

Setup and Introduction to ROS

Overview:

The purpose of this lab is to get the ROS system we will be using installed and working on your computer. You will be working through some ROS tutorials and getting to know the ROS environment.

General Instructions:

In this class we will use ROS 2 Humble, which is supported on Ubuntu 22.04. [Other versions of ROS will require other versions of Ubuntu, make sure that you check the version compatibility if you decide to try a different ROS version, or if you have a more recent Ubuntu version].

Pre-Installation:

ROS works best with Ubuntu Linux but can also work with other operating systems through various virtualization frameworks. Here are the different options for getting ROS to work on your laptop with different operating systems:

1. Dual-boot to run Ubuntu Linux as native OS
 - a. Create a new partition on your computer's hard drive and write the Ubuntu OS into it using a bootable USB drive:
 - b. <https://www.linuxtechi.com/dual-boot-ubuntu-22-04-and-windows-11/>
 - c. Once you have booted up Ubuntu, follow the instructions on <https://docs.ros.org/en/humble/Installation/Ubuntu-Install-Debians.html> to install ROS, making sure that `sudo apt install ros-humble-desktop` is executed successfully.
2. Install a virtual machine to run Ubuntu Linux as a guest OS
 - a. List of virtual machine software:
 - i. VirtualBox <https://www.virtualbox.org/>
 - ii. UTM (*recommended for Mac users!*) <https://mac.getutm.app/>
<https://docs.getutm.app/guides/ubuntu/>
 - iii. VMWare Fusion <https://www.vmware.com/products/fusion.html>
 - b. Download the ISO image from here <https://cdimage.ubuntu.com/jammy/daily-live/current/> . Select AMD64 if your computer has an Intel/AMD chip or ARM64 if your computer has an ARM chip (e.g. Apple M1).
 - c. Create a new VM instance using the installer ISO. It is recommended to allocate at least 2GB RAM and 20GB disk space to the VM. Enabling clipboard and directory sharing can be helpful but not required.
 - d. Go through the Ubuntu installer then reboot the VM. If the reboot fails, you can manually quit the VM, eject/unmount the installer ISO, and start the VM again.

- e. Once an Ubuntu environment is running successfully on the virtual machine, install ROS using the instructions here:
<https://docs.ros.org/en/humble/Installation/Ubuntu-Install-Debians.html>
3. Windows Subsystem for Linux
 - a. Install WSL using the instructions here: <https://learn.microsoft.com/en-us/windows/wsl/install>, then install ROS using the instructions here:
<https://docs.ros.org/en/humble/Installation/Ubuntu-Install-Debians.html>
4. Binary installation on Windows
<https://docs.ros.org/en/humble/Installation/Windows-Install-Binary.html>
5. RoboStack <https://robostack.github.io/GettingStarted.html>

Part I: Installing/Learning ROS

We will be working with ROS Noetic this semester. To get it installed, go to

<https://docs.ros.org/en/humble/Installation.html>

for detailed instructions. Follow the given steps for your operating system. The Desktop Install is recommended.

Once you have completed your ROS installation, please work through the Beginner Level Core ROS tutorials. The tutorials will involve configuring your ROS environment, creating a workspace, and creating a package. We will also be primarily using Python this semester, so you can just do those options when given both C++ and Python versions of a tutorial. Make sure you complete the following tutorials:

<https://docs.ros.org/en/humble/Tutorials/Beginner-CLI-Tools.html>

<https://docs.ros.org/en/humble/Tutorials/Beginner-Client-Libraries.html>

<https://docs.ros.org/en/humble/Tutorials/Intermediate/Launch/Launch-Main.html>

<https://docs.ros.org/en/humble/Tutorials/Intermediate/RViz/RViz-Main.html> (optional for Lab 1 but important for Lab 2)