

4、 ROS+Opencv basic course

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This lesson takes the Astra camera as an example, the ordinary camera is similar.

4.1、 Overview

Wiki: http://wiki.ros.org/cv_bridge/

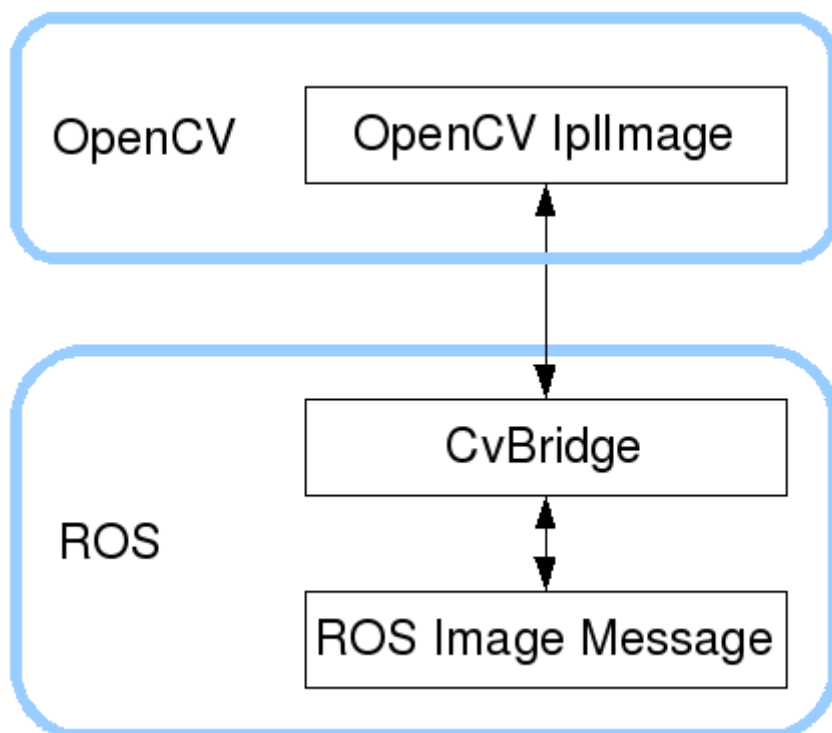
Tutorials: http://wiki.ros.org/cv_bridge/Tutorials

Source code: https://github.com/ros-perception/vision_opencv.git

Function package path: ~/transbot_ws/src/transbot_visual

【CvBridge】 is a ROS library, equivalent to a bridge between ROS and Opencv. It can perfectly convert and be converted image data format.

Opencv and ROS image data conversion is shown below:



This function package not only needs to use [CvBridge], but also needs [Opencv] and [PCL], so we need to perform the following configuration.

- package.xml

Add following content.

```
<build_depend>sensor_msgs</build_depend>
<build_export_depend>sensor_msgs</build_export_depend>
<exec_depend>sensor_msgs</exec_depend>

<build_depend>std_msgs</build_depend>
<build_export_depend>std_msgs</build_export_depend>
<exec_depend>std_msgs</exec_depend>

<build_depend>cv_bridge</build_depend>
<build_export_depend>cv_bridge</build_export_depend>
<exec_depend>cv_bridge</exec_depend>

<build_depend>transbot_msgs</build_depend>
<build_export_depend>transbot_msgs</build_export_depend>
<exec_depend>transbot_msgs</exec_depend>

<exec_depend>image_transport</exec_depend>
```

【cv_bridge】：Image conversion dependent package.

【transbot_msgs】：Custom message dependency package.

- CMakeLists.txt

This file has a lot of configuration content, please check the source file for specific content.

4.2、Astra

4.2.1、Start up Astra camera

```
roslaunch astra_camera astrapro.launch
```

View topic

```
rostopic list
```

Common topics are as follows

Topic name	Data type
/camera/depth/image_raw	sensor_msgs/Image
/camera/depth/image	sensor_msgs/Image
/camera/rgb/image_raw	sensor_msgs/Image
/camera/depth/image_raw/compressedDepth	sensor_msgs/CompressedImage
/camera/rgb/image_raw/compressed	sensor_msgs/CompressedImage

View the encoding format of the topic: rostopic echo + 【topic】 +encoding, for example

```
rostopic echo /camera/rgb/image_raw/encoding
rostopic echo /camera/depth/image_raw/encoding
```

```

yahboom@Yahboom:~$ rostopic echo /camera/rgb/image_raw/encoding
"bgr8"
---
"bgr8"
---

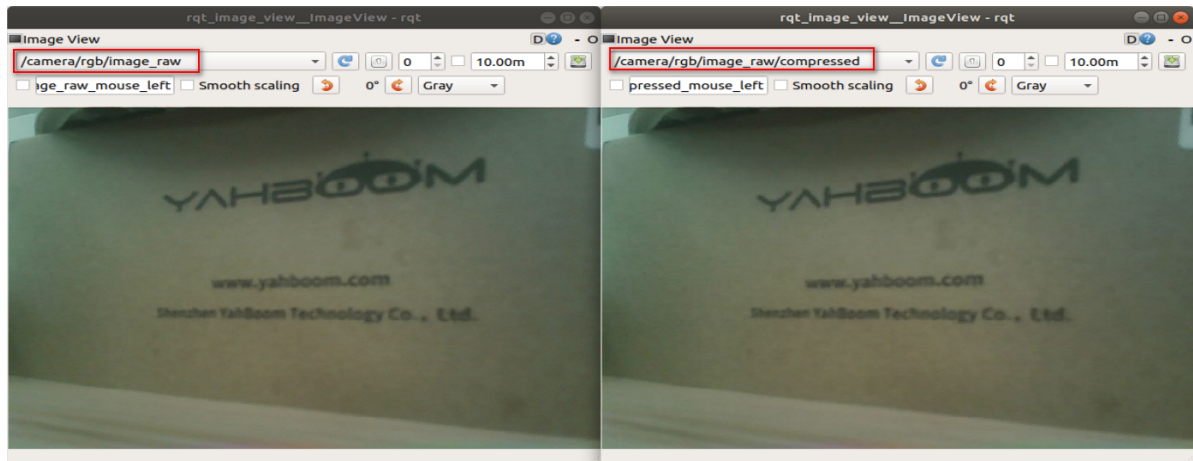
```

```

yahboom@Yahboom:~$ rostopic echo /camera/depth/image_raw/encoding
"16UC1"
---
"16UC1"
---

```

The topic with 【compressed】 or 【compressedDepth】 at the end of the topic is a compressed topic. During image transmission, ROS may cause data packet loss due to factors such as the network, main control running speed, main control running memory, and huge video stream data. Unable to get topics, so we recommend users to use compressed topics.



4.2.2、 Start the color map subscription node

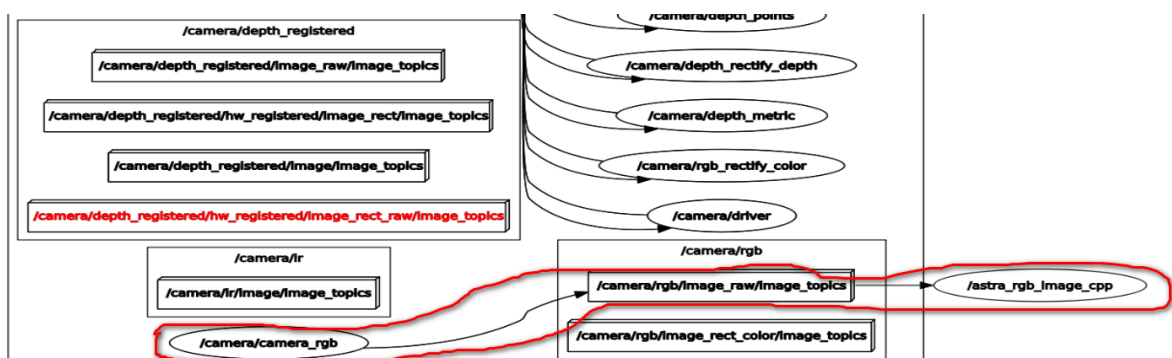
```

roslaunch transbot_visual astra_get_rgb.launch      # launch
roslaunch transbot_visual astra_rgb_image.py        # py
roslaunch transbot_visual astra_rgb_image           # C++

```

View node graph

rqt_graph



【/astra_rgb_image_cpp】 is the node we wrote.

- py code analysis

Create subscribers: The subscribed topic is 【"/camera/rgb/image_raw"】, the data type is 【Image】, and the callback function is 【topic()】

```

sub = rospy.Subscriber("/camera/rgb/image_raw", Image, topic)

```

Use `【CvBridge】` for data conversion to ensure that the encoding format is correct.

```
frame = bridge.imgmsg_to_cv2(msg, "bgr8")
```

- c++ code analysis

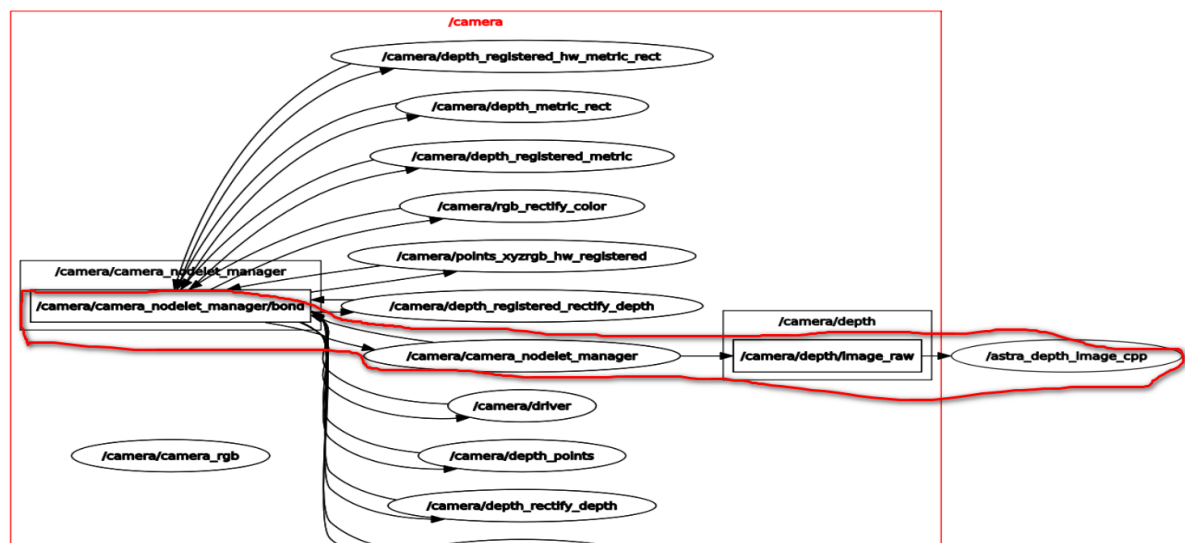
```
//Create a receiver.  
ros::Subscriber subscriber = n.subscribe<sensor_msgs::Image>  
("/camera/rgb/image_raw", 10, RGB_Callback);  
//Create cv_bridge example  
cv_bridge::CvImagePtr cv_ptr;  
//Data conversion  
cv_ptr = cv_bridge::toCvCopy(msg, sensor_msgs::image_encodings::BGR8);
```

4.2.3、Start the depth map subscription node

```
roslaunch transbot_visual astra_get_depth.launch    # launch  
roslaunch transbot_visual astra_depth_image.py      # py  
roslaunch transbot_visual astra_depth_image        # C++
```

View node graph

rqt_graph



- py code analysis

Create subscribers: The subscribed topic is `["/camera/depth/image_raw"]`, the data type is `[Image]`, and the callback function is `[topic()]`

```
sub = rospy.Subscriber("/camera/depth/image_raw", Image, topic)
```

Use `【CvBridge】` for data conversion to ensure that the encoding format is correct.

```
# Encoding format  
encoding = ['16UC1', '32FC1']  
# Can switch different encoding formats to test the effect  
frame = bridge.imgmsg_to_cv2(msg, encoding[1])
```

- c++ code analysis

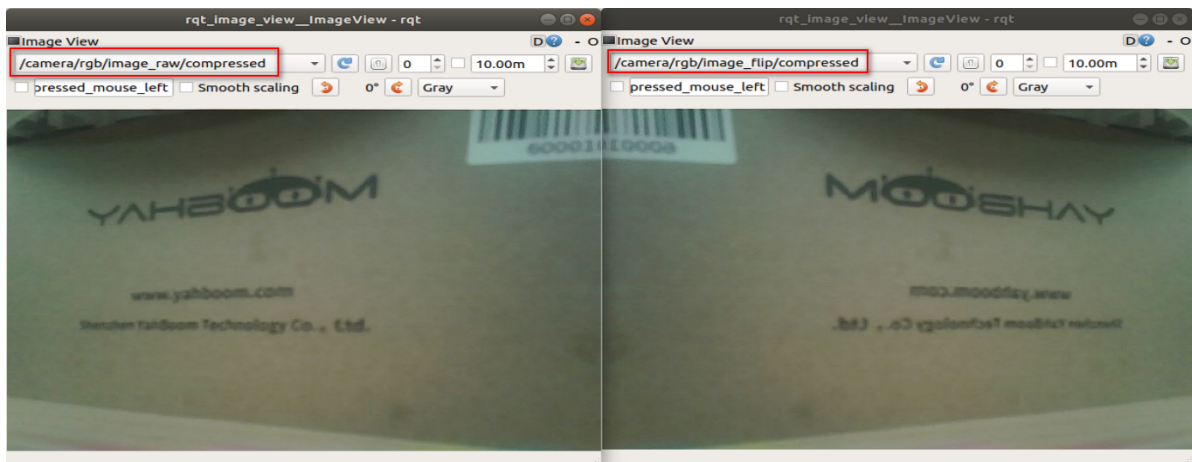
```
//Create a receiver.
ros::Subscriber subscriber = n.subscribe<sensor_msgs::Image>
("/camera/depth/image_raw", 10, depth_Callback);
//Create cv_bridge example
cv_bridge::CvImagePtr cv_ptr;
//Data conversion
cv_ptr = cv_bridge::toCvCopy(msg, sensor_msgs::image_encodings::TYPE_16UC1);
```

4.2.4, Start color image inversion

```
roslaunch transbot_visual astra_image_flip.launch    # launch
roslaunch transbot_visual astra_image_flip.py        # py
```

View node graph

rqt_image_view



- py code analysis

Two subscribers and two publishers are created here, one for processing general image data and one for processing compressed image data.

1) Create subscriber

The subscribed topic is `"/camera/rgb/image_raw"` , the data type is `Image` , and the callback function is `topic()` .

The subscribed topic is `"/camera/rgb/image_raw/compressed"` , the data type is `CompressedImage` , and the callback function is `compressed_topic()` .

2) Create publisher

The published topic is `"/camera/rgb/image_flip"` , the data type is `Image` , Queue size `10` .

The published topic is `"/camera/rgb/image_flip/compressed"` , the data type is `CompressedImage` , Queue size `10` .

```

sub_img = rospy.Subscriber("/camera/rgb/image_raw", Image, topic)
pub_img = rospy.Publisher("/camera/rgb/image_flip", Image, queue_size=10)
sub_comimg = rospy.Subscriber("/camera/rgb/image_raw/compressed",
CompressedImage, compressed_topic)
pub_comimg = rospy.Publisher("/camera/rgb/image_flip/compressed",
CompressedImage, queue_size=10)

```

3) Callback function

```

# Normally image transmission processing
def topic(msg):
    if not isinstance(msg, Image):
        return
    bridge = CvBridge()
    frame = bridge.imgmsg_to_cv2(msg, "bgr8")
    # Opencv processing image
    frame = cv.resize(frame, (640, 480))
    frame = cv.flip(frame, 1)
    # opencv mat -> ros msg
    msg = bridge.cv2_to_imgmsg(frame, "bgr8")
    # The image is processed and released directly
    pub_img.publish(msg)

# Compressed image transmission processing
def compressed_topic(msg):
    if not isinstance(msg, CompressedImage): return
    bridge = CvBridge()
    frame = bridge.compressed_imgmsg_to_cv2(msg, "bgr8")
    # Opencv processing image
    frame = cv.resize(frame, (640, 480))
    frame = cv.flip(frame, 1)
    # Create CompressedImage
    msg = CompressedImage()
    msg.header.stamp = rospy.Time.now()
    # Image data conversion
    msg.data = np.array(cv.imencode('.jpg', frame)[1]).tostring()
    # The image is processed and released directly
    pub_comimg.publish(msg)

```

4.2.5、Publish image

Start up command as following content:

```

roslaunch transbot_visual astra_to_image.launch    # launch
roslaunch transbot_visual astra_to_image.py        # py

```