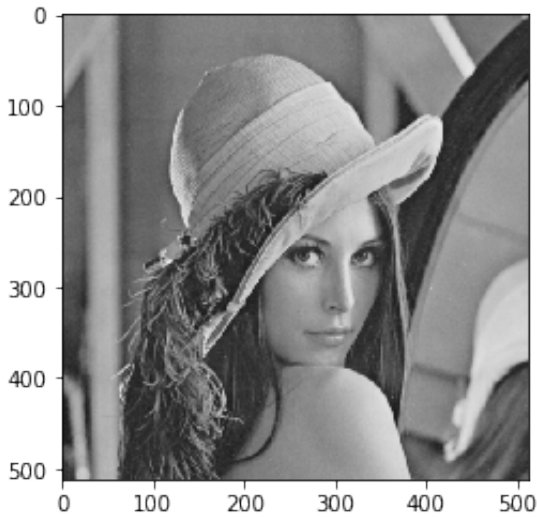


input the image same as last hw

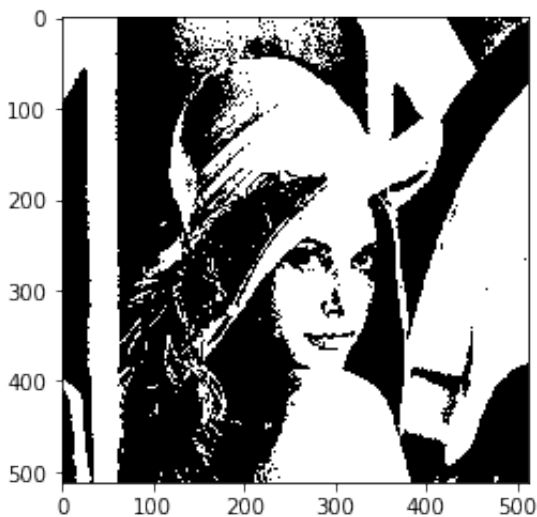
<matplotlib.image.AxesImage at 0x10f3d86d8>



A binary image (threshold at 128)

Set the threshold as 128, means gray graph with pixels under 128 are written as 0(black) and pixels with value higher or equal to 128 are written 255(white)

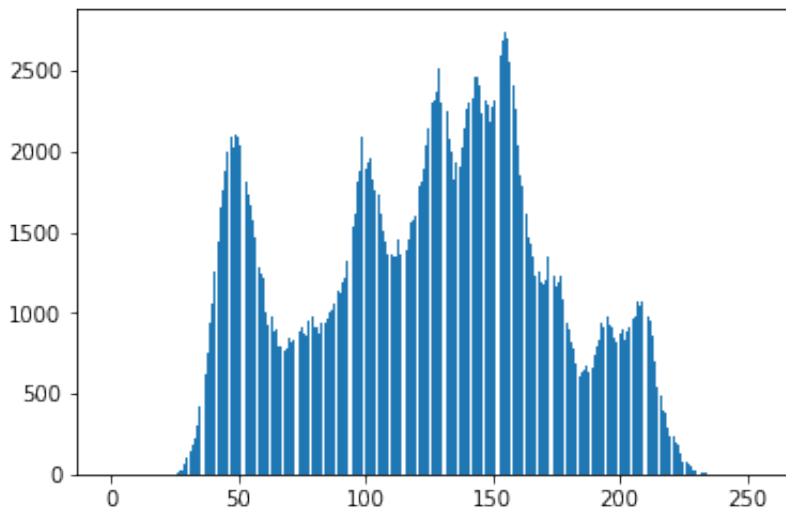
<matplotlib.image.AxesImage at 0x15293dd30>



a histogram

Set up a list of len 256 each number can represent the frequency of each color palettes

<BarContainer object of 256 artists>



connected components (regions with + at centroid, bounding box)

**First change the array into 0/1 format
And I choice the four connected and the forth algorithm**

set up of test matrix

```
lx=[] h,w=8,8 bi_array=np.random.randint(2, size=(8, 8)) + np.random.randint(2, size=(8, 8))
bi_array[bi_array>=1]=1 bi_array=bi_array.tolist() bi_array
```

set up of the matrix in test book

```
lx=[] h,w=5,5 bi_array=[[1,1,0,1,1], [1,1,0,0,1], [1,1,1,0,1], [0,0,0,0,0], [0,1,1,1,1]]
```

Set a matrix like this

so search from left to right ,the continue color palette as a block in one line , storage in list format

	ROW	START_COL	END_COL	PERM_LABEL
1	1	1	2	0
2	1	4	5	0
3	2	1	2	0
4	2	5	5	0
5	3	1	3	0
6	3	5	5	0
7	5	2	5	0

```
[[ 1  0  0 60  0]
 [ 2  0 121 122  0]
 [ 3  0 126 134  0]
 ...
 [7151 511 423 431  0]
 [7152 511 472 472  0]
 [7153 511 474 476  0]]
```

the matrix showed above

some thing different is i set the start col as 0

not 1 as the picture download from the text book

up side down search

for the first line each give a seperate group number

 when in move into second line then give a group number first

 and if overlapped

 replace bigger one by smaller group number

sudu :

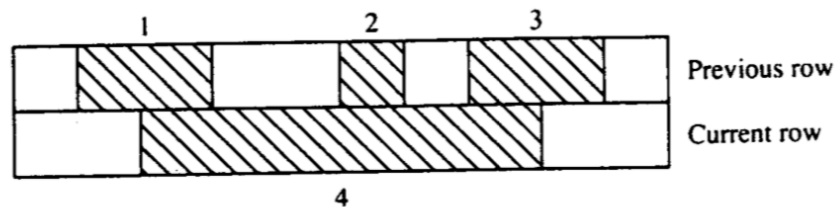
if row_number !=last row :

new line begin

reset blocks contained in line

if in line :

than compare the block with the upper line



set 1,2,3 first

set 4

and compare 4 to 1,2,3

then $4 < -1$

then $2 < -4(1)$

then $3 < -4(1)$

```
[[ 1  0  0 60  1]
 [ 2  0 121 122  2]
 [ 3  0 126 134  3]
 ...
 [7151 511 423 431 1185]
 [7152 511 472 472 1202]
 [7153 511 474 476 1187]]
```

A down to up search is needed

under this situation in the double check

you find that if it is a shape of V (if the third line is linked by the upper is not it will not show the same group number)

so this down to up search is needed

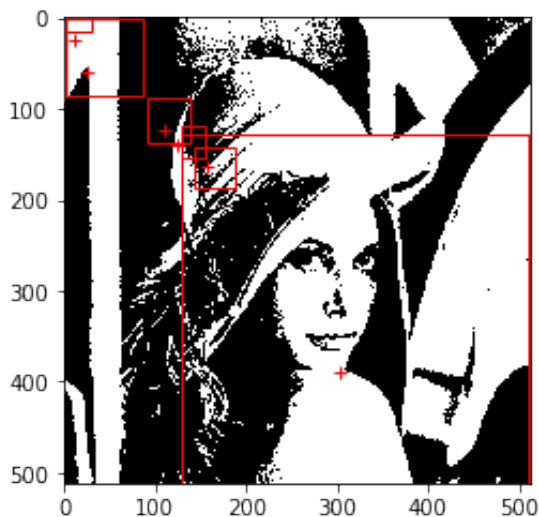
that when the after line change the upper lines

the most upper ones doesnt change

so the mostdown and compare each blocok with the lower line

and what the same overlapping change

```
[[ 1  0  0 60  1]
 [ 2  0 121 122  2]
 [ 3  0 126 134  3]
 ...
 [7151 511 423 431 1185]
 [7152 511 472 472 1202]
 [7153 511 474 476 1187]]
```



centers

```
[(24.501633808953272, 59.6950767890208),
 (303.0579116450595, 388.6045793255522),
 (124.39264705882353, 140.0828431372549),
 (110.7080745341615, 122.54658385093168),
 (158.00230946882218, 162.62355658198615),
 (11.239597315436242, 23.783221476510068)]
```

Toggle Code

