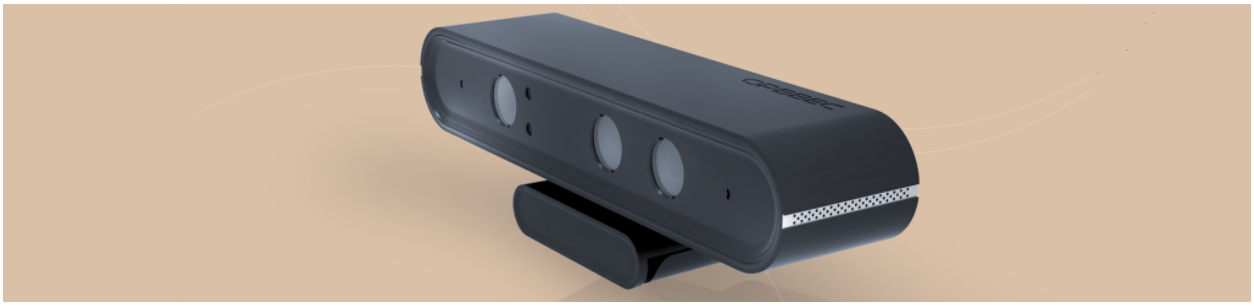
orbbec-astra-wiki Documentation

Release 2.0

Dabit Industries

May 11, 2018

Contents:



A quick-start guide to download the appropriate drivers for Orbbec Astra camera. Instructions to install on Windows and Linux are provided.

CHAPTER 1

About

Astra is a powerful and reliable standalone 3D camera which includes the proprietary Orbbec 3D microchip and VGA color. It has the same superior depth resolution and fast performance as Astra Pro.

Astra 3D cameras are excellent for a wide range of scenarios, including gesture control, robotics, 3D scanning, and point cloud development.

1.1 Technical Specs

Features	Details
Size/Dimensions	165 x 30 x 40 mm
Weight	0.3 kg
Range	0.6 - 8.0 m (Optimal 0.6 - 5.0 m)
Depth Image Size	• 640*480 (VGA) @ 30 FPS • 320*240 (QVGA) @ 30 FPS • 160*120 (QQVGA) @ 30 FPS
RGB Image Size	• 1280*960 @ 7 FPS • 640*480 @ 30 FPS • 320*240 @ 30 FPS
Field Of View	60° horiz x 49.5° vert. (73° diagonal)
Data Interface	USB 2.0
Microphones	2
Operating Systems	Windows 7/8/10, Linux, Android
Power	USB 2.0
Software	Astra SDK or OpenNI 2 or 3rd Party SDK

CHAPTER 2

Download Drivers

Apps can be developed using one of the two available SDKs on Windows.

- Astra SDK (via Visual Studio 13/15)
- OpenNI 2

2.1 Windows

2.1.1 System Requirements

- Windows 7 or later
- x86-based processor @ 1.8 GHz
- USB 2.0
- 4 gigabytes of RAM

The Astra driver and OpenNI 2 for Windows 7,8 and 10 can be downloaded from here:

Download driver for Win

2.1.2 Visual Studio 2013 or 2015

This is needed if you are using Astra SDK.

Visual C++ Redistributable Packages for Visual Studio 2013

Visual C++ Redistributable Packages for Visual Studio 2015

2.1.3 Astra SDK

Download Astra SDK For Visual Studio 2013 32-bit

Download Astra SDK For Visual Studio 2013 64-bit

Download Astra SDK For Visual Studio 2015 32-bit

Download Astra SDK For Visual Studio 2015 64-bit

2.2 Linux

2.2.1 System Requirements

- Ubuntu 14.04 or later
- x86 or ARM-based processor @ 1.8+ GHz
- USB 2.0
- 1 gigabyte of RAM

The OpenNI 2 for Linux can be downloaded from here: Download driver for Linux

For more download options

Visit the developer site of Orbbec.

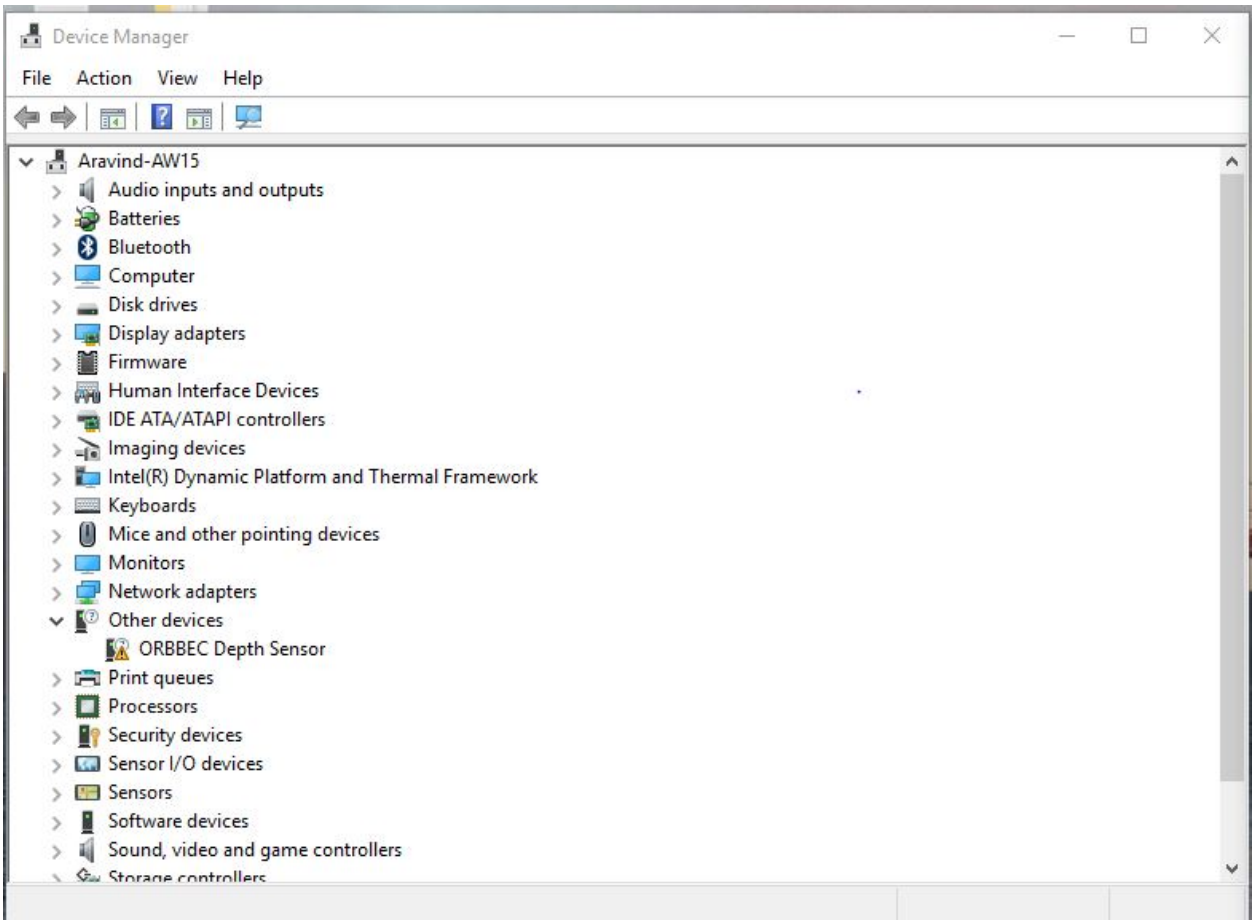
CHAPTER 3

Installation

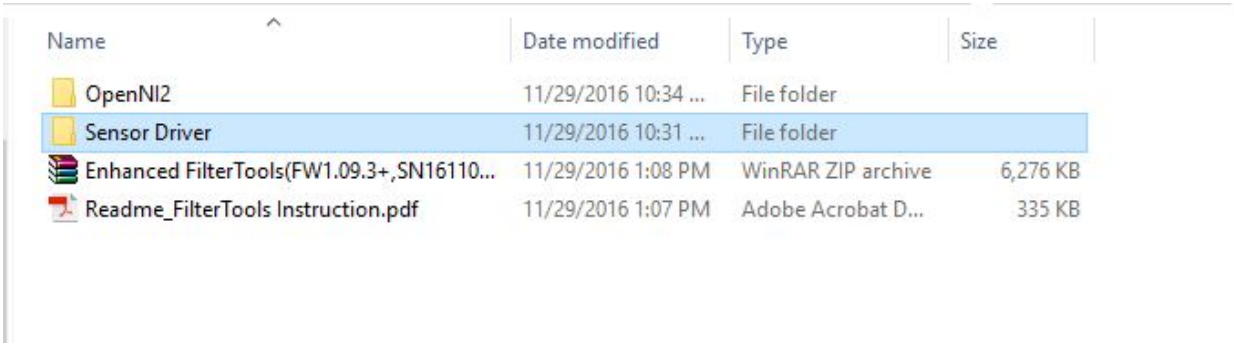
3.1 Windows

Installation procedure on Windows is straight-forward using an installer.

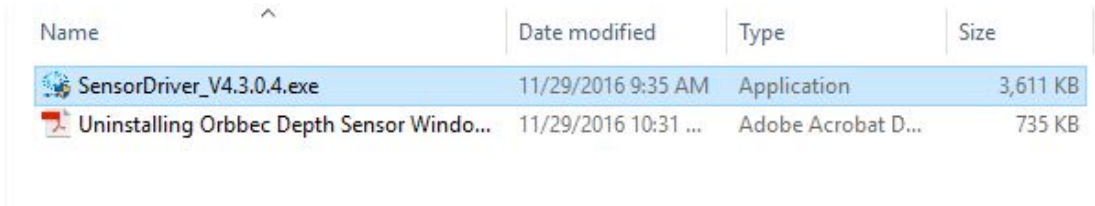
- Connect the Orbbec Astra camera to one of the USB ports
- Look for the new hardware notification in Device Manager under `Other devices`



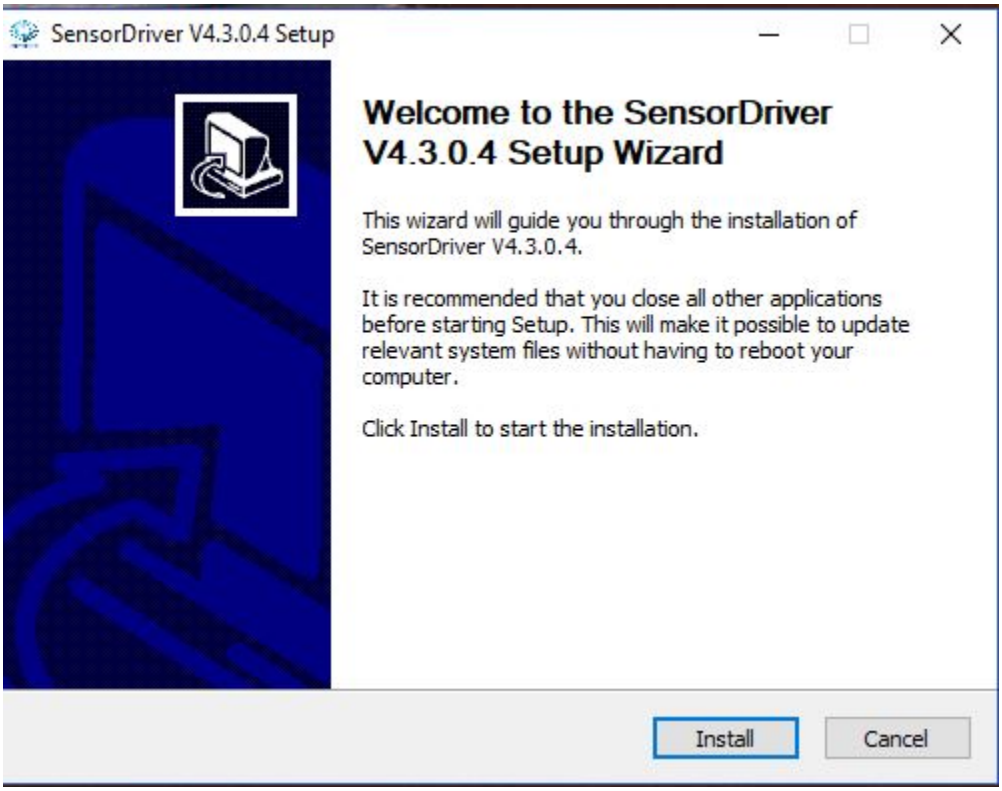
- A look at the contents of the driver

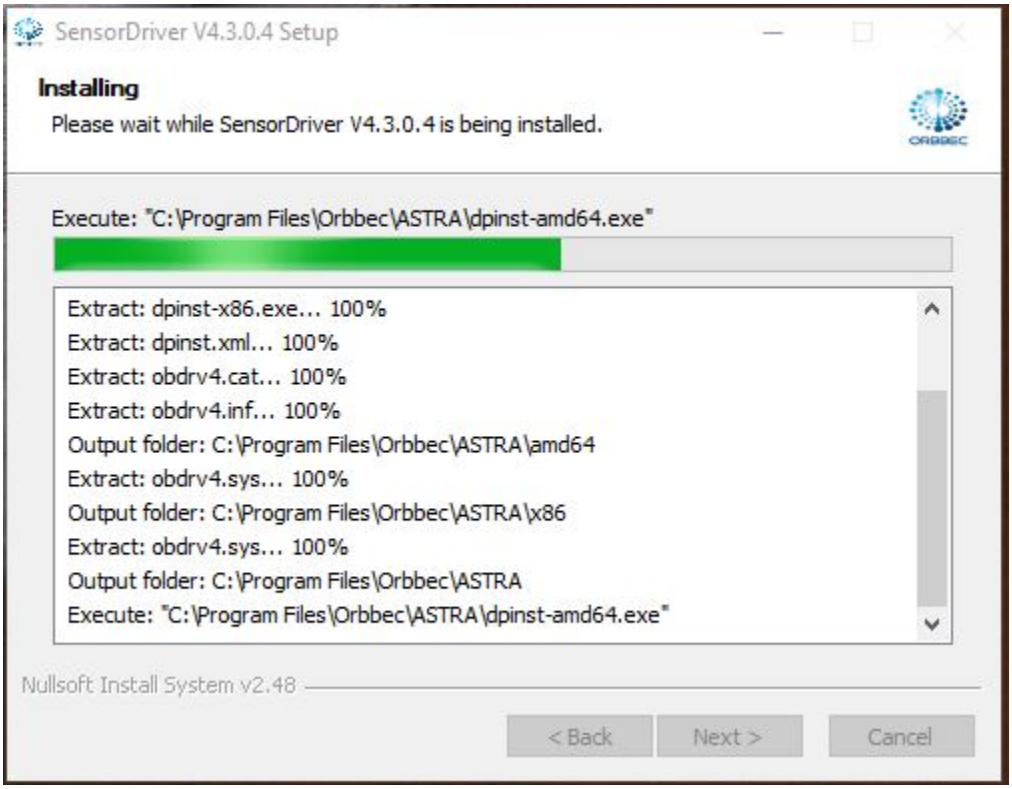


- Open the *Sensor Driver* folder and look for *SensorDriver_V4.3.0.4.exe*

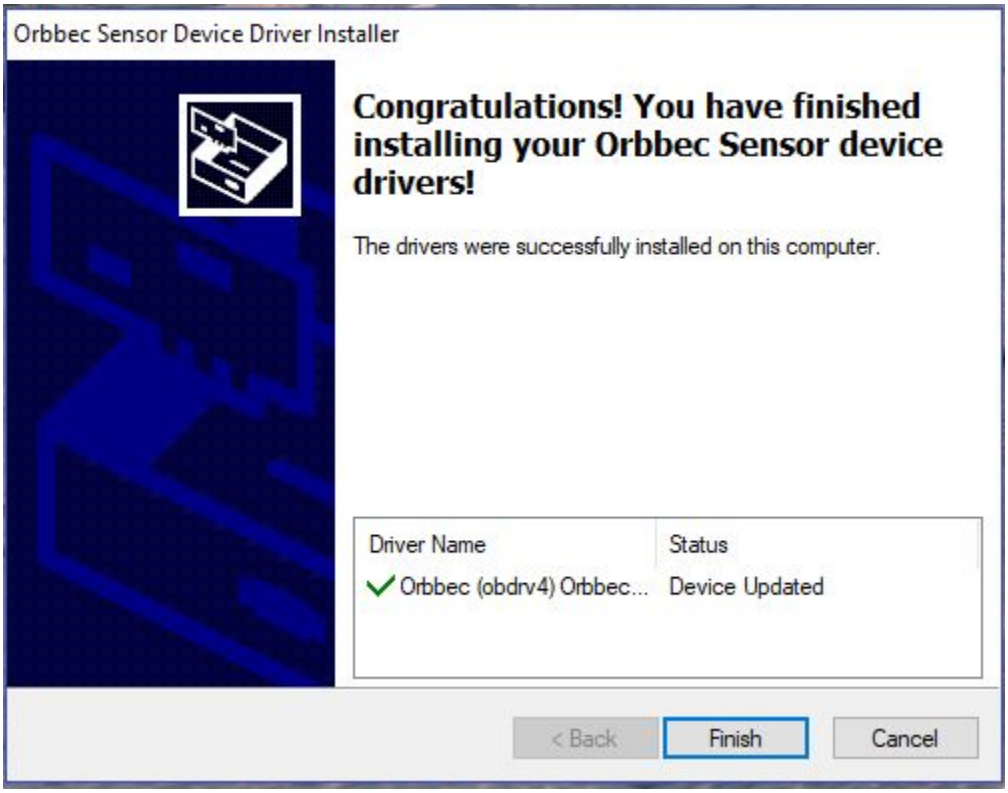


- Double click the .exe and wait for the installer to begin and then click on the *Install* option


SensorDriver V4.3.0.4 Setup
Welcome to the SensorDriver V4.3.0.4 Setup Wizard
This wizard will guide you through the installation of SensorDriver V4.3.0.4.
It is recommended that you close all other applications before starting Setup. This will make it possible to update relevant system files without having to reboot your computer.
Click Install to start the installation.
Install
Cancel

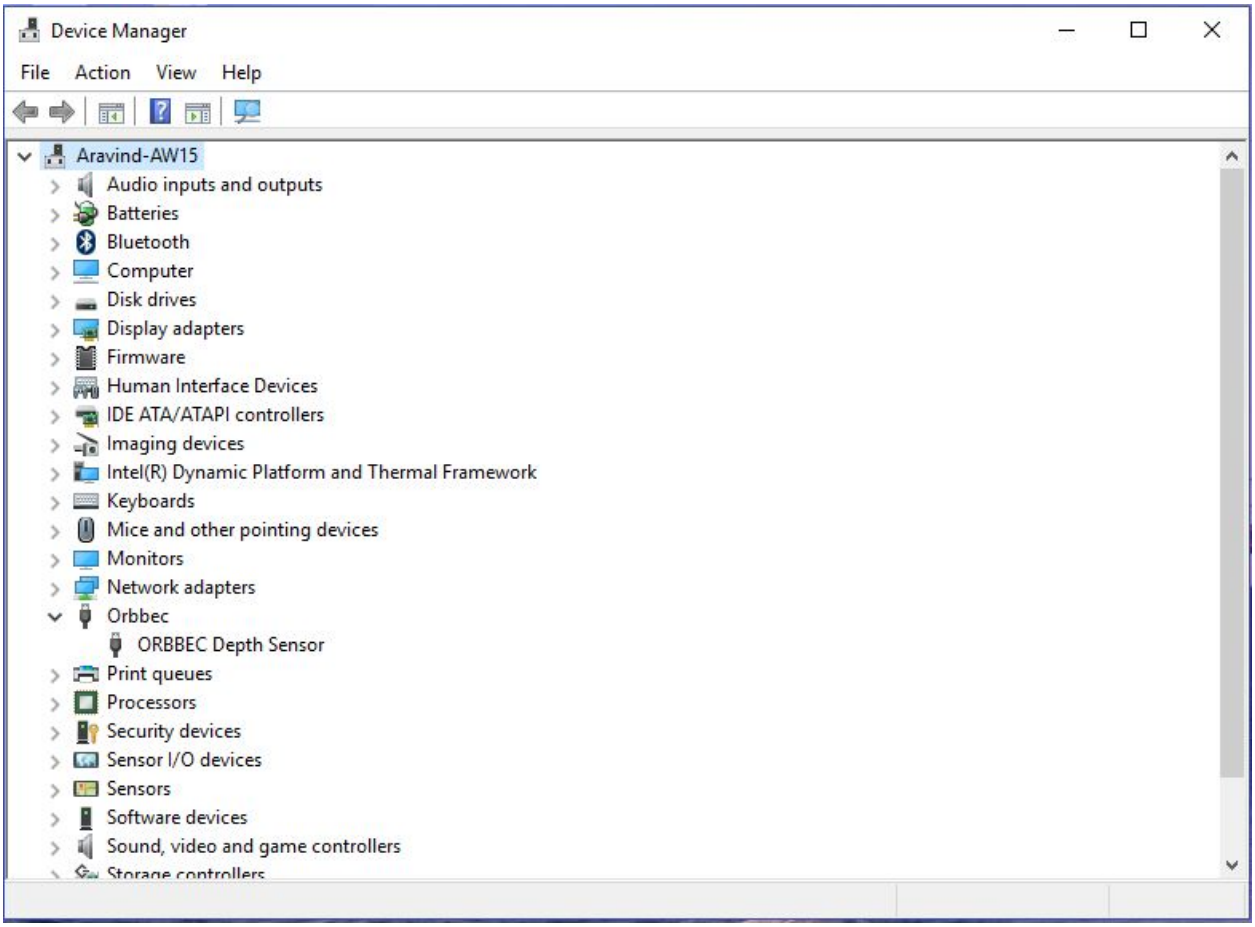

SensorDriver V4.3.0.4 Setup
Installing
Please wait while SensorDriver V4.3.0.4 is being installed.
Execute: "C:\Program Files\Orbbec\ASTRA\dpinst-amd64.exe"
Extract: dpinst-x86.exe... 100%
Extract: dpinst.xml... 100%
Extract: obdrv4.cat... 100%
Extract: obdrv4.inf... 100%
Output folder: C:\Program Files\Orbbec\ASTRA\amd64
Extract: obdrv4.sys... 100%
Output folder: C:\Program Files\Orbbec\ASTRA\x86
Extract: obdrv4.sys... 100%
Output folder: C:\Program Files\Orbbec\ASTRA
Execute: "C:\Program Files\Orbbec\ASTRA\dpinst-amd64.exe"
Nullsoft Install System v2.48
< Back
Next >
Cancel

- Click *Next*



- Click on *Finish* and the installation is complete

Now, the driver must be visible in *Device Manager*



3.2 Linux

Adapted from the Readme file provided by Orbbec.

Note:

- For user with ARM based development board:
- With CPU Structure older than Cortex A17, use OpenNI-Linux-Arm-2.3 Nofilter.tar for better performance.

Download the OpenNI2 Zip Package from Orbbec - There are two zip files, one is for a 32bit machine and the other for a 64bit machine.

Let's choose 64bit (x64) and install the driver using an example as follows:

- To run visual samples(e.g., SimpleViewer), you will need `freeglut3 header and libaries`, please install

```
$ sudo apt-get install build-essential freeglut3 freeglut3-dev
```

Check the udev version, Orbbec Driver needs `libudev.so.1`

If you can't find it then make a symbolic link from `libudev.so.x.x`, which is usually located at `/lib/x86_64-linux-gnu` or `/lib/i386-linux-gnu`

Note: Type the following commands, only if you could not find the right udev version.

```
$ ldconfig -p | grep libudev.so.1
$ cd /lib/x86_64-linux-gnu
$ sudo ln -s libudev.so.x.x.x libudev.so.1
```

Next, let's install the OpenNI 2 driver.

- Download the tgz(or zip) file to directory (e.g., /home) and unzip it.

```
            $ cd ~/Downloads
            $ wget http://www.orbbec3d.net/Tools_SDK_OpenNI/2-Linux.zip
            $ unzip 2-Linux.zip
$ cd 2-Linux
$ unzip OpenNI-Linux-x64-2.3.zip -d ~/OpenNi
$ cd ~/OpenNi/OpenNi-Linux-x64-2.3
```

- Run `install.sh` to generate OpenNIDevEnvironment, which contains OpenNI development environment

```
$ sudo chmod a+x install.sh
$ sudo ./install.sh
```

- Please replug the Orbbec Astra device for usb-register
- Add environment variables

```
$ source OpenNIDevEnvironment
```

CHAPTER 4

Examples

4.1 Windows

4.2 Linux

4.2.1 SimpleViewer

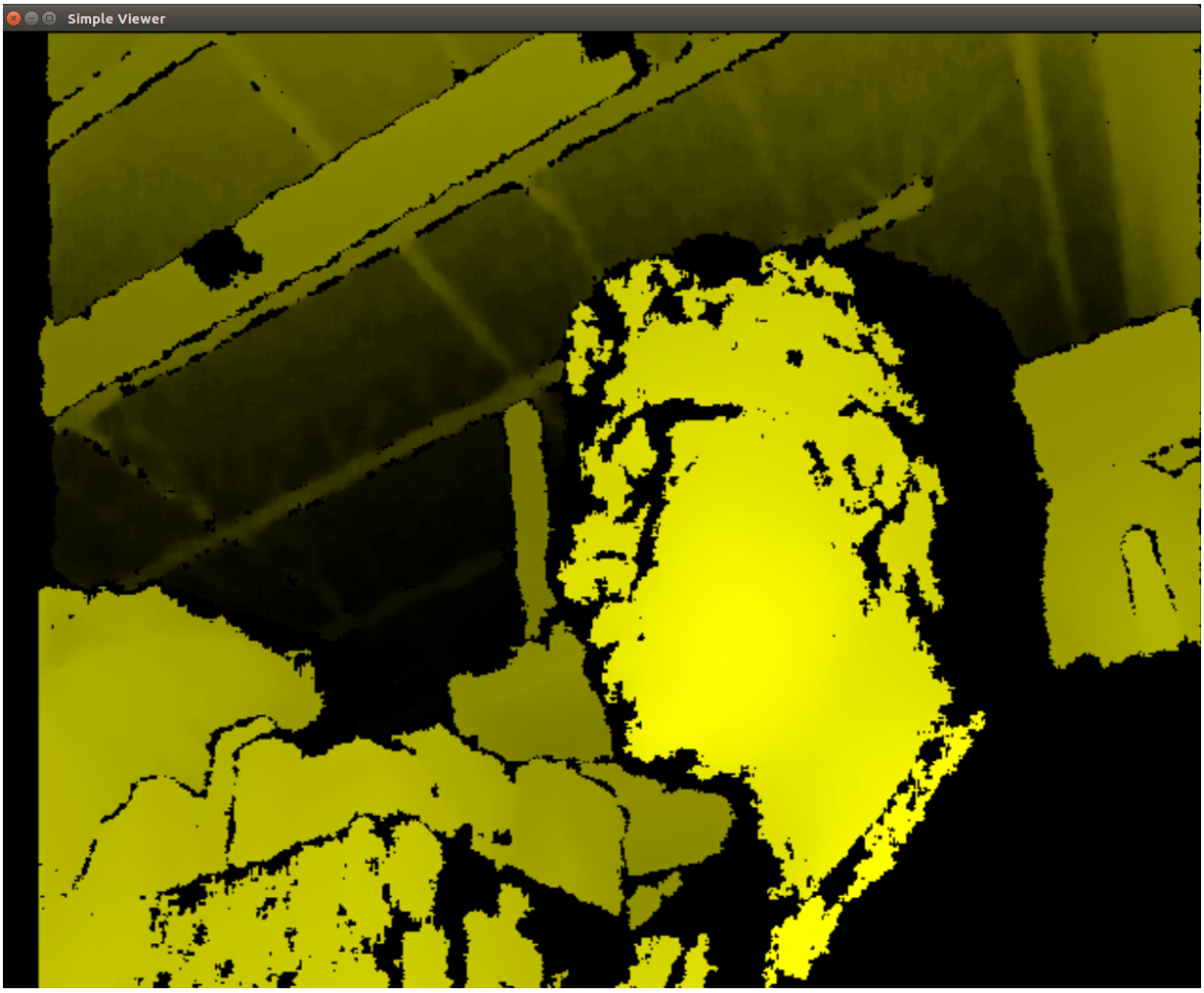
- Build sample(e.g., SimpleViewer)

```
$ cd Samples/SimpleViewer
$ make
```

- Run a sample

```
$ cd Bin/x64-Release
$ ./SimpleViewer
```

- You should now be able to see a GUI window showing the depth stream video. Here is an image showing the GUI window



4.2.2 ClosestPointViewer

- Build sample

```
$ cd Samples/ClosestPointViewer
$ make
```

- Run the sample

```
$ cd Bin/x64-Release
$ ./ClosestPointViewer
```

The gif shows the closest point (marked by red and blue points).

Note:

- If the Debian Jessie Lite is used for testing, it may require the following installation for properly start the viewer.

```
$ sudo apt-get install libgl1-mesa-dri
```

4.2.3 Depth Stream using C++

Prequisites

Libaries Used:

- OpenNI2
- PCL 1.8

Note: PCL 1.8 is not available in the Ubuntu Xenial (16.04) repositories PCL 1.7 does not have the required OpenNI2 libraries to run the Orbbec Astra with PCL 1.7 also has visualization issues due to VTK bugs, which were fixed in 1.8

Warning: This was only tested in Ubuntu 16.04 with PCL 1.8.1rc2 compiled from source and OpenNI2 provided from Structure.io

Code Example Overview

- ***openni_read.cpp***
  - Using the OpenNI2 library, open an depth camera stream and return the number of points
- ***pcd_write.cpp***
  - Using the PCL library, test writing a random point cloud to a file
- ***pcl_openni_viewer.cpp***
  - Using the PCL and OpenNI library, open and stream a depth device

  Note: The *pcl_openni_viewer.cpp* example does not work with the Orbbec Astra as you need OpenNI2

- ***pcl_openni2_viewer.cpp***
  - Using the PCL and OpenNI2 library, open and stream a depth device
- ***pcl_visualizer.cpp***
  - Using the PCL library, test generating and viewing point clouds

Setting up OpenNI2

Note: The way structure.io has their package setup, you cannot easily install it into your system. Therefore, you need to point to the directory you extracted OpenNI2 every time you want to use the code…

Reference the OpenNI2 setup earlier in this document.

Installing PCL

Note: You can use a pre-built .deb for installing on Ubuntu Xenial (16.04) from the following link: https://larrylisky.com/2016/11/03/point-cloud-library-on-ubuntu-16-04-lts/

Warning: If you go with the pre-built .deb, you will need to edit the CMAKE file in /usr/share/PCL-1.8. (TODO: see below) Also, with the pre-built .deb, you do not have openni2 PCL compatibility. :(

Install Prequisites:

```
sudo apt-get update
sudo apt-get install git build-essential linux-libc-dev
sudo apt-get install cmake cmake-gui
sudo apt-get install libusb-1.0-0-dev libusb-dev libudev-dev
sudo apt-get install mpi-default-dev openmpi-bin openmpi-common
sudo apt-get install libflann1.8 libflann-dev
sudo apt-get install libeigen3-dev
sudo apt-get install libboost-all-dev
sudo apt-get install libvtk5.10-qt4 libvtk5.10 libvtk5-dev
sudo apt-get install libqhull* libgtest-dev
sudo apt-get install freeglut3-dev pkg-config
sudo apt-get install libxmu-dev libxi-dev
sudo apt-get install mono-complete
sudo apt-get install qt-sdk openjdk-8-jdk openjdk-8-jre
```

Source OpenNI2 libraries:

```
source ~/OpenNi/OpenNi-Linux-x64-2.3/OpenNIDevEnvironment
```

Download and build PCL:

```
mkdir ~/tmp
cd ~/tmp
git clone https://github.com/PointCloudLibrary/pcl -b pcl-1.8.1rc2
cd pcl
      mkdir build
      cd build
cmake -DCMAKE_BUILD_TYPE=None -DCMAKE_INSTALL_PREFIX=/usr \
      -DBUILD_GPU=ON -DBUILD_apps=ON -DBUILD_examples=ON \
      -DCMAKE_INSTALL_PREFIX=/usr ..
      make -j4
```

Building C++ Code

```
source ~/OpenNi/OpenNi-Linux-x64-2.3/OpenNIDevEnvironment
cd /path/to/your/code/src
mkdir build
cd build
cmake ..
make -j4
```

Running C++ Examples

```
source ~/OpenNi/OpenNi-Linux-x64-2.3/OpenNIDevEnvironment
./pcd_write_test
./openni_read
./visualizer -h
./openni_viewer --help
./openni_viewer -l
./openni_viewer
```

4.2.4 Depth Stream using Python and OpenCV

You can view depth data in Python from the Orbbec Astra using the OpenNI, OpenCV, and Numpy libraries. OpenNI is used to communicate with the camera. Numpy is used to manipulate the data to be displayed in a 2D window OpenCV is used to display the manipulated depth data.

Install OpenCV-Python

```
sudo -H pip install opencv-python
```

To start, you should source the Orbbec build environment from earlier:

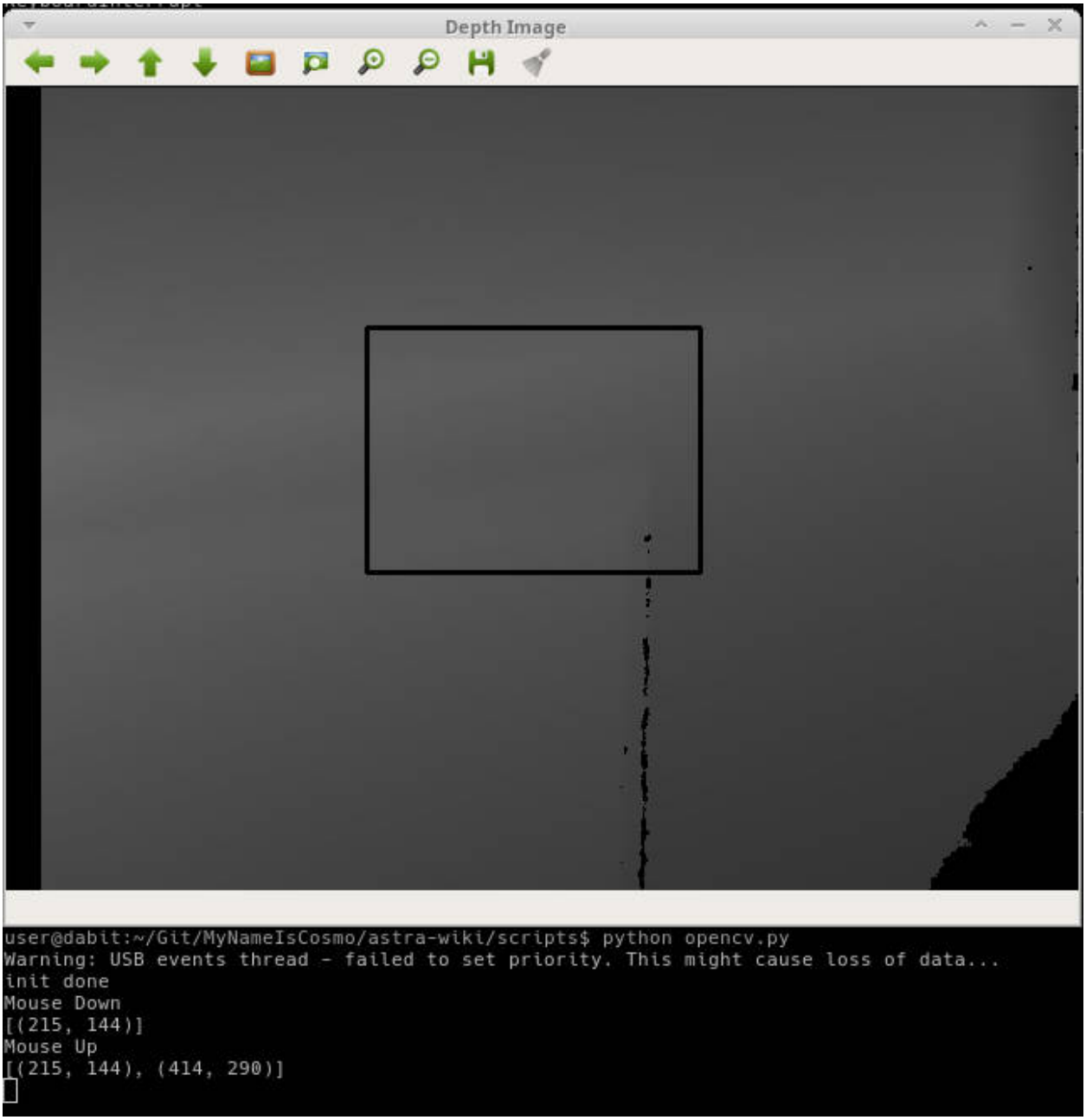
```
$ source ~/OpenNi/OpenNI-Linux-x64-2.3/OpenNIDevEnvironment
```

Now create a new Python file and put the following code in it:

```
#!/usr/bin/python
import cv2
import numpy as np
from openni import openni2
from openni import _openni2 as c_api

# Initialize the depth device
openni2.initialize()
dev = openni2.Device.open_any()

# Start the depth stream
depth_stream = dev.create_depth_stream()
depth_stream.start()
depth_stream.set_video_mode(c_api.OniVideoMode(pixelFormat = c_api.OniPixelFormat.ONI_
↪PIXEL_FORMAT_DEPTH_100_UM, resolutionX = 640, resolutionY = 480, fps = 30))

# Function to return some pixel information when the OpenCV window is clicked
refPt = []
selecting = False

def point_and_shoot(event, x, y, flags, param):
                global refPt, selecting
                if event == cv2.EVENT_LBUTTONDOWN:
                                print "Mouse Down"
                                refPt = [(x,y)]
                                selecting = True
                                print refPt
                elif event == cv2.EVENT_LBUTTONUP:
                                print "Mouse Up"
```

```
                                refPt.append((x,y))
                                selecting = False
                                print refPt

# Initial OpenCV Window Functions
cv2.namedWindow("Depth Image")
cv2.setMouseCallback("Depth Image", point_and_shoot)

# Loop
while True:
                # Grab a new depth frame
                frame = depth_stream.read_frame()
                frame_data = frame.get_buffer_as_uint16()
                # Put the depth frame into a numpy array and reshape it
                img = np.frombuffer(frame_data, dtype=np.uint16)
                img.shape = (1, 480, 640)
                img = np.concatenate((img, img, img), axis=0)
                img = np.swapaxes(img, 0, 2)
                img = np.swapaxes(img, 0, 1)

                if len(refPt) > 1:
                                img = img.copy()
                                cv2.rectangle(img, refPt[0], refPt[1], (0, 255, 0), 2)

                # Display the reshaped depth frame using OpenCV
                cv2.imshow("Depth Image", img)
                key = cv2.waitKey(1) & 0xFF

                # If the 'c' key is pressed, break the while loop
                if key == ord("c"):
                                break

# Close all windows and unload the depth device
openni2.unload()
cv2.destroyAllWindows()
```

- Run the example code and click + drag on the screen to make a "selection" box. The 2D image coordinates of the selected box are printed to the terminal.



4.2.5 Depth Stream using Python, OpenCV, pyqtgraph, and PCL

Install Prerequisites

:: conda create -n py35 python=3.5 anaconda source activate py35 conda install pyqtgraph conda install pyopengl conda install pyopengl-accelerate ~/anaconda2/envs/py35/bin/pip install opencv-python ~/anaconda2/envs/py35/bin/pip install openni

:: pip install opencv-python pip install openni pip install pyqtgraph pip install PyOpenGL conda install python-pcl sudo -H pip3 install PyQt5 sudo apt install python3-pyqt5.qtopengl python3-pyopengl

Code Setup

4.2.6 Depth Visualization using Python QT

Warning: Work in progress, incomplete.

```
sudo -H pip2 install pyqtgraph
```

4.2.7 Depth Visualization using Python PCL

Warning: Work in progress, incomplete

- Download and install Anaconda for Python 2.7
- **Install Python-PCL using Anaconda**
  - `conda install -c https://conda.anaconda.org/ccordoba12 python-pcl`