Computer Vision HW1 Report
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Part 1:
The task is to write a program to flip the original image upside-down, mirrored (flip right-side-left), and flipped diagonally.

To complete the task, I used Python for the program language.
Using PIL library, first let the program open the original image (lena.bmp), then initialize the width and length of the image.
Then tweak the pixel to get the wanted result, before saving it as a new file image.

Final code:

```python
from PIL import Image

ori = Image.open("lena.bmp")

w, h = ori.size

usd = Image.new("L", ori.size)
rsl = Image.new("L", ori.size)
dia = Image.new("L", ori.size)

for c in range(w):
    for r in range(h):
        #upside-down
        x = ori.getpixel((c, h - 1 - r))
        usd.putpixel((c, r), x)

        #right-side-left
        x = ori.getpixel((w - 1 - c, r))
        rsl.putpixel((c, r), x)

        #diagonal flip
        x = ori.getpixel((r, c))
        dia.putpixel((c, r), x)

usd.save("upside-down-lena.jpg")
rsl.save("right-side-left-lena.jpg")
dia.save("flipped-lena.jpg")
```

Note: to run the program, the original image and the program must be put in the same directory.
On terminal: [copy] python3 hw1.py

Result:

a. Upside-down

(upside-down-lena.jpg)

b. Right-side-left

(right-side-left-lena.jpg)

c. Diagonally flip

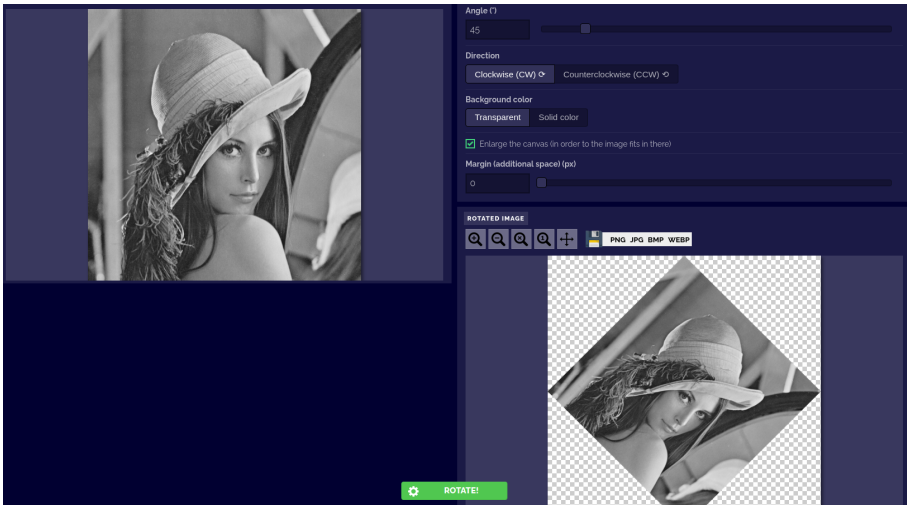
(flipped-lena.jpg)

Part 2:
The task is to use *any resource* to rotate the original image 45 degree clockwise, shrink the size to half, lastly to binarize the image at 128

To complete the task, I used a free online tool called PineTools. With its tool variety, it allows me to get the desired result quickly.

The process:
Go to the [Images] section and choose the tools available.

a. To rotate the image 45 degrees clockwise, first choose (or search) “Rotate Image”, then upload the original image (lena.bmp). In the advanced section input the number and set the direction, then submit by clicking [Rotate!]

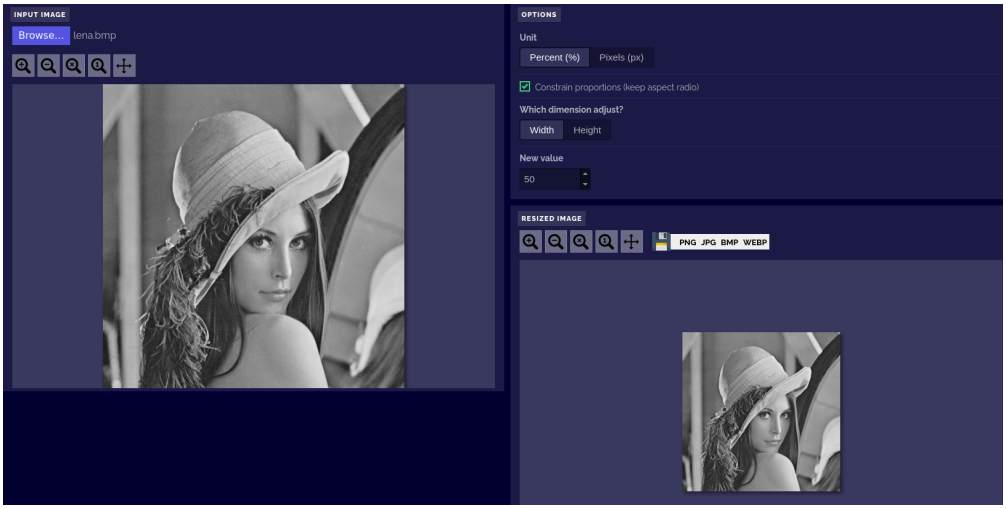


Rotate Image using PineTools

Result:

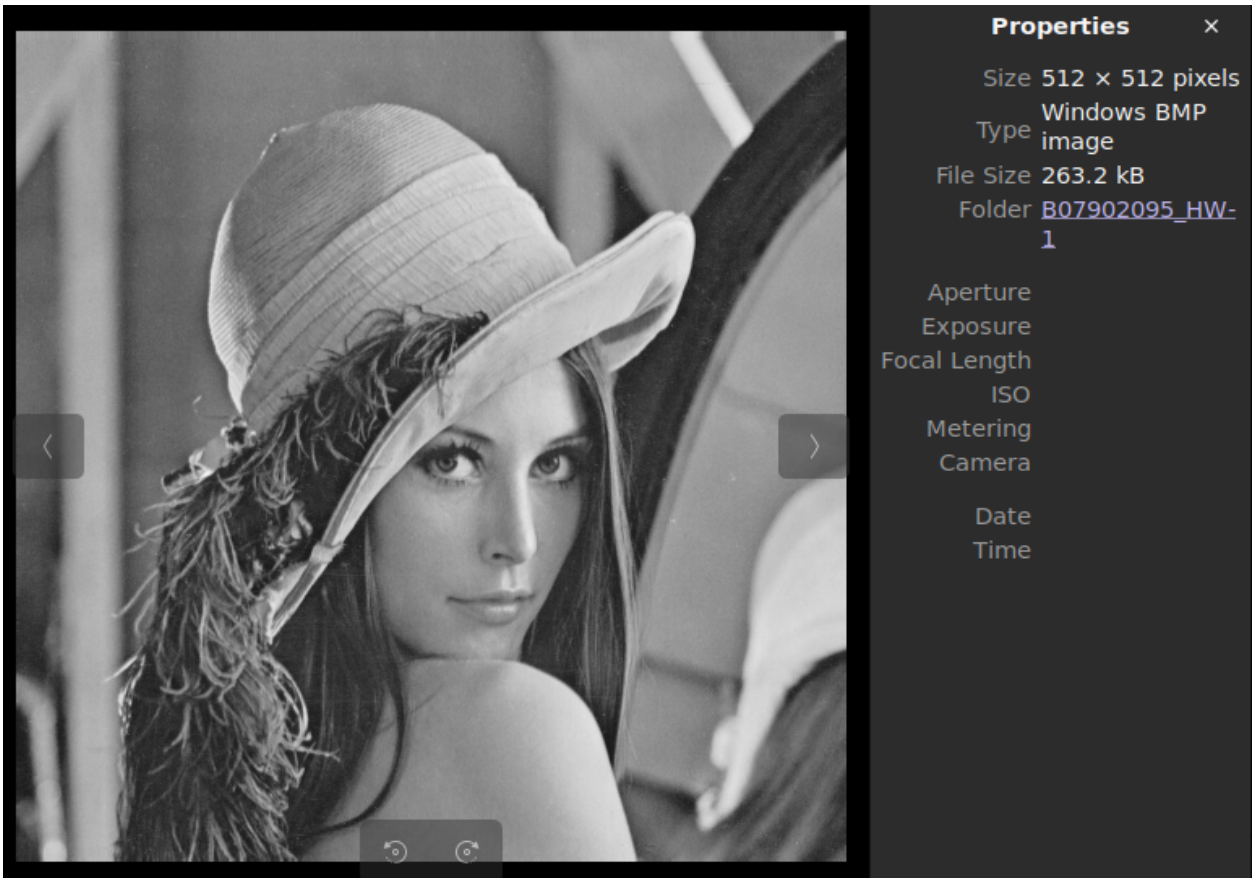
(rotated-lena.jpg)

b. To shrink the image in half, choose or search (“Resize Image”), after uploading the original image (lena.bmp), input the number in the new value part then click [Resize!]

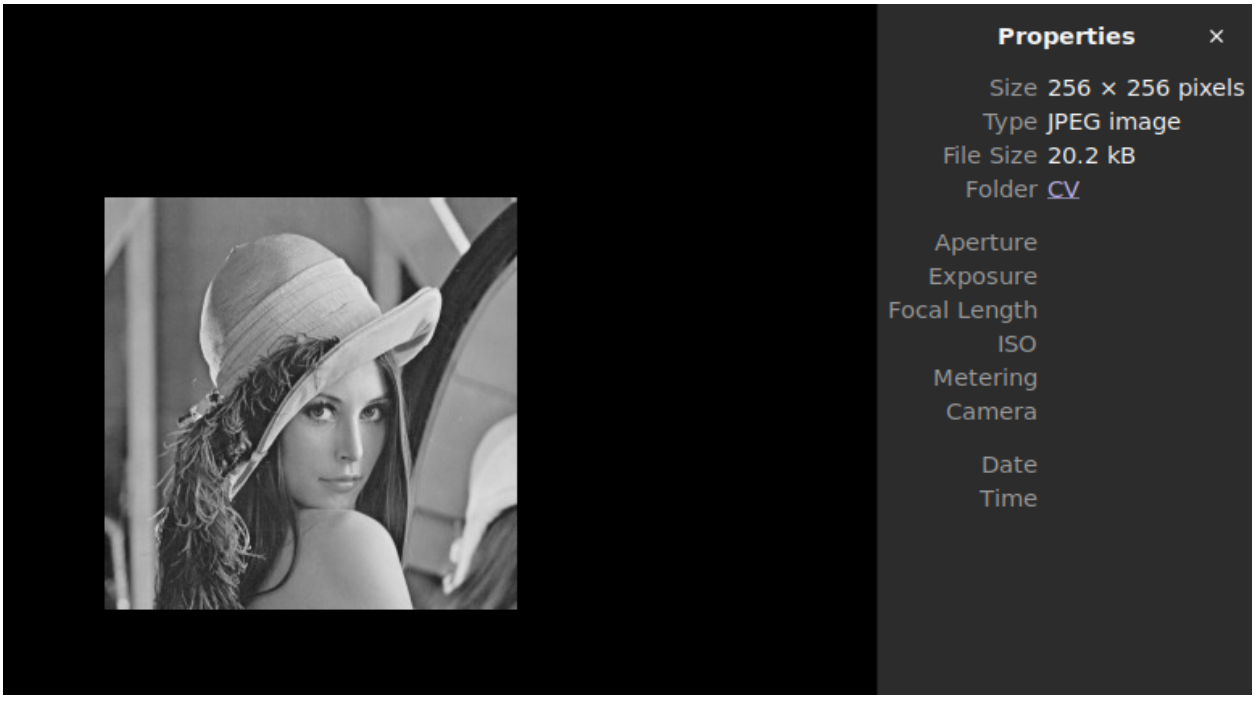


Resize Image using PineTools

Result:

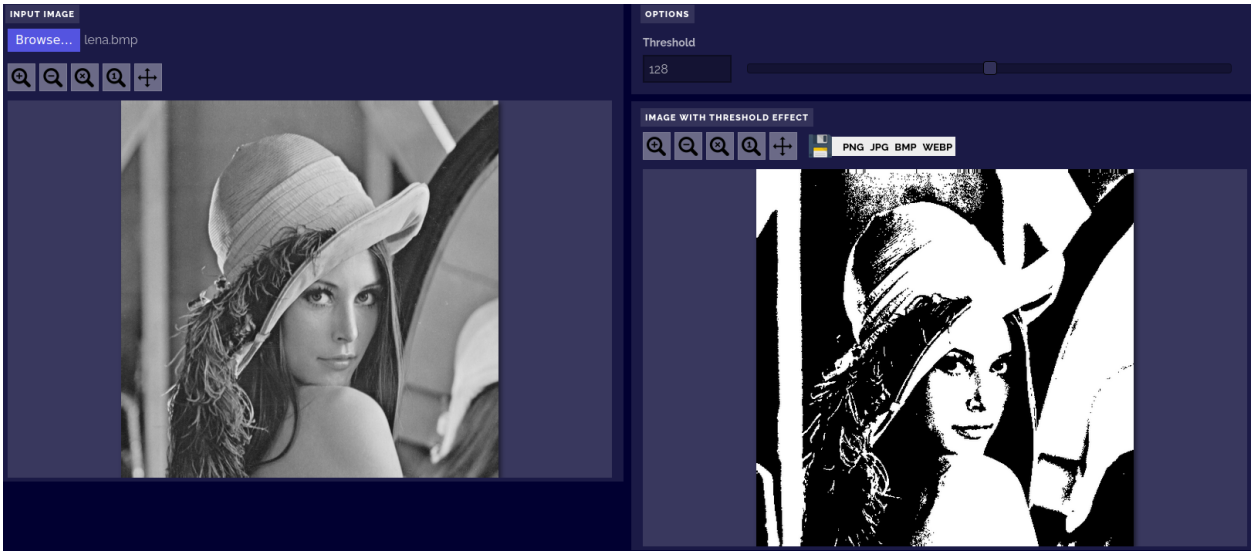


Before: the original image (lena.bmp)
Size: 512 x 512 px



After: shrunk to half (shrinked-lena.jpg)
Size: 256 x 256 px

c. To binarize the image at 128 to get a binary image, choose or search “Threshold Image”, after uploading the original image (lena.bmp), input the number then click [Apply!]



Binarize Image using PineTools

Result:

(binary-lena.jpg)