2. Opencv application

2.1. Overview

OpenCV is a cross-platform computer vision and machine learning software library released under the BSD license (open source) and can run on Linux, Windows, Android and MacOS operating systems. [1] It is lightweight and efficient - it consists of a series of C functions and a small number of C++ classes. It also provides interfaces in Python, Ruby, MATLAB and other languages, and implements many aspects of image processing and computer vision. General algorithm.

2.2. QR code

2.2.1. Introduction to QR code

QR code is a type of two-dimensional barcode. QR comes from the abbreviation of "Quick Response" in English, which means quick response. It comes from the inventor's hope that the content of QR code can be decoded quickly. QR codes not only have large information capacity, high reliability, and low cost, but can also represent a variety of text information such as Chinese characters and images. They have strong confidentiality and anti-counterfeiting properties and are very easy to use. What's more important is that the QR code technology is open source.

2.2.2. Structure of QR code

图片	解析
	**定位标识**（Positioning markings）标明二维码的方向。
	**对齐标记**（Alignment markings）如果二维码很大，这些附加元素帮助定位。
	**计算模式**（Timing pattern）通过这些线，扫描器可以识别矩阵有多大。
	**版本信息**（Version information）这里指定正在使用的QR码的版本号，目前有QR码有40个不同的版本号。 用于销售行业的的版本号通常为1-7。
	**格式信息**（Format information）格式模式包含关于容错和数据掩码模式的信息，并使得扫描代码更加容易。
	**数据和错误校正值**（Data and error correction keys）这些模式保存实际数据。
	**宁静区域**（Quiet zone）这个区域对于扫描器来说非常重要，它的作用就是将自身与周边的进行分离。

2.2.3. Characteristics of QR code

The data values in the QR code contain repeated information (redundant values). Therefore, even if up to 30% of the QR code structure is destroyed, the readability of the QR code is not affected. The storage space of QR code is up to 7089 bits or 4296 characters, including punctuation marks and special characters, which can be written into QR code. In addition to numbers and characters, words and phrases (such as web addresses) can also be encoded. As more data is added to the QR code, the code size increases and the code structure becomes more complex.

2.2.4. QR code creation and recognition

Install the relevant environment (the supporting virtual machine has already set up the environment)

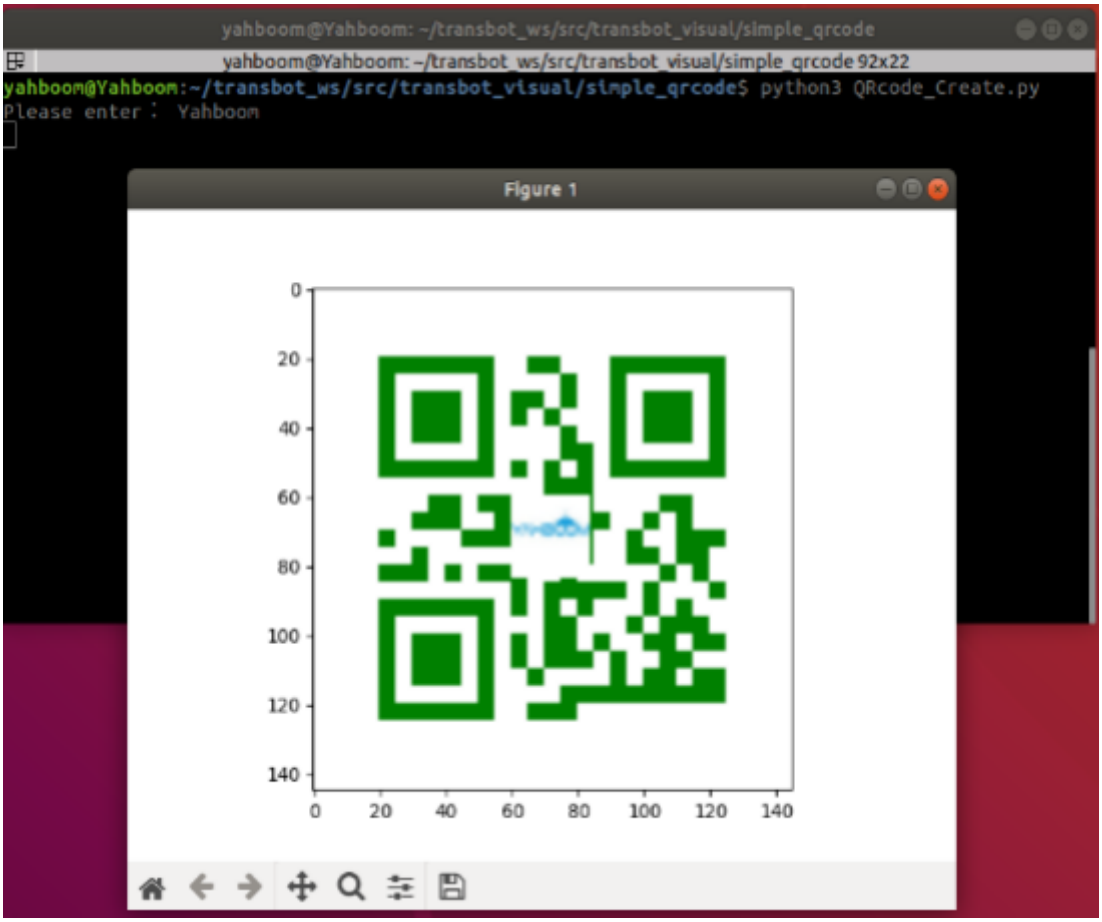
```
python3 -m pip install qrcode pyzbar
sudo apt-get install libzbar-dev
```

- create

  Source code location: ~/orbbec_ws/src/astra_visual/qrcode/QRcode_Create.py

```
cd ~/orbbec_ws/src/astra_visual/qrcode
pythonQRcode_Create.py
```

Enter the content to be generated in the terminal and press Enter to confirm.



- Identify

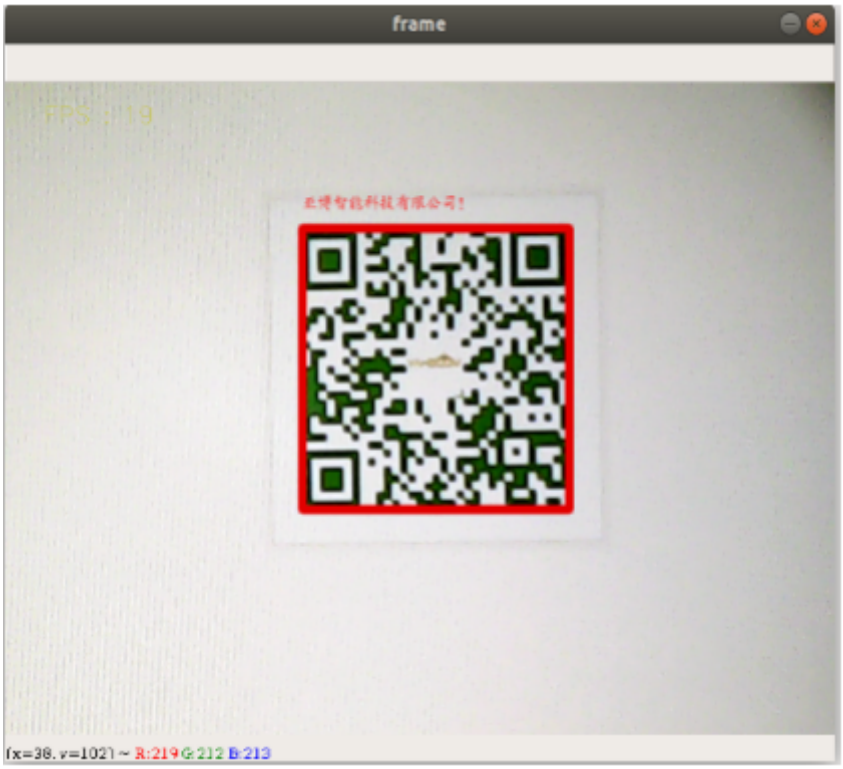
  Source code location: ~/orbbec_ws/src/astra_visual/qrcode/QRcode_Parsing.py

```
cd ~/orbbec_ws/src/astra_visual/qrcode
pythonQRcode_Parsing.py
```

If the following situation occurs, re-plug the camera and run again.

```
yahboom@yahboom-virtual-machine:~/orbbec_ws/src/astra_visual/qrcode$ python QRco
de_Parsing.py
[ WARN:0@0.533] global cap_v4l.cpp:982 open VIDEOIO(V4L2:/dev/video0): can't ope
n camera by index
[ERROR:0@0.534] global obsensor_uvc_stream_channel.cpp:156 getStreamChannelGroup
 Camera index out of range
capture get FPS :  0.0
```

After normal startup, place the QR code in front of the camera. After the QR code is recognized, the QR code will be framed and the content of the QR code will be printed out.


frame
FPS :19
(x=38, y=102) ~ R:219 G:212 B:213