

1. Introduction

Object recognition is essential in higher level robotic applications. To achieve this, the goal in this tutorial is to detect the markers ("AR Tags") based on RGB data given by a RGBD camera.

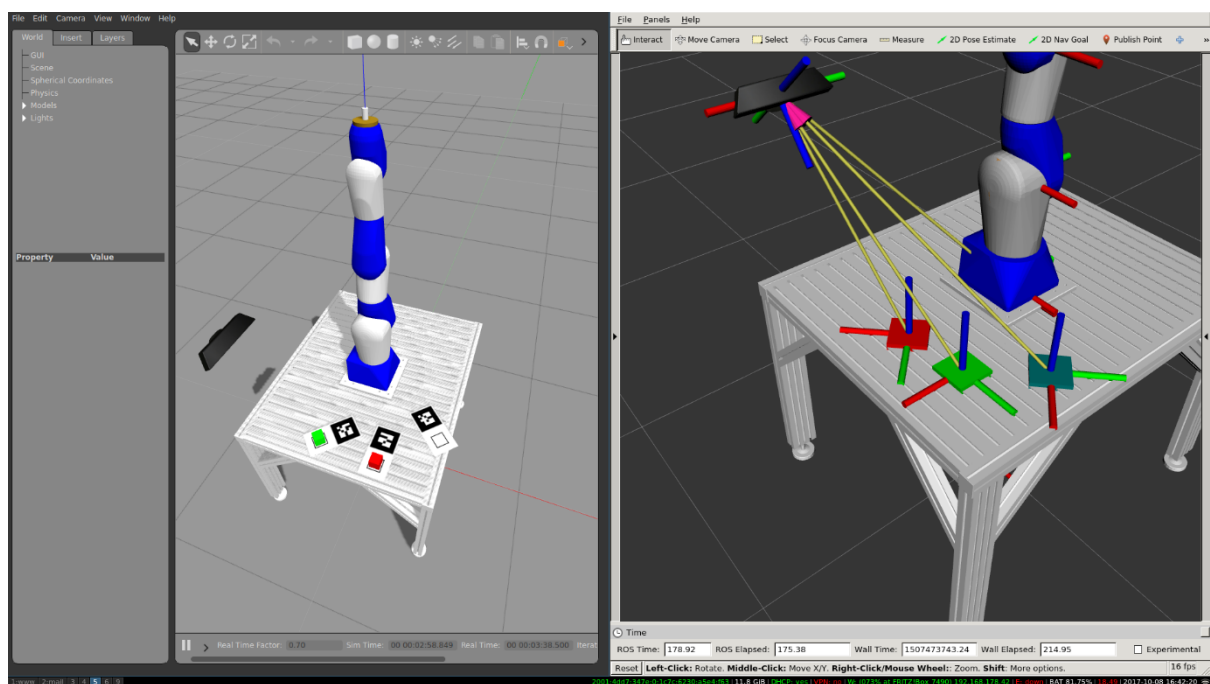


Figure 1: Simulation environment

2. AR Marker detection

AR Markers are fiducial markers (see figure 2). They provide a way of visual pose estimation. AR Markers can be detected by the `ar_track_alvar` package. This package can be installed in the following manner along with package to read camera images:

```
$ sudo apt-get install ros-kinetic-ar-track-alvar
$ sudo apt-get install ros-kinetic-openni2-launch
```

3. Startup

Start the following launch file to open the camera and read images from it.

```
$ roslaunch openni2_launch openni2.launch
```

Start the launch file *ar.launch* from the *moveit_tutorial package* to detect the AR Tags in the Simulation as well. AR Track Alvar works out of the box by just running it, you only need to determine the length of one side of the tag and the image topic to be used. This is parametrized in the launch file. In this case:

```
marker size: 13cm x 13cm  
camera image topic: /camera/rgb/image_raw  
camera info topic: /camera/rgb/camera_info  
output frame: /camera_link
```

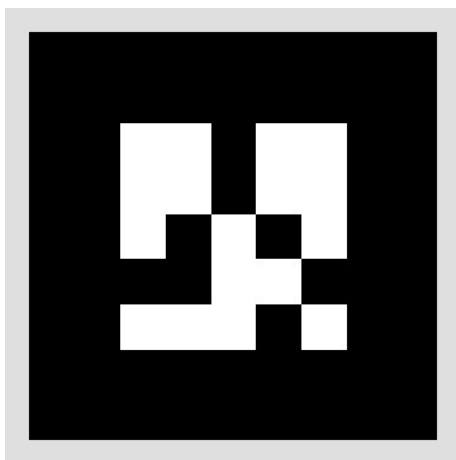


Figure 2: AR Tag showing number 1

When you start up AR-Track Alvar you can visualize the detected AR Tags by enabling the topic `/visualization_marker` in Rviz. You can also visualize (and make use of) tf data provided by AR-Track Alvar as it also represents detected Markers by publishing transforms.

Once you started it up for the first time and set up the appropriate visualizations in rviz you'll probably notice a screen like the following:

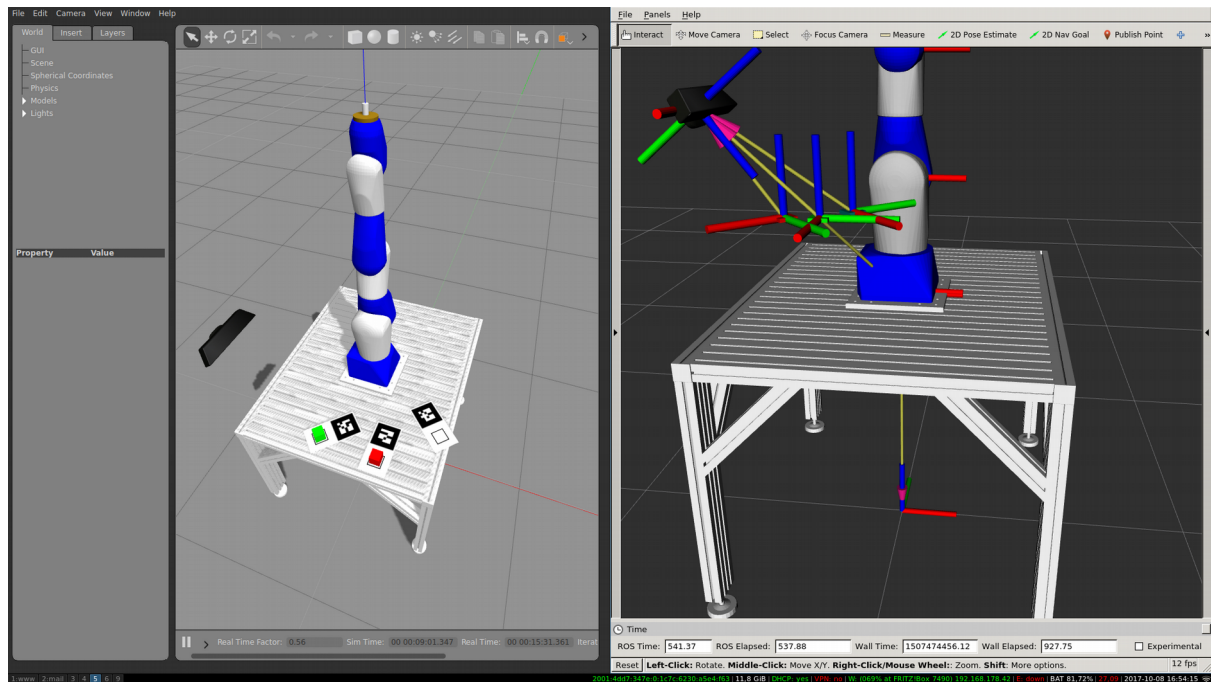


Figure 3: AR Tags at wrong size

This is caused by a wrong value of “marker_size” in the ar.launch file or the wrong transformation in the URDF. Try to tweak this value until you have a set-up as shown in figure 1.

4. Output analysis

Running AR-Track alvar will provide a new topic called /ar_pose_marker which provides information about the detected AR Tags. These messages can easily be used in ROS nodes to further interact with the perceived AR Tags.