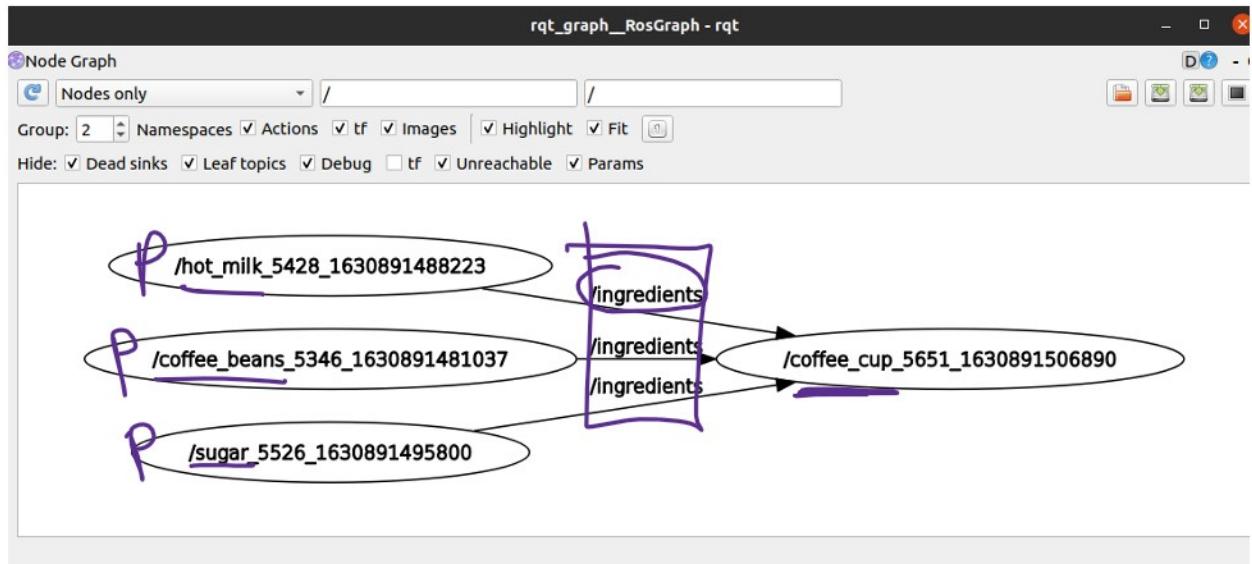


S#1 :: Publisher and Subscriber Nodes

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Let's make a Latte-Coffee



Statically publishing Nodes

- Selection of Topic
- Message

```

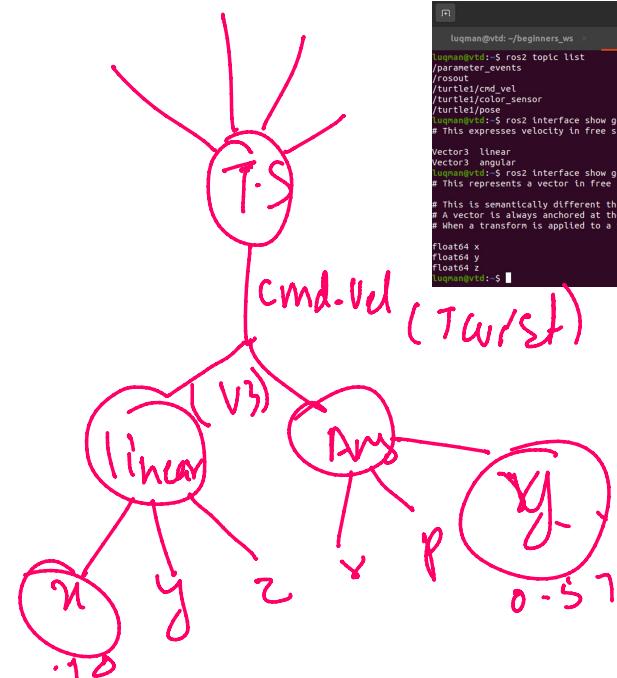
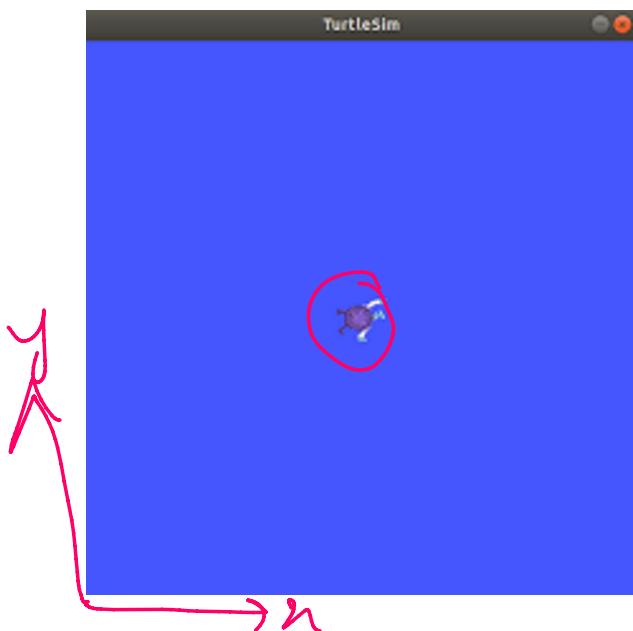
1 2 f top msg data
"rostopic pub -1 /topic message_type values"
  
```

Section 2: Turtle Sim

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S#2 :: TurtleSim and its driving Node

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```
luqman@vtd:~/beginners_ws$ ros2 topic list
/parameter_events
/rosout
/turtle1/cmd_vel
/turtle1/color_sensor
/turtle1/pose
luqman@vtd:~/beginners_ws$ ros2 interface show geometry_msgs/msg/Twist
# This expresses velocity in free space broken into its linear and angular parts.
Vector3 linear
Vector3 angular
luqman@vtd:~/beginners_ws$ ros2 interface show geometry_msgs/msg/Vector3
# This is semantically different than a point.
# A vector is always anchored at the origin.
# When a transform is applied to a vector, only the rotational component is applied.

float64 x
float64 y
float64 z
luqman@vtd:~/beginners_ws$
```

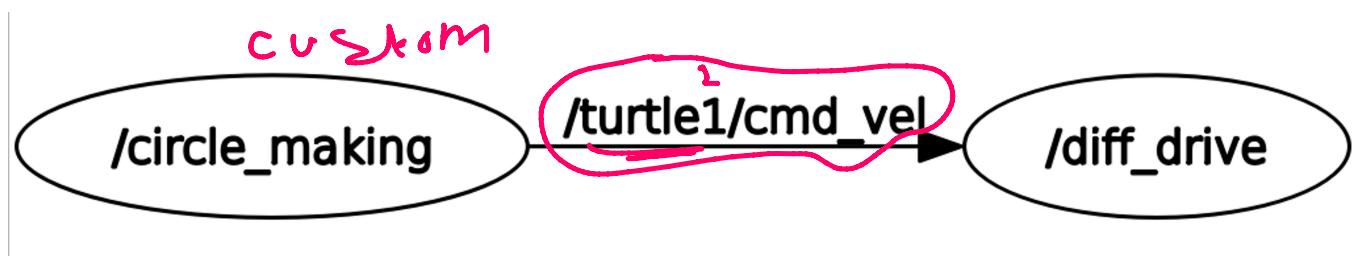
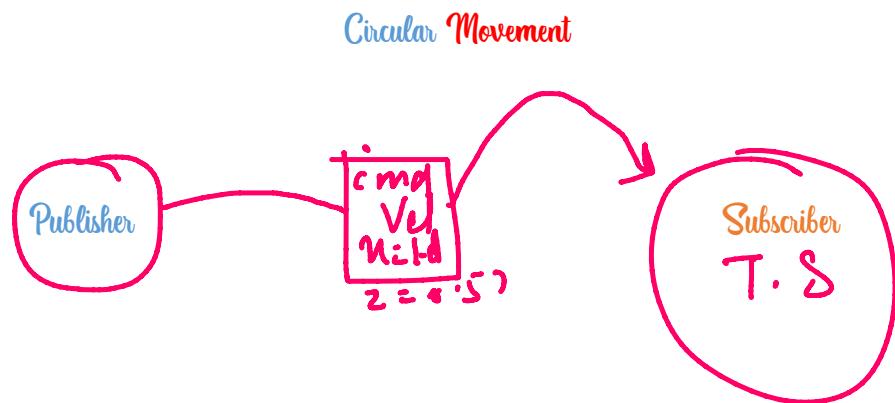
Static Publishing

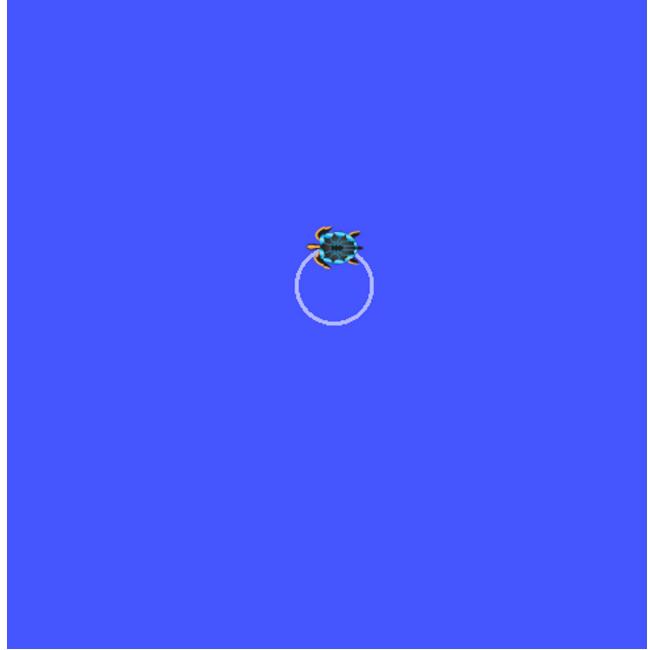
```
luqman@vtd:~$ rostopic pub -1 /turtle1/cmd_vel geometry_msgs/Twist "linear:
x: 0.0
y: 0.0
z: 0.0
angular:
x: 0.0
y: 0.0
z: 0.0"
luqman@vtd:~$
```

"ros2 topic list"

S#2 :: Writing Custom Driving Node

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S#2 :: Launch Files

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Section 3 : Turtle Bot

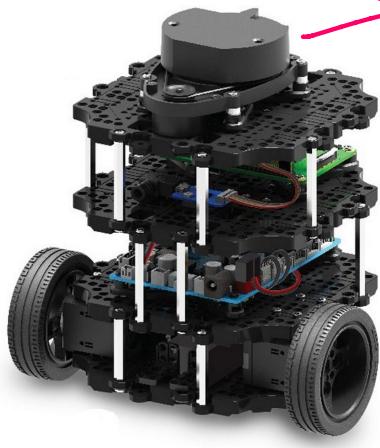
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S#3 :: TurtleBot3 Package

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A differential Type Robot

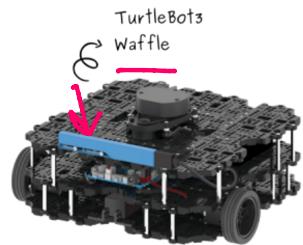
Popular robot repositories



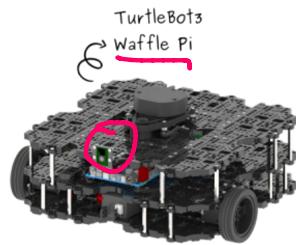
laser



TurtleBot3
Burger



TurtleBot3
Waffle



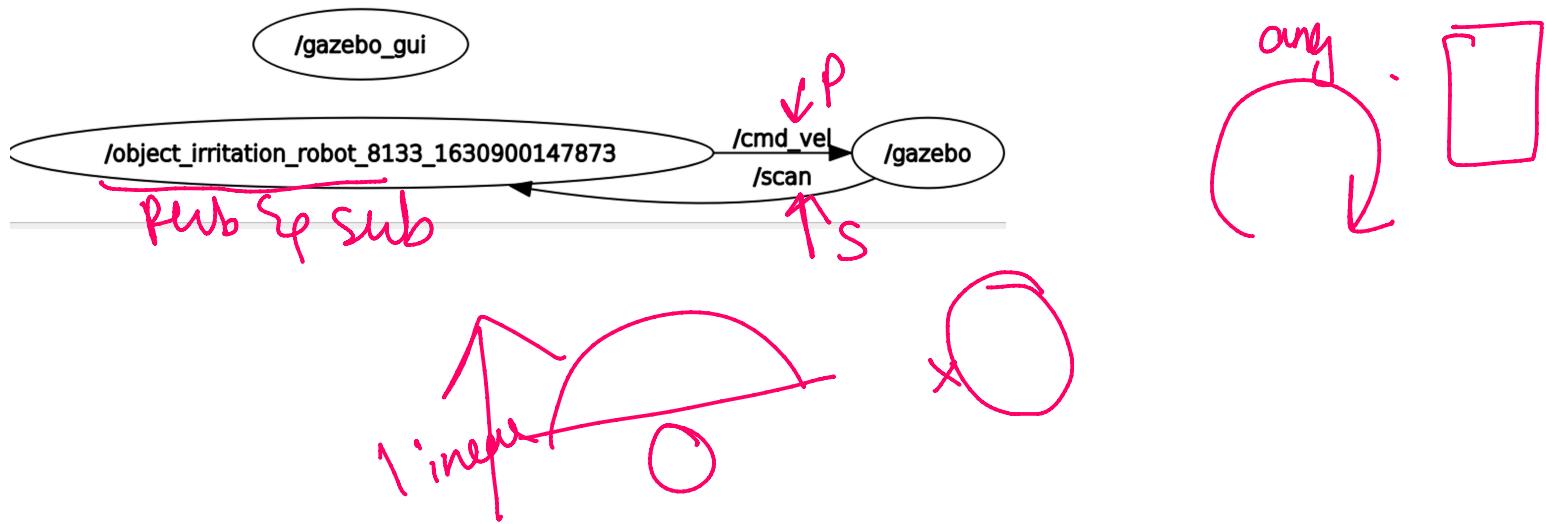
TurtleBot3
Waffle Pi

Cameras .

- drive
- Sensors → laser -

S#3 :: Object Irritational Robot

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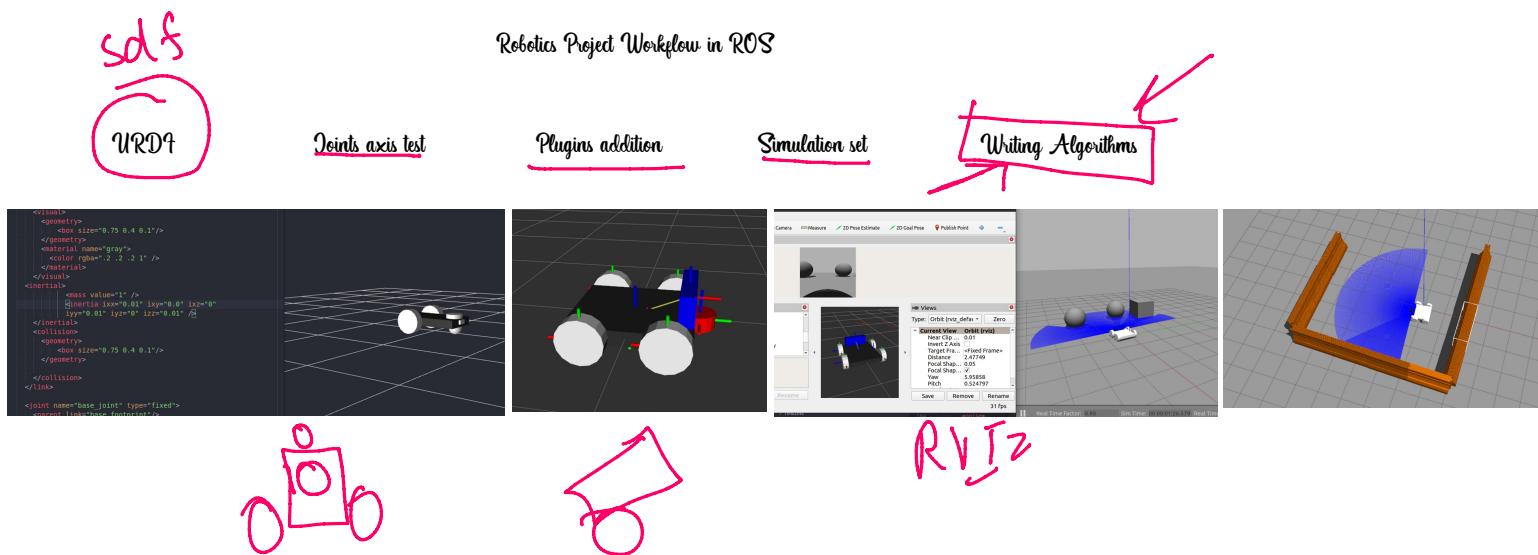


Section 4: Custom Dolly Robot

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S#4 .. Deciding Robot Structure and ROS workflow

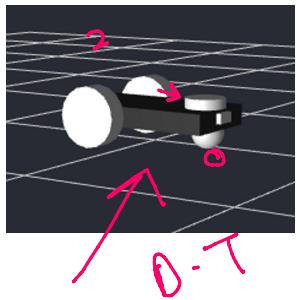
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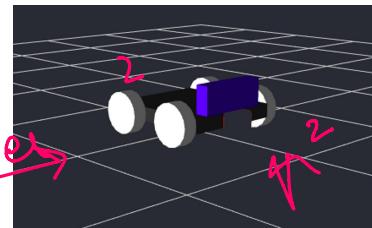
- Robots using ground for locomotion

Mobile

The Mobile Robot we are going to be using is



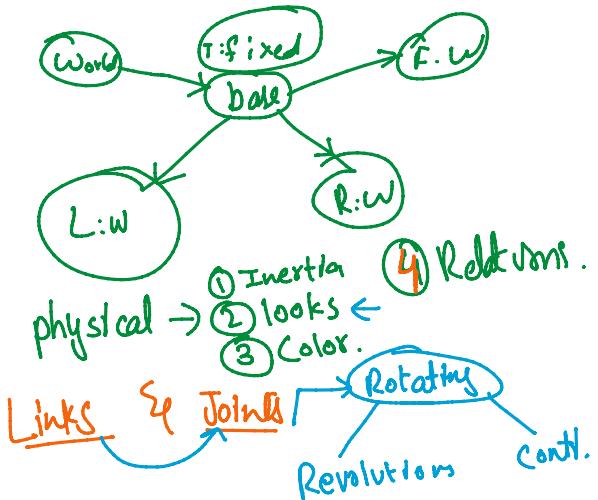
Driving Mechanisms ?



URDF

xml.

```
<?xml version="1.0"?
<root name="renri">
  <link name="base_footprint"/>
  <link name="base">
    <visual>
      <geometry>
        <box size="0.75 0.4 0.1"/>
      </geometry>
      <material name="gray">
        <color rgba=".2 .2 .2 1"/>
      </material>
    </visual>
    <inertial>
      <mass value="1"/>
      <inertia ixz="0.01" ixy="0.0" ixz="0"
            iyx="0.01" iyz="0" izz="0.01" />
    </inertial>
    <collision>
      <geometry>
        <box size="0.75 0.4 0.1"/>
      </geometry>
    </collision>
  </link>
  <joint name="base_joint" type="fixed">
```



S#4 :: Adding Sensors to the Robot

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