

A Warm-up on ROS

COMS 4733, Spring 2019

The purpose of this document is to help you 1) get the ROS Kinetic system up and running on your laptop and 2) learn entry-level ROS programming.

Chapters 1-7 of the book [ROS By Example](#), A Do-It-Yourself Guide to the Robot Operating System, by R. Patrick Goebel, are helpful! Feel free to reach out to any of the TAs if you have installation issues or questions after attempting to follow this tutorial.

1 Set up a working Ubuntu machine

You need to set up a working Ubuntu machine. You have three options: using a Virtual Machine, directly booting into your personal machine, or installing into Windows Subsystem for Linux.

1.1 Option 1: Boot directly into Ubuntu (RECOMMENDED)

Your best option is to create a native Ubuntu 14.04 USB boot stick and run a native Ubuntu machine. This [video](#) describes how—just change Ubuntu 16.04 in the video to 14.04. Here are links to [Virtual Box](#) and [Ubuntu 14.04](#).

You can also purchase the [Parallels](#) software that will give you access to a Ubuntu 14.04 image (Mac OS only). This [video](#) is helpful and explains what to do to get Ubuntu 14.04 set up.

1.2 Option 2: Windows Subsystem for Linux

The Windows Subsystem for Linux (WSL) is a feature built into Windows 10 that allows you to run a Linux shell natively.

First, install WSL following [this tutorial](#). Install `Ubuntu 18.04`, instead of 14.04, since Microsoft added ROS support in later versions. Next, refer to section 2.1 to install ROS.

1.3 Option 3: Use provided VM

If your computer can handle running a virtual machine, the TAs have provided a Ubuntu 14.04 VM image with ROS pre-installed [here](#).

Open `ros.ova` in a VM software of your choice. We recommend either [VirtualBox](#) or [VMware Workstation Player](#). You should set the RAM to at least 1 GB, and the disk size to at least 20 GB. If you can run the VM without much lag or issues, then you can use the ROS software pre-installed here (you can skip to section 3).

2 ROS installation

Install ROS Indigo step by step by going through the [instructions](#) on the ROS Wiki (the official forum for ROS developers).

The instructions deal specifically with ROS Indigo since we are talking about Ubuntu 14.04 here in this document. If you are using other Ubuntu versions, please check [ROS distribution](#) carefully to match the correct one. The above instructions are still applicable.

In the ROS By Example book, Chapter 4 explains how to install ROS Indigo. Chapter 5 explains how to install the code used in the book. Chapter 6 explains how to install the Arbotix python simulator. You will probably use or refer to these in later assignments.

2.1 Install ROS on WSL

This section assumes you are running a Windows machine, and have installed WSL as per section 1.2. Please follow [this tutorial](#) starting from the section titled “Install ROS”.

You may run into an issue with retrieving SSH keys, getting the error message:

```
gpg: keyserver receive failed: No dirmngr
```

If so, retrieve the keys using the workaround in [this post](#). Then, continue from the `sudo apt update` line in the original tutorial.

3 ROS tutorials

You should go through the official [ROS tutorials](#), Beginner Level, to acquaint yourself with ROS. Make sure you actually run the tutorial examples on your machine. Good luck with your first ROS run!

4 Homework 2 and MoveIt! framework

4.1 MoveIt! installation

To install MoveIt!, go to this link: http://docs.ros.org/kinetic/api/moveit_tutorials/html/doc/getting_started/getting_started.html, follow the instruction to the very end of the page, and make sure you use the version corresponding to your ROS version.

This single page is all you need for this assignment. But if you want to learn more about Rviz (a powerful robot visualization software that comes with ROS), feel free to move on to the “Visualize a robot with the interactive motion planning plugin for RViz” section.

4.2 HW2 visualization

After you generate your text file containing joint angle configurations, you can use MoveIt! to simulate the robot by following the steps below:

- Makes sure you source the `setup.bash` file by running

```
source [HOME]/ws_moveit/devel/setup.bash
```

You should have done this already if you followed the MoveIt! installation tutorial above.

- Run the following command:

```
roslaunch panda_moveit_config demo.launch
```

You should see a Rviz window pop up with a Panda arm in it.

- Download the `move_arm.py` file we provided, and run

```
python move_arm.py [JOINT_FILE]
```

You should now see the Panda arm moving in the Rviz scene according to your joint trajectories. Yeah!!