Work to do and tutorials to follow.

As explained in the first introductory course, this course is based on new pedagogical methods that aim to maximize your time in class to do experiments (ROS and experimental robotics, that was in the title!). For that, and after two introductory courses, you will have to follow tutorials at home.

Attention: this course is entirely based on this autonomous work.

If you don't do this work or follow the tutorials without trying to understand, you will be completely lost during the practical sessions. A good method of work would be to create a summary sheet of everything you learn during these tutorials so that you can use it during the practical sessions.

All the tutorials on the official website and on the beginner, level must be done before the first practical session (http://wiki.ros.org/ROS/Tutorials), only the first tutorial on the installation is not to be followed since you have a virtual machine with a complete installation.

Similarly, all the videos mentioned are to be watched before the first session.

We can't insist enough but it's not by simply reading and passively watching the videos that you will be ready for the sessions. It is necessary to redo all the manipulations (and to understand them). Don't hesitate to re-watch the introductory documents/videos once you've made some progress. Some of the concepts will be clearer after you have worked on them a bit and you will understand more and new things by doing so.

To help you during this work we propose you hereafter an organization on how to follow the tutorials of the official ROS website in parallel of the explanatory videos created by Robotis (manufacturer of the turtlbebot) which also proposes an initiation to ROS. The path we propose among these tutorials is supposed to guide you to acquire the list of skills expected at the end of part 1 and which can be found on moodle (see document ..)

Recommended planning :

DAY 1	How to set-up your environment
DAY 2	Chapter 1, 2 and 3
DAY 3	Chapter 4, 5, 6
DAY 4	Chapter 7 : nodes, topics, publisher, subscriber
DAY 5	
DAY 6	
DAY 7	Chapter 7: Services
DAY 8	Chapter 7: Parameters, launchfile
DAY 9	Conclusion: last tutorials + study for the exam (review of important points)
DAY 10	

Chapter 1 Robot Software Platform

General introduction about the need for a unifying OS that can interface between all software and hardware developments

https://www.youtube.com/watch?v=1tqYrWqrbC8&t=21s

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Chapter 2 Robot operating system

General introduction to ROS and the tools it provides to simplify/optimize the development of robotic applications.

https://www.youtube.com/watch?v=ynzKAoRQAOA&t=21s

Chapter 3 Configuring the ROS Development Environment

This video focuses on the installation and verification of the correct installation of ROS on your machine. In your case, a virtual machine is provided to you with all the installation done (**including the terminal named terminator** which allows having several terminal windows side by side (right click-split horizontally), you will see later that it is very useful for ROS).

So, we advise you to watch the video only from the timing of the link (2m46). It starts by introducing the ROS environment settings. Then the video will guide you to the launch of your first node in order to verify that everything is working properly. Finally, the video ends with a description of some IDE tools. **In this course, we will use 'Sublime text'**.

https://www.youtube.com/watch?v=MrUKBryECpY

Chapter 4 Important Concepts of ROS

This video is very important (**feel free to watch it several times or come back to it later**). It describes all the basic concepts that govern ROS, including how to communicate between nodes.

https://www.youtube.com/watch?v=HuKgOs59mbk

Chapter 5 ROS commands

This video describes all the command types that will allow you to navigate/interact when developing with ROS. The knowledge and correct use of these instructions are part of the skills expected and evaluated at the end of part 1.

https://www.youtube.com/watch?v=hr2kARujQQs

Chapitre 6 ROS tools

This video talks about two very useful tools (RViz and RQt) that come with ROS and that allow us to observe the state of our system/application while it is running.

It ends by talking about Gazebo which we will talk about in more detail in part 2 of the course.

Attention, the video shows the method to install RVIZ **but as said in the video RVIZ is already installed on your virtual machine**.

https://www.youtube.com/watch?v=gnrucTYdizw

Chapitre 7 Basic ROS Programming

With this video we get to the heart of what will be expected of you at the end of this course, i.e. being able to develop ROS packages allowing you to control a robot according to a specification. Here the video summarizes and explains the programming concepts used in tutorials on the official ROS website.

Attention in this video the examples are given for development in C. Nevertheless, some parts remain interesting and are detailed below. In general, do not stop on the code in this video but only on the concepts that are explained.

- 4min12: Here the first difference appears. The instruction to create a package is given with a dependency to roscpp (ros C++) while we use rospy (ROS python). The corresponding tutorial is the following one: http://wiki.ros.org/ROS/Tutorials/CreatingPackage

- 5m40-10m03: Part not to be looked at. Here we detail the modification of the cmake, the creation of a message type, the creation of two nodes and the code of the latter in C++. However, you can watch the video out of curiosity (without watching the codes) once you have completed the corresponding tutorials in python. The corresponding tutorials are the following:

  - http://wiki.ros.org/ROS/Tutorials/BuildingPackages
  - http://wiki.ros.org/ROS/Tutorials/UnderstandingNodes
  - http://wiki.ros.org/ROS/Tutorials/UnderstandingTopics
  - http://wiki.ros.org/ROS/Tutorials/WritingPublisherSubscriber%28python%29
  - http://wiki.ros.org/ROS/Tutorials/ExaminingPublisherSubscriber

At the end of these tutorials, you will have created a node that publishes information on a topic and a subscriber which subscribe to that same topic and can therefore "listen" to that information.

- 10min00-11m51: Interestingly, you can read on here because after developing in C++, we return to "ROS" instructions which are therefore valid regardless of the code with which we have chosen to develop our package/node, this is precisely one of the advantages of ROS.

- 11m52 – 13m50: this corresponds to the creation of the server in C++. The corresponding tutorials are the following:
  - http://wiki.ros.org/ROS/Tutorials/UnderstandingServicesParams
  - http://wiki.ros.org/ROS/Tutorials/WritingServiceClient%28python%29
  - http://wiki.ros.org/ROS/Tutorials/CreatingMsgAndSrv
  - http://wiki.ros.org/ROS/Tutorials/WritingServiceClient%28python%29
  - http://wiki.ros.org/ROS/Tutorials/ExaminingServiceClient
- 13m50-15min34: The video continues using the service created and therefore may be interesting for you since once again we find ourselves in the situation where it doesn't matter what language the code was developed in.
- 15min34-17min07: the video introduces the notion of parameter (very important notion) but explains it with code in C++ so once again, we refer you to the corresponding tuto in python.
  - http://wiki.ros.org/ROS/Tutorials/UnderstandingServicesParams
- 17min07-End: the video talks about the notion of launchfile which is also very important. Everything is compatible with the since the writing of these launch files uses its XML language.
  - http://wiki.ros.org/ROS/Tutorials/UsingRqtconsoleRoslaunch

https://www.youtube.com/watch?v=X_MYREehGzU

Conclusion

This marks the end of the videos to watch for part 1 **but not the end for the tutorials** on the official site since there are still several tutorials on points not covered so far. We particularly draw your attention to the notion of ROS bag which is also a strength of ROS.

- Using rosed to edit files in ROS
- http://wiki.ros.org/ROS/Tutorials/Recording%20and%20playing%20back%20data
- http://wiki.ros.org/ROS/Tutorials/reading%20msgs%20from%20a%20bag%20file
- http://wiki.ros.org/ROS/Tutorials/Getting%20started%20with%20roswtf
- http://wiki.ros.org/ROS/Tutorials/NavigatingTheWiki
- http://wiki.ros.org/ROS/Tutorials/WhereNext

As it was said during the first lesson, one of the main advantages of ROS is to federate the robotics community around the world and it is, therefore, possible to find a lot of resources. If you get stuck on the point of understanding, you can always look for other resources and/or exchange on this point online.

There are for example dozens of different courses/tutorials that you can consult if you ever want to hear the same thing in a different way (the only point to watch out for is not to take a course on ROS2 which is not the subject of this course because it is not yet in its final version).

Within the framework of this teaching unit, all the teaching staff is available to answer your questions on the forum set up on moodle and we invite you to ask all your questions on this platform (they will benefit your fellow students) it is also possible to answer each other on these posts (do not hesitate it is very encouraged).

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