How to Create a ROS Workspace?

catkin | rosbuild

These instructions are for ROS Groovy and later. For ROS Fuerte and earlier, select rosbuild.

Let's create and build a catkin workspace:

```
$ mkdir -p ~/catkin_ws/src
$ cd ~/catkin_ws/
$ catkin_make
```

The catkin_make command is a convenience tool for working with catkin workspaces. Running it the first time in your workspace, it will create a `CMakeLists.txt` link in your 'src' folder. Additionally, if you look in your current directory you should now have a 'build' and 'devel' folder. Inside the 'devel' folder you can see that there are now several setup.*sh files. Sourcing any of these files will overlay this workspace on top of your environment. To understand more about this see the general catkin documentation: catkin. Before continuing source your new setup.*sh file:

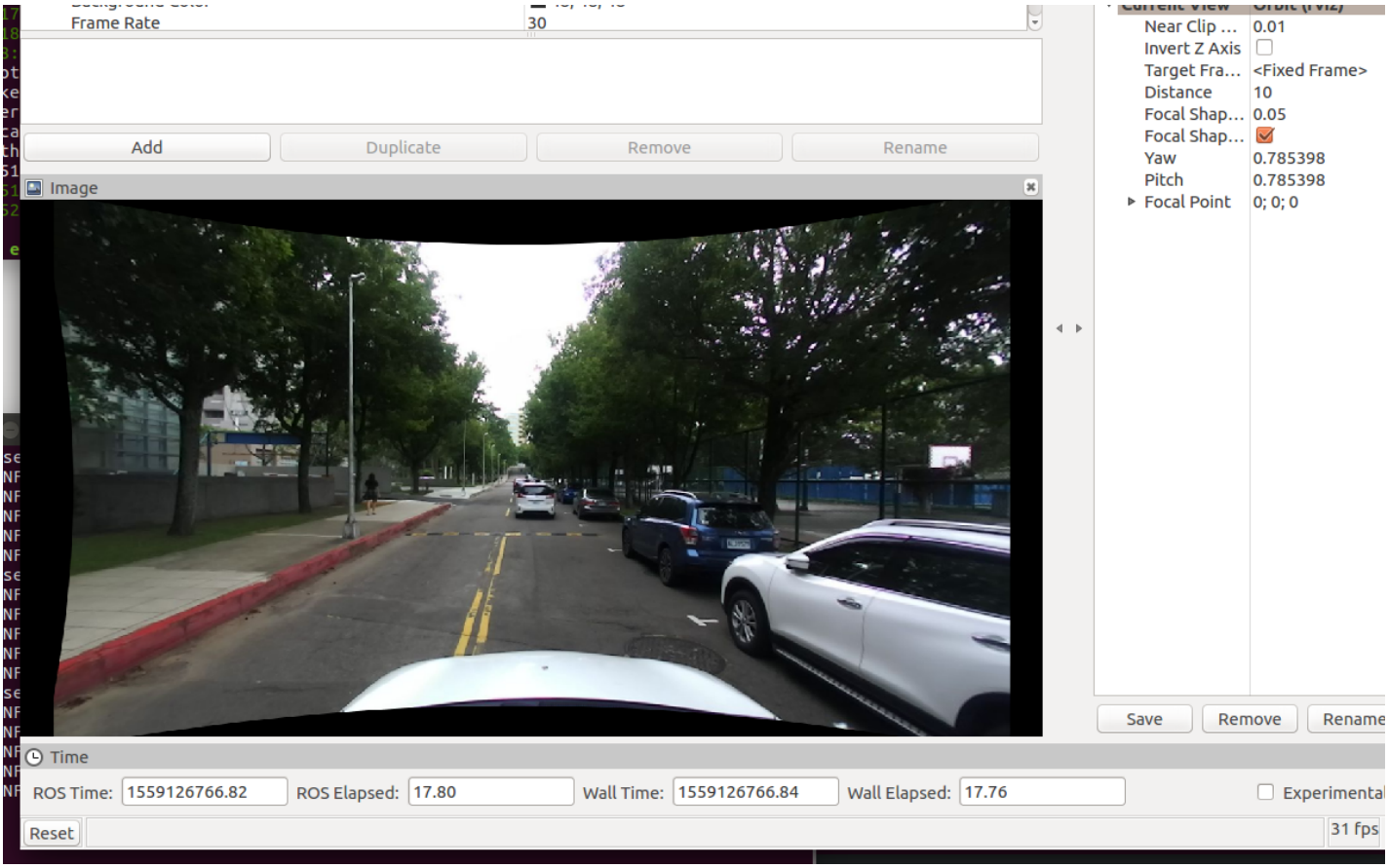
```
$ source devel/setup.bash
```

To make sure your workspace is properly overlayed by the setup script, make sure `ROS_PACKAGE_PATH` environment variable includes the directory you're in.

```
$ echo $ROS_PACKAGE_PATH
/home/youruser/catkin_ws/src:/opt/ros/kinetic/share
```

```
$ mkdir -p ~/catkin_ws/src

$ cd ~/catkin_ws/

$ catkin_make

$ source devel/setup.bash

$ echo $ROS_PACKAGE_PATH
```

Undistort Image result:



Request: Subscribe image in the rosbag and publish them after undistortion.

Hint: the way to convert cv::Mat to sensor_msgs::Image

http://wiki.ros.org/image_transport/Tutorials/PublishingImages

Why undistortion?

在相機的成像矩陣中, 我們是假設相機是一個理想的 Pinhole Camera, 也就是不須透鏡的, 但在實際的相機中 camera model 則包含了 radial lens distortion and tangential lens distortion。

EX: taking pictures by a fish eye camera looks like this.