Question Description

Write a program to plot the diffraction pattern of a triangular aperture. It should use Fraunhofer approximation and the Fourier transform.

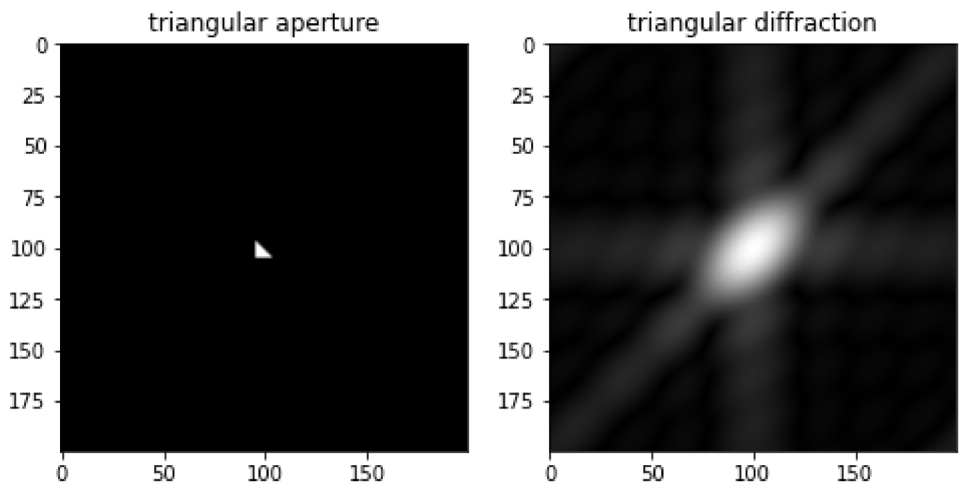
Answer

In [1]:
```
# import the libs
import numpy as np
import matplotlib.pyplot as plt
import math
from numpy.fft import fft2
```

In [2]:
```
def get_shape(img_):
    h, w = img_.shape
    for i in range(h):
        for j in range(w):
            img[i][j] = 255 if (95 < i < 105 and 95 < j < i) else 0

            # Increase the contrast between light and dark
            img[i][j] = img[i][j] * math.pow(-1, i + j)
```

In [3]:
```
def draw_shape(img_, shape):
    get_shape(img_)

    ax1 = fig.add_subplot(121)
    ax1.imshow(np.abs(img_), cmap='gray')
    ax1.set_title('{} aperture'.format(shape))

    ax2 = fig.add_subplot(122)
    img_ = fft2(img_)
    ax2.imshow(np.abs(img_), cmap='gray')
    ax2.set_title('{} diffraction'.format(shape))
```

In [4]:
```
if __name__ == '__main__':
    fig = plt.figure(figsize=(8, 4))
    img = np.zeros((200, 200))

    shape = 'triangular'
    draw_shape(img, shape)

    fig.suptitle('Diffraction pattern of a {} aperture'.format(shape), fontsize=14)
    plt.savefig('Q5_Diffraction pattern of a {} aperture'.format(shape))
    plt.show()
```


Diffraction pattern of a triangular aperture
triangular aperture
triangular diffraction
0
25
50
75
100
125
150
175
0
50
100
150