7. Discrete Fourier Transform Algorithm

Fourier transform can decompose an image into two components, sine and cosine. In other words, it can transform an image from its spatial domain to the frequency domain. The idea of this transformation is that any function can be very accurate to the sum of an infinite number of sin() and cos() functions. Fourier transform provides a way to achieve this effect.

For discrete signals such as digital images, the frequency indicates the intensity of the signal change or the speed of the signal change. The larger the frequency, the more drastic the change, and the smaller the frequency, the smoother the signal. Corresponding to the image, high-frequency signals are often edge signals and noise signals in the image, while low-frequency signals include image contours and background signals with frequent image changes

7.1.1, Use

Source launch file path: ~/opt/ros/noetic/share/opencv_apps/launch

Step 1: Start the camera

```
roslaunch ascam_visual opencv_apps.launch img_flip:=false
```

- img_flip parameter: whether the image needs to be flipped horizontally, the default is false.

The [usb_cam-test.launch] file opens the [web_video_server] node by default, and you can directly use the [IP:8080] web page to view the image in real time.

Step 2: Start the discrete Fourier transform function of Opencv_apps

```
roslaunch opencv_apps discrete_fourier_transform.launch # Discrete Fourier
transform algorithm
```

Each function case will have a parameter [debug_view], Boolean type, whether to use Opencv to display the image, the default is displayed.

If you do not need to display, set it to [False], for example

```
roslaunch opencv_apps discrete_fourier_transform.launch debug_view:=False
```

However, after starting in this way, some cases may not be displayed in other ways, because in the source code, some [debug_view] is set to [False], which will turn off the image processing.

7.1.2, Display method

- rqt_image_view

Enter the following command and select the corresponding topic

```
rqt_image_view
```

- opencv

The system displays by default, no processing is required.

- Web page viewing

(Under the same LAN) Enter IP+port in the browser, for example:

```
192.168.2.116:8080
```

For specific IP, use your current virtual machine IP.

7.1.3, Effect display

The right side is the picture after Fourier transform algorithm