

3. Picture shift

Convert the original image *src* to the target image *dst* by the conversion matrix *M*:

$$\text{dst}(x, y) = \text{src}(M_{11}x + M_{12}y + M_{13}, M_{21}x + M_{22}y + M_{23})$$

Moving the original image *src* 200 pixels to the right and 100 pixels to down, the corresponding relationship is:

$$\text{dst}(x, y) = \text{src}(x+200, y+100)$$

Complete the above expression according to the formula, as shown below.

$$\text{dst}(x, y) = \text{src}(1 \cdot x + 0 \cdot y + 200, 0 \cdot x + 1 \cdot y + 100)$$

According to the above expression, we can determine the value of each element in the corresponding conversion matrix *M*, as shown below.

$$M_{11}=1$$

$$M_{12}=0$$

$$M_{13}=200$$

$$M_{21}=0$$

$$M_{22}=1$$

$$M_{23}=100$$

Substituting the above values into the transformation matrix *M*, we can get,

$$M = \begin{bmatrix} 1 & 0 & 200 \\ 0 & 1 & 100 \end{bmatrix}$$

Next, we directly use the conversion matrix *M* to call the function **cv2.warpAffine ()** to complete the translation of the image.

Code path:

```
import cv2

import numpy as np

img = cv2.imread('yahboom.jpg',1)

#cv2.imshow('src',img)

imgInfo = img.shape

height = imgInfo[0]

width = imgInfo[1]

####
```

```

matShift = np.float32([[1,0,200],[0,1,100]])# 2*3

dst = cv2.warpAffine(img, matShift, (height, width))    #1 data 2 mat 3 info

# Shift matrix

# cv2.imshow('dst',dst)

# cv2.waitKey(0)

```

After running the following program, two images will be displayed in the jupyterLab control interface, that is original image and the translated image.

```

#bgr 8 to jpeg format

import enum

import cv2

def bgr8_to_jpeg(value, quality=75):

    return bytes(cv2.imencode('.jpg', value)[1])

import ipywidgets.widgets as widgets

image_widget1 = widgets.Image(format='jpg', )

image_widget2 = widgets.Image(format='jpg', )

# create a horizontal box container to place the image widget next to eachother

image_container = widgets.HBox([image_widget1, image_widget2])

# display the container in this cell's output

```

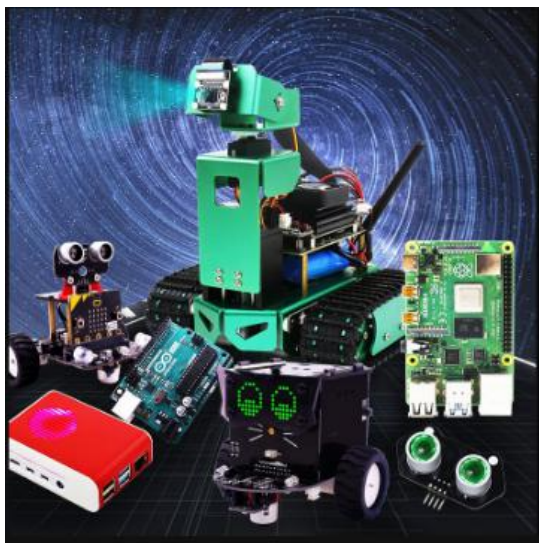
```
display(image_container)

#display(image_widget2)

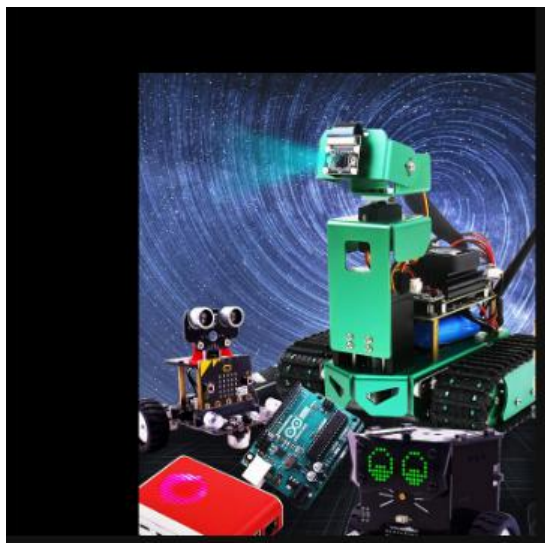
img1 = cv2.imread('yahboom.jpg',1)

image_widget1.value = bgr8_to_jpeg(img1)

image_widget2.value = bgr8_to_jpeg(dst)
```



[Original picture]



[Shift picture]

According to the above picture, this picture has moved to the lower right corner (200, 100).