1、完成课本习题3.2(a)(b), 课本中文版《处理》第二版的113页。可以通过matlab帮助你分析理解。

(a)对比度拉伸的转化函数为:

$$s = T(r) = \frac{1}{1 + (m/r)^E}$$

(b)固定阈值m为灰度级的一半即128，改变参数E的大小查看效果变化:

In [1]:

```
from matplotlib import pyplot as plt
import numpy as np
import cv2

img = cv2.imread("test.jpg",1)
b, g, r = cv2.split(img)
image_new = cv2.merge([r, g, b])
plt.imshow(image_new)
```

Out[1]:

<matplotlib.image.AxesImage at 0x217903e7940>

对比度拉伸函数

In [2]:

```
def contrast_stretch(image, m, E):
    img_gray = cv2.cvtColor(image,cv2.COLOR_RGB2GRAY)
    output = 1 / (1 + pow((m / img_gray), E))
    return output
```

In [3]:

```
fig = plt.figure(figsize=(15, 10))
rows = 1
columns = 5

result1 = contrast_stretch(img,128,0.5)
result2 = contrast_stretch(img,128,1)
result3 = contrast_stretch(img,128,2)
result4 = contrast_stretch(img,128,4)
result5 = contrast_stretch(img,128,8)

fig.add_subplot(rows, columns, 1)
plt.imshow(result1,cmap="gray")
plt.axis('off')
plt.title("E=0.5")

fig.add_subplot(rows, columns, 2)
plt.imshow(result2,cmap="gray")
plt.axis('off')
plt.title("E=1")

fig.add_subplot(rows, columns, 3)
plt.imshow(result3,cmap="gray")
plt.axis('off')
plt.title("E=2")

fig.add_subplot(rows, columns, 4)
plt.imshow(result4,cmap="gray")
plt.axis('off')
plt.title("E=4")

fig.add_subplot(rows, columns, 5)
plt.imshow(result5,cmap="gray")
plt.axis('off')
plt.title("E=8")
plt.show()
```

```
C:\Users\Ashmore\AppData\Local\Temp/ipykernel_16968/1630898704.py:3: RuntimeWarning:
divide by zero encountered in true_divide
  output = 1 / (1 + pow((m / img_gray), E))
```