

Robotics Assignment 1

Due: 20.03.2018, 23:59

1 Introduction

In this assignment, you will create your robot simulation workspace. You will learn about what is V-Rep and what is ROS.

2 Preliminary Installation

1. Install Ubuntu 16 x86_64.
2. Install Ros Kinetic (see <http://wiki.ros.org/kinetic/Installation/Ubuntu>) make sure you have the "desktop-full" ROS package. Command:

```
sudo apt install ros-kinetic-desktop-full
```

3. Install V-REP Linux 64-bit. Make sure that V-REP version is 3.4.0 .

```
mkdir ~/Simulators
cd ~/Simulators
wget http://coppeliarobotics.com/files/V-REP_PRO_EDU_V3_4_0_Linux.tar.gz
tar zvxvf ~/Simulators/V-REP_PRO_EDU_V3_4_0_Linux.tar.gz
# set the VREP_ROOT variable in ~/.bashrc:
echo 'export VREP_ROOT="/Simulators/V-REP_PRO_EDU_V3_4_0_Linux"' >> ~/.bashrc
source ~/.bashrc
```

- 4) Install some required Ubuntu packages.

```
sudo apt install git cmake python-tempita python-catkin-tools python-lxml default-jre
```

- 5) Install saxon.

```
cd ~/Downloads
wget http://downloads.sourceforge.net/project/saxon/Saxon-HE/9.7/SaxonHE9-7-0-8J.zip
cd ~
mkdir -p saxon/bin
cd saxon
unzip ~/Downloads/SaxonHE9-7-0-8J.zip
echo -e '#!/bin/sh\njava -jar "`dirname "$0"`/saxon9he.jar' "$@"' > bin/saxon
chmod a+x bin/saxon
# update PATH env var with the location of saxon executable:
echo 'export PATH="$PATH:$HOME/saxon/bin"' >> ~/.bashrc
source ~/.bashrc
```

- 5) Install v_repStubsGen (https://github.com/fferri/v_repStubsGen)

```
mkdir -p ~/Programs/python-packages
cd ~/Programs/python-packages
git clone https://github.com/fferri/v_repStubsGen.git
echo 'export PYTHONPATH="$PYTHONPATH:~/Programs/python-packages"' >> ~/.bashrc
source ~/.bashrc
```

6) Setup catkin workspace. VREP ROS interface is necessary for connecting V-Rep simulator to ROS.

```
mkdir -p ~/dummy_catkin_ws/src
cd ~/dummy_catkin_ws/src
catkin_init_workspace
cd ..
catkin build
source devel/setup.bash
git clone https://github.com/ffferri/v_repExtRosInterface.git vrep_ros_interface
catkin build
```

7) Copy vrep-ros packages to your catkin space.

```
cd ~/dummy_catkin_ws
cp -r ~/Simulators/V-REP_PRO_EDU_V3_4_0_Linux/programming/ros_packages/ src/
catkin build
#If there is no problem
cp devel/lib/libv_repExtRos* ~/Simulators/V-REP_PRO_EDU_V3_4_0_Linux/
```

Now you can remove dummy_ros_ws and run Vrep with ros connection.

1) roscore, 2) ~/Simulators/V-REP_PRO_EDU_V3_4_0_Linux/vrep.sh

3 Assignment

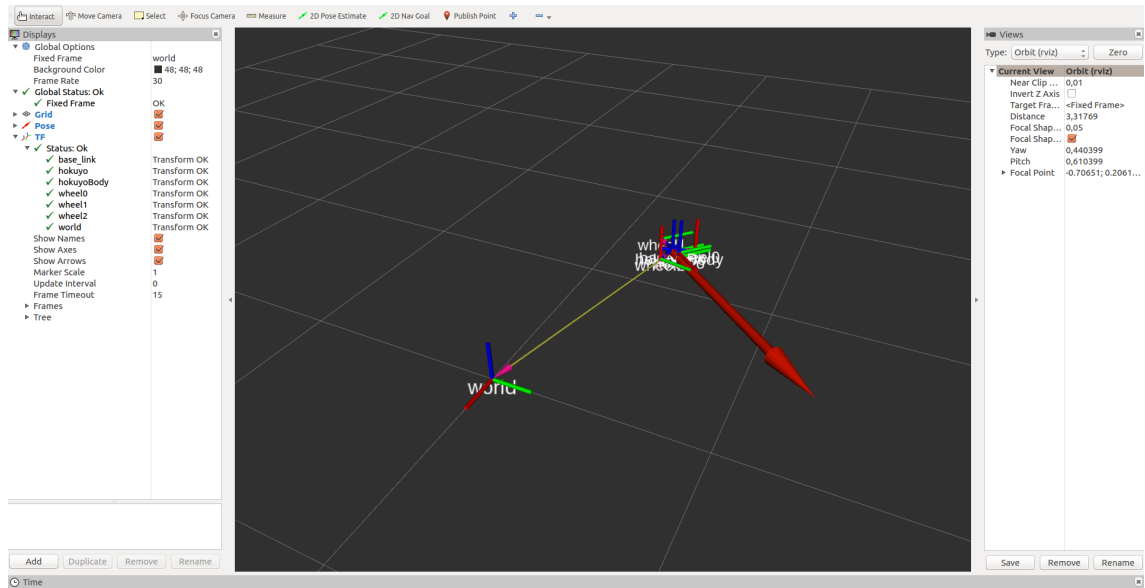
1. Read what is ROS and what is VREP from their web page (<http://wiki.ros.org/ROS/Introduction> and <http://www.coppeliarobotics.com/index.html>).
2. Download following zip file:

https://drive.google.com/file/d/1aXSMr0rb9rw2DBarStr_jqQQGrQ0s07x/view?usp=sharing
3. Create a ros workspace. Add modules found in zip file to your workspace (vrep_scan_to_laserscan, vrep_stack). Then, run catkin_make function in your workspace.
4. Open roscore.
5. Open VREP.
6. Run Assignment1.ttt in VREP.
7. run base.launch found in vrep_apps module (You should use roslaunch). You can control the robot with arrow buttons in this terminal.
8. Run rviz with command rviz.

(note that to be able to send keyboard commands to the simulated robot, terminal should have the focus)

4 Deliverables

1. Short report on what you did . Briefly describe your understanding of how ROS works, how V-REP works. Try to illustrate how ROS and V-REP works together in the experiment you have done (Communication between modules etc.). Discuss why simulators are used in robotic tasks.
2. Video of you operating your robot with keyboard. You should also show your robots TF in RVIZ in the given video.(All together it should be shorter than one page.)



Rviz scene example.

5 Submission

You should email your submission tekdenahmet@gmail.com with subject [Robot Assignment 1].

Your submission should contain:

- Report pdf.
- Video link of your video.

ACKNOWLEDGEMENT

This assignment was adapted from an assignment prepared by Yiğit Yıldırım (RobotLab) for CMPE 565 Autonomous Robots course.