Introduction

This document describes the steps necessary to add and remove the custom OpenCV installation necessary to run the vesselness tracker alongside ROS. This needs to be done once per computer; unless you uninstall the OpenCV version used it does not need to be performed again if the package is removed.

A: Download & Install CUDA

1. Download the CUDA library from http://developer.nvidia.com/cuda-downloads. Vesselness works by default with CUDA 8.0. Select
   Architecture: x86-64
   Distribution: Ubuntu
   Version: 16.04
   Installer Type: deb(Network)
2. cd to your Downloads folder or wherever the .deb was put.
3. `sudo dpkg -i cuda-repo-ubuntu1604_8.0.61-1_amd64.deb`
4. `sudo apt-get update`
5. `sudo apt-get install cuda-8`
6. Add the following lines to .bashrc:

```
export PATH=/usr/local/cuda-8.0/bin${PATH:+:${PATH}}

export LD_LIBRARY_PATH=/usr/local/cuda-8.0/lib64\${LD_LIBRARY_PATH:+:$
{LD_LIBRARY_PATH}}
```

Optionally test the CUDA installation:

1. `cd /user/local/cuda-8.0/bin`
2. `sudo ./cuda-install-samples-8.0.sh ~`
3. `cd ~/NVIDIA_CUDA-8.0_Samples/0_Simple/vectorAdd`

B: Download & Install OpenCV

1. Make sure you have the required dependency packages:
```
sudo apt-get install build-essential qt5-default qtdeclarative5-dev
sudo apt-get install cmake git libgtk2.0-dev pkg-config
sudo apt-get install libavcodec-dev libavformat-dev libswscale-dev
sudo apt-get install python-dev python-numpy libtbb2
sudo apt-get install libtbb-dev libjpeg-dev libpng-dev libtiff-dev
sudo apt-get install libjasper-dev libdc1394-22-dev
sudo apt-get install libeigen3-dev
```
2. From https://opencv.org/releases/, select a version of OpenCV. 3.2.0 is the standard for this package.
3. Create a folder to store the source files- for instance, `mkdir ~/OpenCV`
4. Extract the downloaded source files into the folder you just made.
5. Open a terminal in the folder you just made.
6. `mkdir build`
7. `cd build`
8. `cmake -D CMAKE_BUILD_TYPE=Release -D CMAKE_INSTALL_PREFIX=/usr/local -D WITH_QT=TRUE -D WITH_OPENGL=TRUE ..`
9. `Verify that CUDA, Python, and QT are used in the output of the previous command.`
10. `make -j3`
11. `sudo make install`
12. `ldconfig`
13. Restart computer