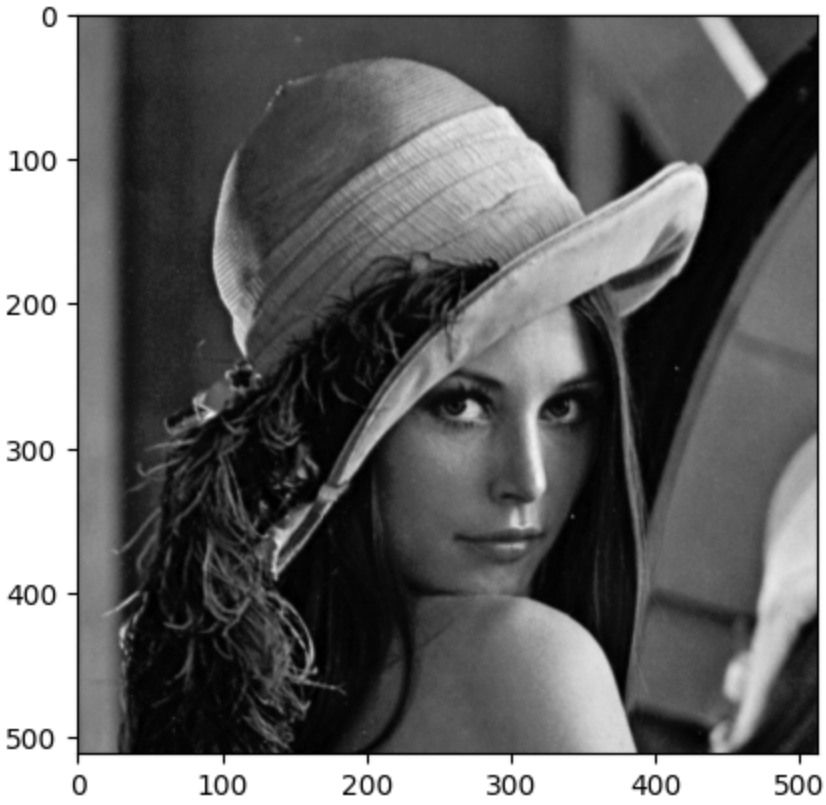
In [4]:
```
import cv2
import numpy as np
import matplotlib.pyplot as plt
from io import BytesIO
from PIL import Image
from google.colab.patches import cv2_imshow
from google.colab import files
# uploaded = files.upload()
```

In [5]:
```
img = cv2.imread('lena_gray.tif')
img = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
plt.imshow(img,cmap=plt.cm.gray)
```

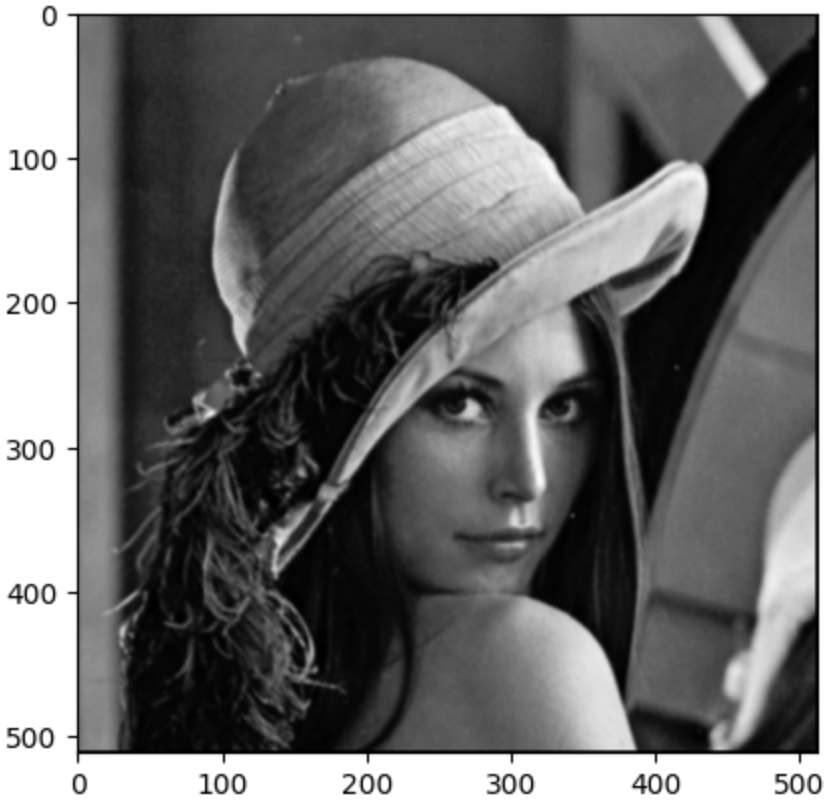
Out[5]: <matplotlib.image.AxesImage at 0x785b60a40490>




In [6]:
```
[m,n] = img.shape;

m,n

#mask = np.ones([3, 3], dtype = int)
mask = np.array([[1,2,1],[2,4,2],[1,2,1]])
mask = mask / 16

#Rmask=np.array([[1,0],[0,-1]])
mask

img_new = np.zeros([m, n])

img_new
```

```
for i in range(1, m-1):
  for j in range(1, n-1):
    temp = img[i-1, j-1]*mask[0, 0]+img[i-1, j]*mask[0, 1]+img[i-1, j + 1]*mask[0,
    img_new[i, j]= temp

img_new = img_new.astype(np.uint8)
plt.imshow(img_new,cmap=plt.cm.gray)

img_new
```

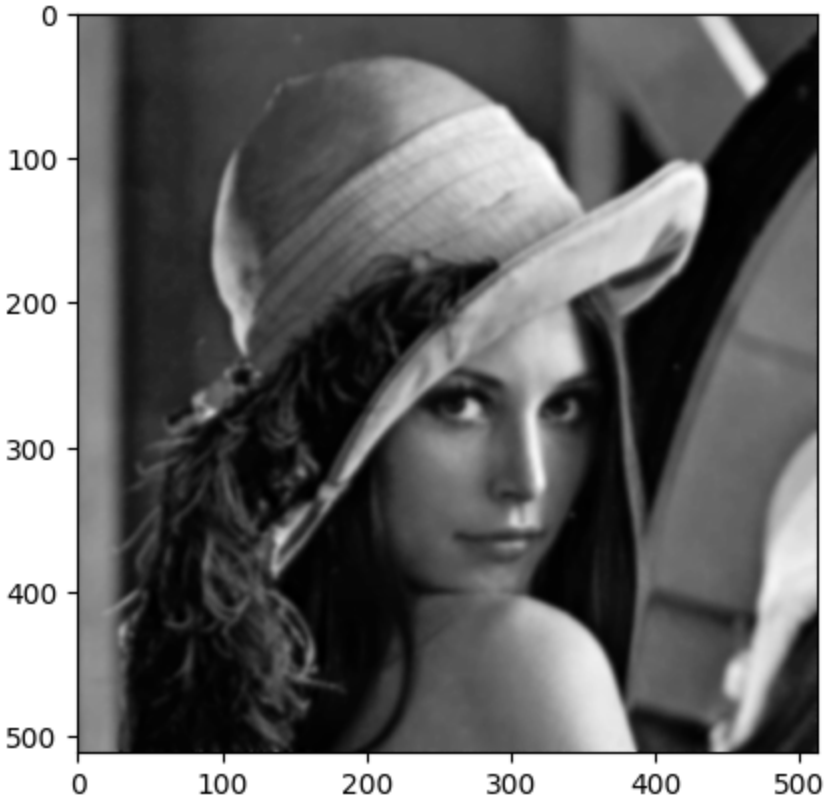
Out[6]:
```
array([[  0,   0,   0, ...,   0,   0,   0],
       [  0, 105, 106, ...,  59,  59,   0],
       [  0, 106, 106, ...,  59,  59,   0],
       ...,
       [  0,  96, 102, ...,  19,  23,   0],
       [  0,  95, 100, ...,  21,  26,   0],
       [  0,   0,   0, ...,   0,   0,   0]], dtype=uint8)
```




In [7]:
```
[m,n] = img.shape;

m,n

#mask = np.ones([3, 3], dtype = int)
mask=np.array([[1,2,1],[2,4,2],[1,2,1]])
mask = mask / 16

#Rmask=np.array([[1,0],[0,-1]])
mask

img1=img
```

```
for c in range(1,5):
  for i in range(1, m-1):
    for j in range(1, n-1):
      temp = img1[i-1, j-1]*mask[0, 0]+img1[i-1, j]*mask[0, 1]+img1[i-1, j + 1]*mas
      img1[i, j]= temp
img1 = img1.astype(np.uint8)
plt.imshow(img1,cmap=plt.cm.gray)

img1
```

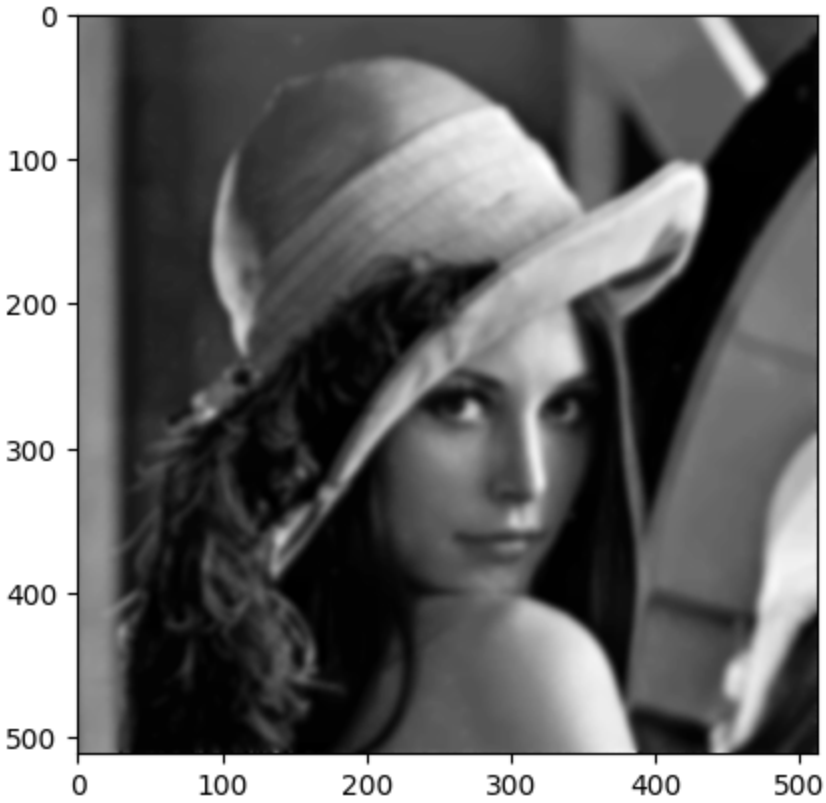
Out[7]:
```
array([[105, 105, 106, ...,  60,  59,  59],
       [106, 105, 105, ...,  58,  59,  60],
       [106, 104, 104, ...,  58,  59,  60],
       ...,
       [ 89,  93,  98, ...,  20,  24,  30],
       [ 88,  94,  99, ...,  23,  28,  32],
       [ 89,  98, 101, ...,  28,  34,  39]], dtype=uint8)
```




In [8]:
```
[m,n] = img.shape;

m,n

#mask = np.ones([3, 3], dtype = int)
mask=np.array([[1,2,1],[2,4,2],[1,2,1]])
mask = mask / 16
img3 = cv2.imread('lena-gray.jpg')

#Rmask=np.array([[1,0],[0,-1]])
mask
```

```
img2=img1


for c in range(1,5):
  for i in range(1, m-1):
    for j in range(1, n-1):
      temp = img2[i-1, j-1]*mask[0, 0]+img2[i-1, j]*mask[0, 1]+img2[i-1, j + 1]*mas
      img2[i, j]= temp
img2 = img2.astype(np.uint8)
plt.imshow(img1,cmap=plt.cm.gray)

img2
```

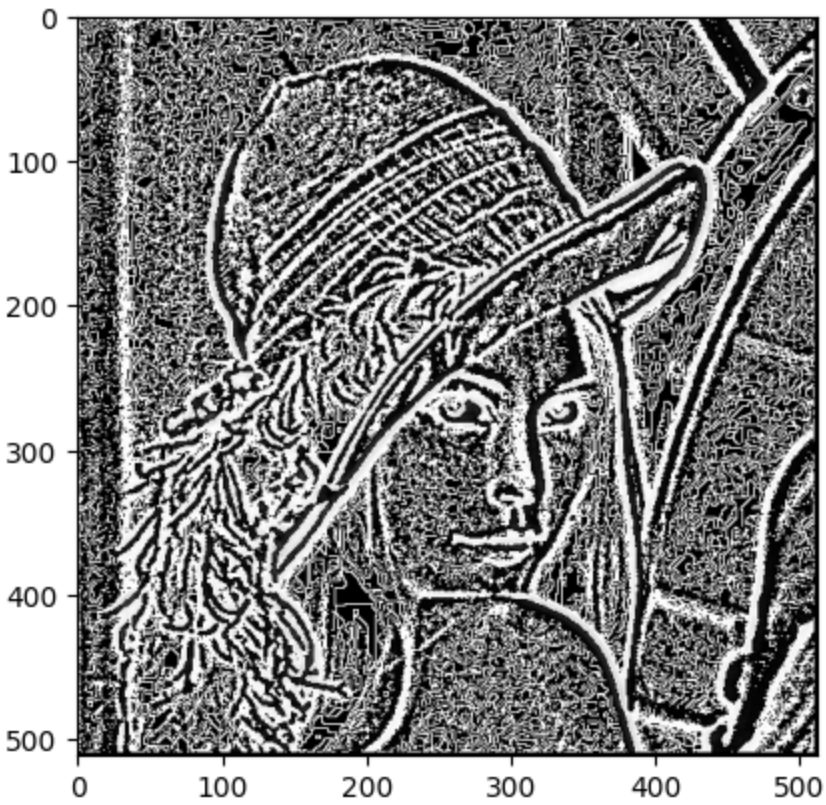
Out[8]:
```
array([[105, 105, 106, ...,  60,  59,  59],
       [106, 104, 104, ...,  58,  59,  60],
       [106, 104, 103, ...,  58,  59,  60],
       ...,
       [ 89,  92,  96, ...,  20,  24,  30],
       [ 88,  93,  98, ...,  23,  28,  32],
       [ 89,  98, 101, ...,  28,  34,  39]], dtype=uint8)
```




In [9]:
```
[m,n] = img.shape;

m,n

#mask = np.ones([3, 3], dtype = int)
mask=np.array([[-1,-1,-1],[-1,8,-1],[-1,-1,-1]])

#Rmask=np.array([[1,0],[0,-1]])
mask
```

```
img_new = np.zeros([m, n])

img_new

for i in range(1, m-2):
  for j in range(1, n-2):
    temp = img[i-1, j-1]*mask[0, 0]+img[i-1, j]*mask[0, 1]+img[i-1, j + 1]*mask[0,
    img_new[i, j]= temp
img_new = img_new.astype(np.uint8)
plt.imshow(img_new,cmap=plt.cm.gray)

img_new
```

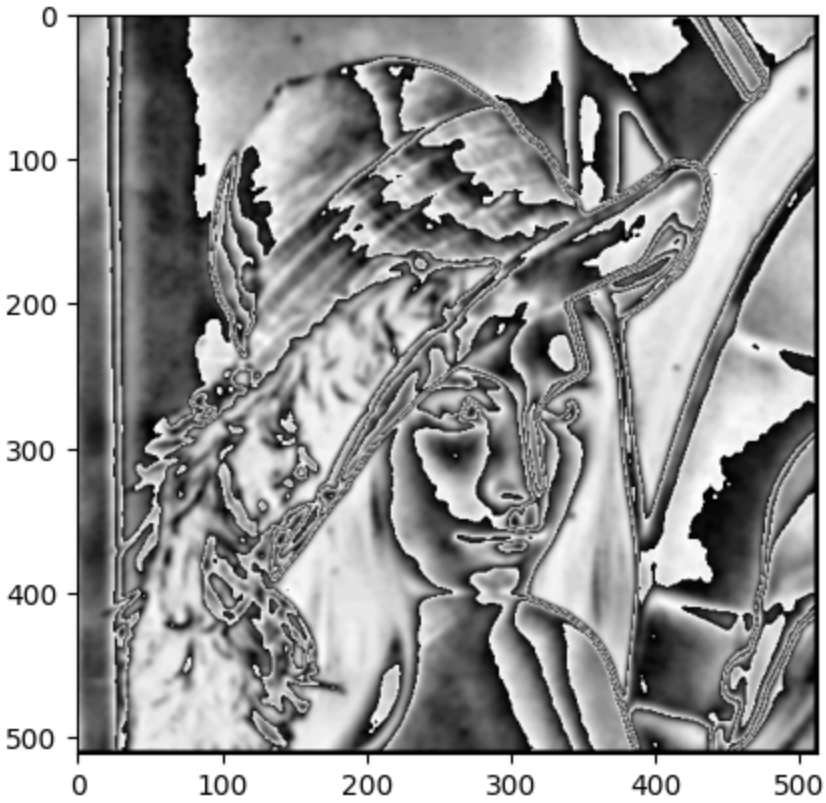
Out[9]:
```
array([[  0,   0,   0, ...,   0,   0,   0],
       [  0, 255,   3, ..., 250,   0,   0],
       [  0, 251,   2, ..., 255,   0,   0],
       ...,
       [  0,   0,   1, ..., 251,   0,   0],
       [  0,   0,   0, ...,   0,   0,   0],
       [  0,   0,   0, ...,   0,   0,   0]], dtype=uint8)
```




In [10]:
```
[m,n] = img.shape;

m,n

#mask = np.ones([3, 3], dtype = int)
mask=np.array([[-1,0,-1],[-1,0,-1],[-1,0,-1]])

#Rmask=np.array([[1,0],[0,-1]])
mask
```

```
img_new = np.zeros([m, n])

img_new

for i in range(1, m-2):
  for j in range(1, n-2):
    temp = img[i-1, j-1]*mask[0, 0]+img[i-1, j]*mask[0, 1]+img[i-1, j + 1]*mask[0,
    img_new[i, j]= temp
img_new = img_new.astype(np.uint8)
plt.imshow(img_new,cmap=plt.cm.gray)

img_new
```

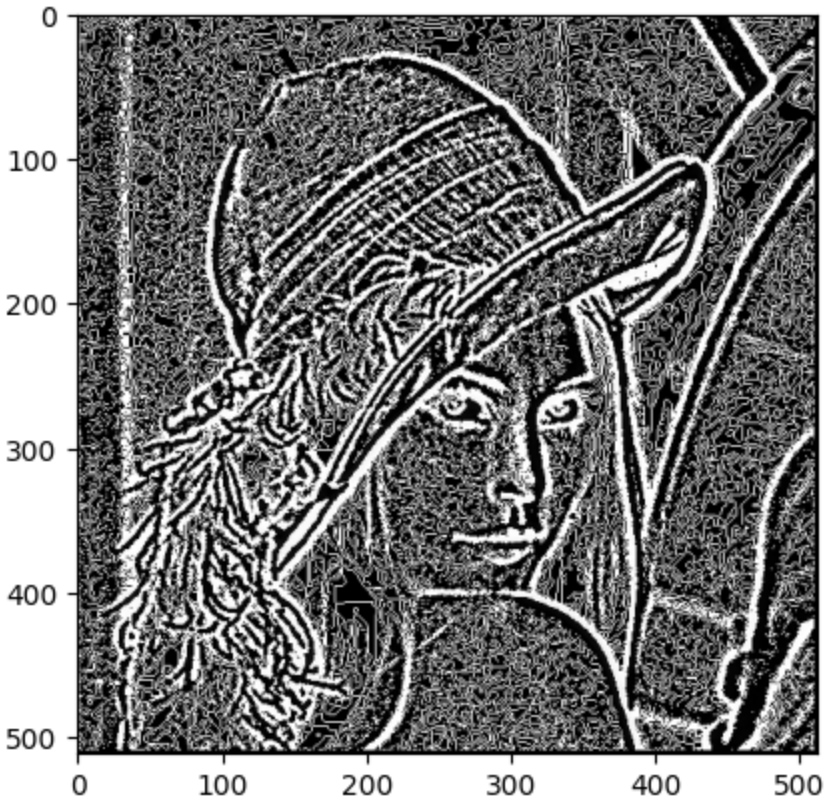
Out[10]:
```
array([[  0,   0,   0, ...,   0,   0,   0],
       [  0, 136, 141, ..., 160,   0,   0],
       [  0, 139, 146, ..., 163,   0,   0],
       ...,
       [  0, 210, 181, ..., 132,   0,   0],
       [  0,   0,   0, ...,   0,   0,   0],
       [  0,   0,   0, ...,   0,   0,   0]], dtype=uint8)
```




In [11]:
```
[m,n] = img.shape;

m,n

#mask = np.ones([3, 3], dtype = int)
mask=np.array([[0,-1,0],[-1,4,-1],[0,-1,0]])

#Rmask=np.array([[1,0],[0,-1]])
mask
```

```
img_new = np.zeros([m, n])

img_new

for i in range(1, m-2):
  for j in range(1, n-2):
    temp = img[i-1, j-1]*mask[0, 0]+img[i-1, j]*mask[0, 1]+img[i-1, j + 1]*mask[0,
    img_new[i, j]= temp
img_new = img_new.astype(np.uint8)
plt.imshow(img_new,cmap=plt.cm.gray)

img_new
```

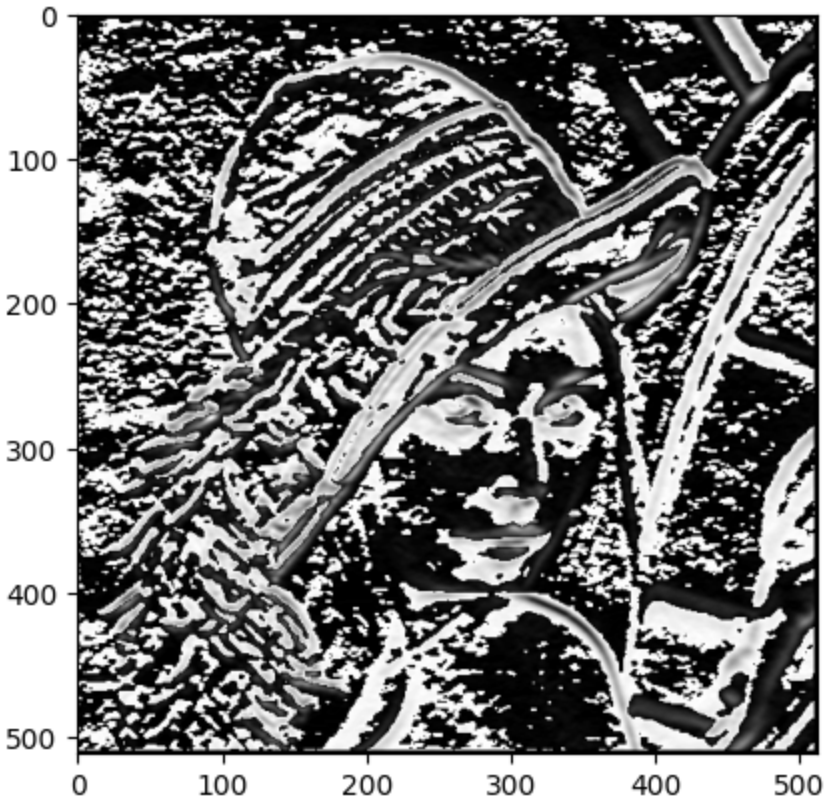
Out[11]:
```
array([[  0,   0,   0, ...,   0,   0,   0],
       [  0,   0,   1, ..., 253,   0,   0],
       [  0, 254,   1, ...,   0,   0,   0],
       ...,
       [  0, 255,   1, ..., 255,   0,   0],
       [  0,   0,   0, ...,   0,   0,   0],
       [  0,   0,   0, ...,   0,   0,   0]], dtype=uint8)
```




In [12]:
```
[m,n] = img.shape;

m,n

#mask = np.ones([3, 3], dtype = int)
mask=np.array([[1,2,1],[0,0,0],[-1,-2,-1]])

#Rmask=np.array([[1,0],[0,-1]])
mask
```

```
img_new = np.zeros([m, n])

img_new

for i in range(1, m-2):
  for j in range(1, n-2):
    temp = img[i-1, j-1]*mask[0, 0]+img[i-1, j]*mask[0, 1]+img[i-1, j + 1]*mask[0,
    img_new[i, j]= temp
img_new = img_new.astype(np.uint8)
plt.imshow(img_new,cmap=plt.cm.gray)

img_new
```

Out[12]:
```
array([[  0,   0,   0, ...,   0,   0,   0],
       [  0,   3,   8, ...,   7,   0,   0],
       [  0,   7,   7, ...,   1,   0,   0],
       ...,
       [  0, 249, 248, ..., 236,   0,   0],
       [  0,   0,   0, ...,   0,   0,   0],
       [  0,   0,   0, ...,   0,   0,   0]], dtype=uint8)
```

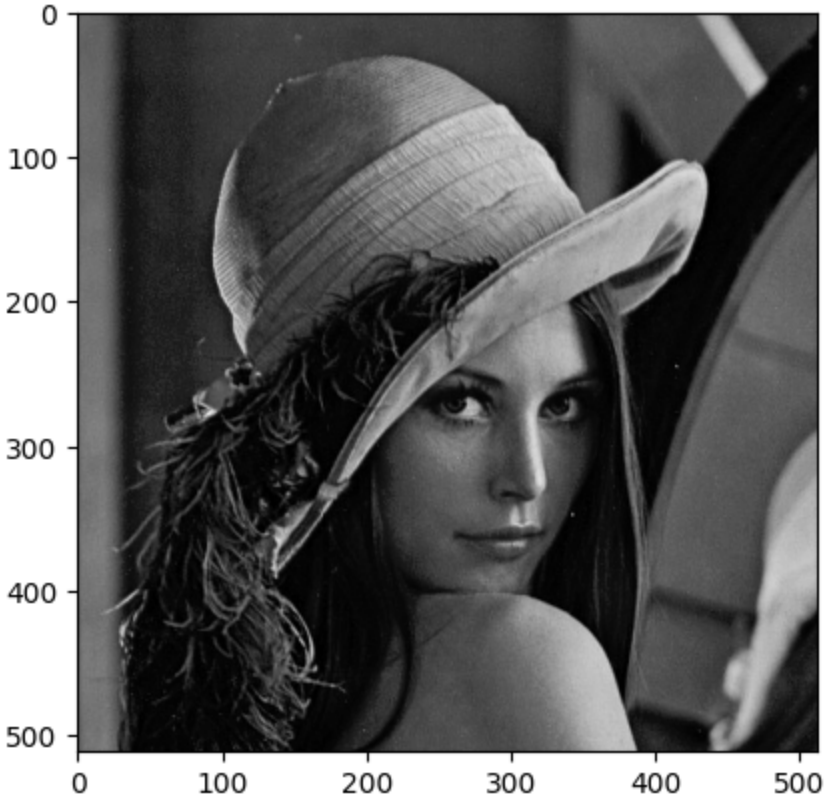



In [15]:
```
hb=0.9*img+0.5*img_new
hb
cv2_imshow(hb)
```

In [16]:
```
cv2_imshow(img3)
```

In [17]:
```
import cv2

# Load the image
image = cv2.imread("lena_gray.tif")
# Blur the image
gauss = cv2.GaussianBlur(image, (3,3), 0)
# Apply Unsharp masking
unsharp_image = cv2.addWeighted(image, 2, gauss, -1, 0)
plt.imshow(unsharp_image)
```

Out[17]:
```
<matplotlib.image.AxesImage at 0x785b52db4850>
```


0
100
200
300
400
500
0
100
200
300
400
500