古月居 GYH.AI ROS

ROS入门
21讲

17.ROS中的坐标系管理系统

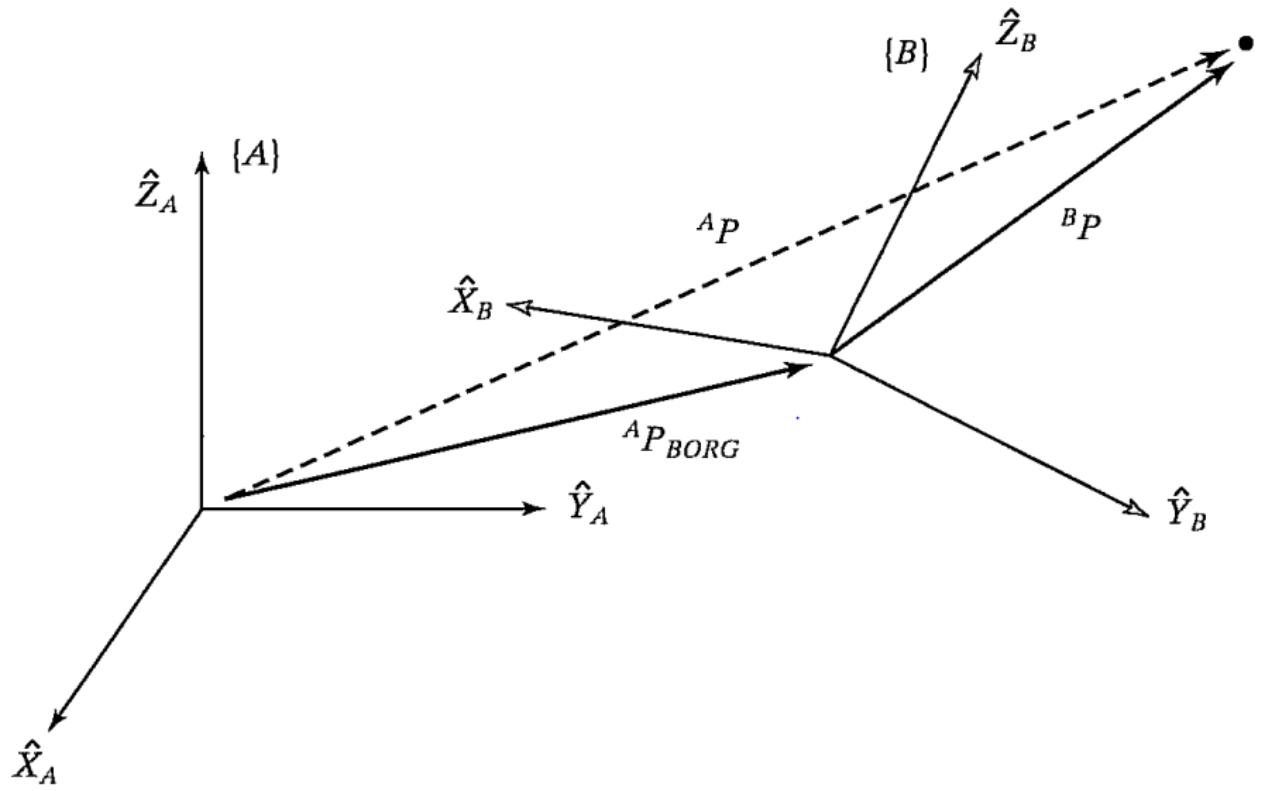
主讲人：古月

机器人中的坐标变换

$$ {}^{A}P = {}^{A}_{B}R\,{}^{B}P + {}^{A}P_{BORG}. $$

$$ {}^{A}P = {}^{A}_{B}T\,{}^{B}P. $$

$$ \begin{bmatrix} {}^{A}P \\ 1 \end{bmatrix} = \left[\begin{array}{ccc|c} & {}^{A}_{B}R & & {}^{A}P_{BORG} \\ \hline 0 & 0 & 0 & 1 \end{array}\right] \begin{bmatrix} {}^{B}P \\ 1 \end{bmatrix}. $$



某位姿在A、B两个坐标系下的坐标变换

* 参考：《机器人学导论》

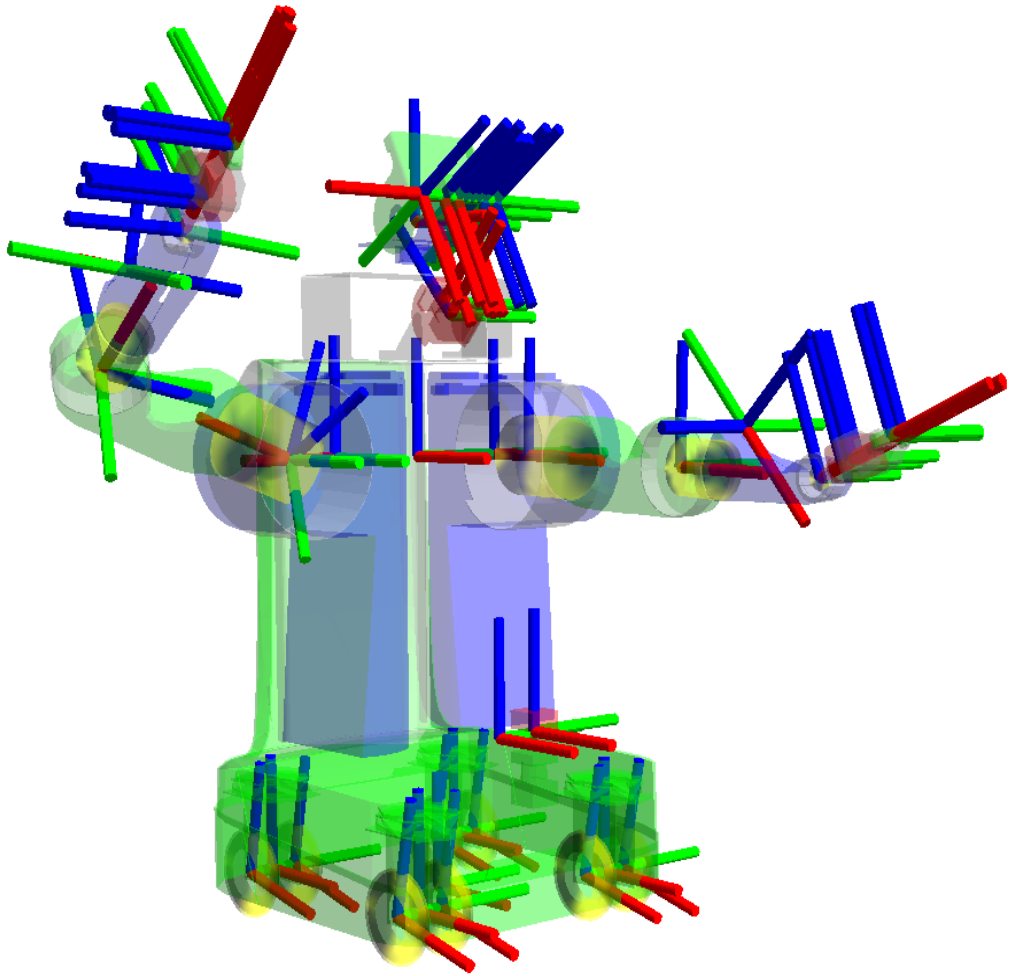
机器人中的坐标变换

TF功能包能干什么?

- 五秒钟之前，机器人头部坐标系相对于全局坐标系的关系是什么样的?
- 机器人夹取的物体相对于机器人中心坐标系的位置在哪里?
- 机器人中心坐标系相对于全局坐标系的位置在哪里?

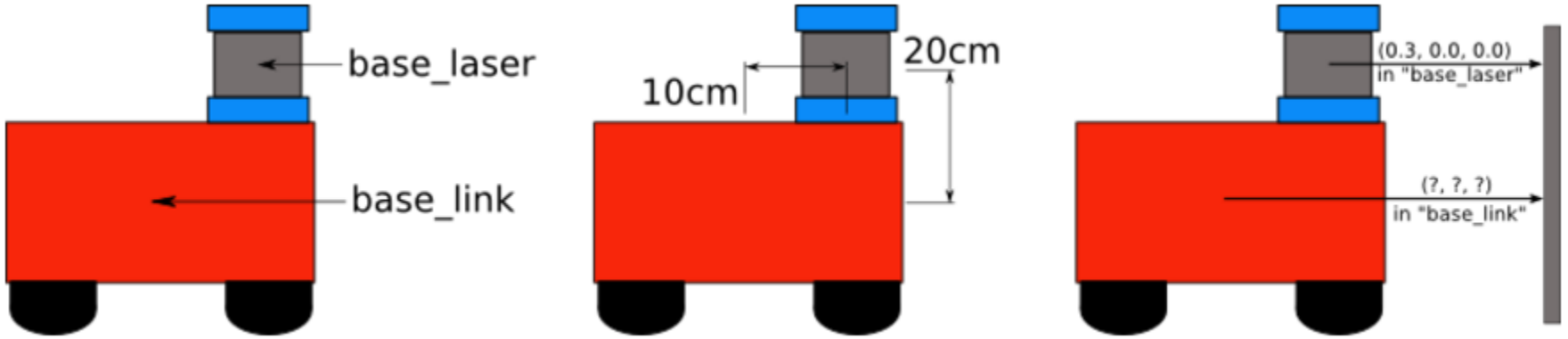
TF坐标变换如何实现?

- 广播TF变换
- 监听TF变换

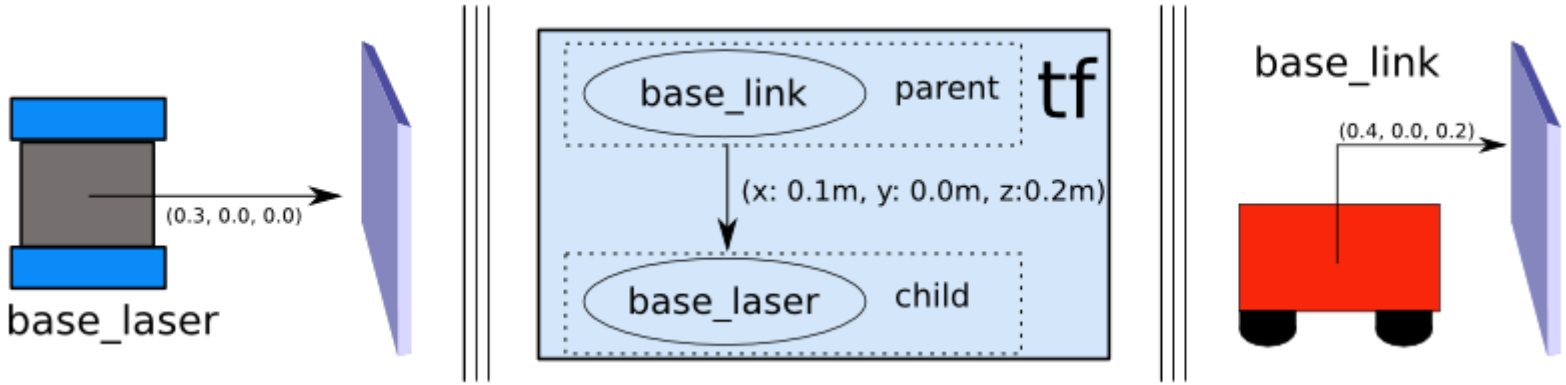


机器人系统中繁杂的坐标系

机器人中的坐标变换



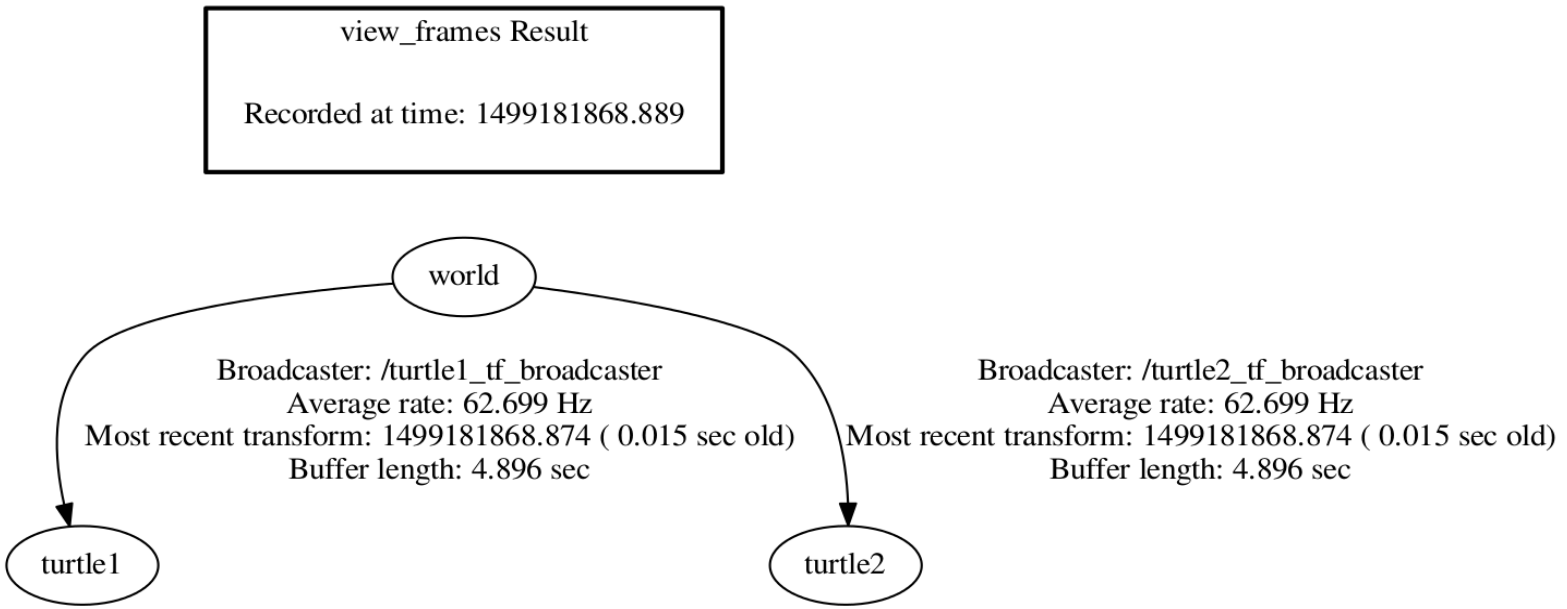
移动机器人的本体坐标系与雷达坐标系

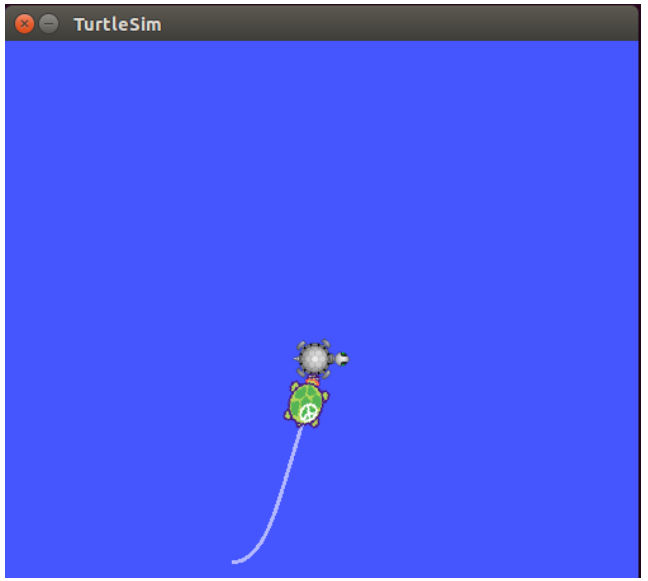


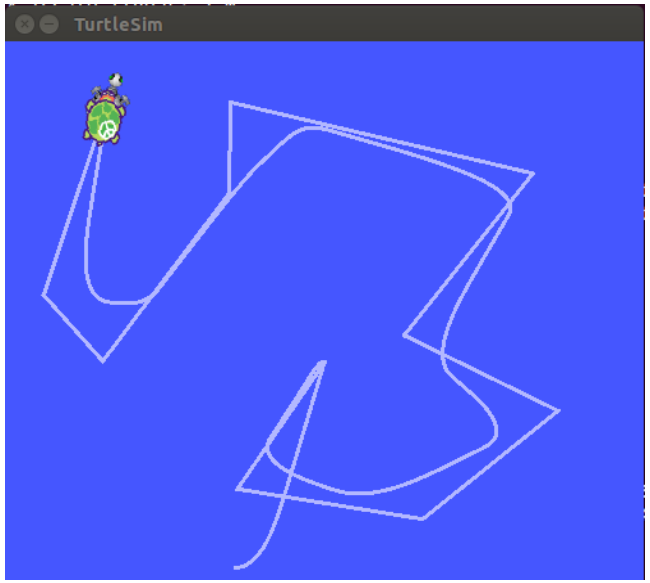
坐标系之间的数据变换

机器人中的坐标变换

```
$ sudo apt-get install ros-melodic-turtle-tf
$ roslaunch turtle_tf turtle_tf_demo.launch
$ rosrun turtlesim turtle_teleop_key
$ rosrun tf view_frames
```







小海龟跟随实验

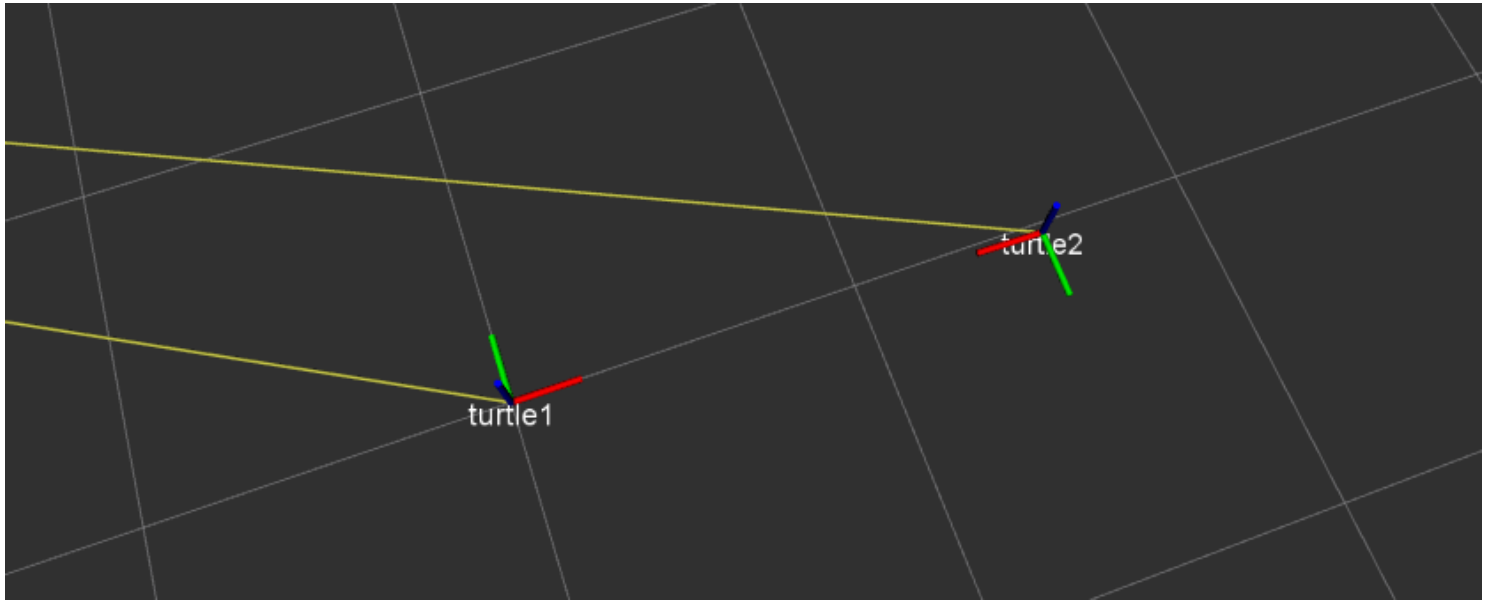
机器人中的坐标变换

命令行工具

```
➜ ~ rosrun tf tf_echo turtle1 turtle2
At time 1504942486.329
- Translation: [0.000, 0.000, 0.000]
- Rotation: in Quaternion [0.000, 0.000, 0.311, 0.950]
            in RPY (radian) [0.000, -0.000, 0.633]
            in RPY (degree) [0.000, -0.000, 36.290]
At time 1504942487.018
- Translation: [0.000, 0.000, 0.000]
- Rotation: in Quaternion [0.000, 0.000, 0.311, 0.950]
            in RPY (radian) [0.000, -0.000, 0.633]
            in RPY (degree) [0.000, -0.000, 36.290]
```

$$T_{turtle1\_turtle2} = T_{turtle1\_world} * T_{world\_turtle2}$$

可视化工具

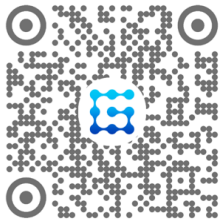


$ rosrun rviz rviz -d `rospack find turtle_tf`/rviz/turtle_rviz.rviz

感谢观看

怕什么真理无穷，进一寸有一寸的欢喜

更多精彩，欢迎关注



古月居

古月学院

古月居GYH