Assgn_06_20231017 Mirroring / Distortion on Image

Load a image (You can choose another image)

- fill the blank area with opencv python codes and
- get the result images as shown below
- do all 3 questions : mirroring, waving and Lenz Convex/Concave Distortion
  ※ You can use other images but do the same image processing and get the same style of the answer image.

filename and type : yourname_assgn_06.pdf
Due Date : 23 Oct 0900 a.m. (Monday 0900 a.m. 1 day before the class)

1. Affine Transformation (Mirroring Effect)

In [2]:
```python
# mirroring.py

import cv2
import numpy as np

img = cv2.imread('./images/practice_img/suji.png')
# print(img.shape)

cols, rows  =
map_y, map_x = np.indices(                    )
# print(map_y.shape)

# Mirroring
map_mirrorh_x,map_mirrorh_y = map_x.copy(), map_y.copy()
map_mirrorv_x,map_mirrorv_y = map_x.copy(), map_y.copy()
map_mirrorh_x[: , cols//2:] =                    # horizontal mirroring
map_mirrorv_y[rows//2:, :] =                    # vertical mirroring

mirrorh=cv2.remap(                              )
mirrorv=cv2.remap(                              )

cv2.imshow('horizontal mirroring', mirrorh)
cv2.imshow('vertical mirroring', mirrorv)
cv2.waitKey(0)
cv2.destroyAllWindows()

from matplotlib import pyplot as plt
from matplotlib.pyplot import figure
figure(figsize=(15, 10), dpi=100)

plt.subplot(131),plt.imshow
plt.subplot(132),plt.imshow
plt.subplot(133),plt.imshow
plt.show()
```


original

mirror_h

mirror_v

Answer

In [42]:

```python
# mirroring.py

import cv2
import numpy as np

img = cv2.imread('./images/practice_img/gojo.jpg')
# print(img.shape)

rows, cols = img.shape[:2]
map_y, map_x = np.indices((rows, cols),dtype=np.float32)
# print(map_y.shape)

# Mirroring
map_mirrorh_x,map_mirrorh_y = map_x.copy(), map_y.copy()
map_mirrorv_x,map_mirrorv_y = map_x.copy(), map_y.copy()
map_mirrorh_x[: , cols//2:] = cols - map_mirrorh_x[: , cols//2:] -1
map_mirrorv_y[rows//2:, :] = rows - map_mirrorv_y[rows//2:, :] - 1

mirrorh=cv2.remap(img, map_mirrorh_x, map_mirrorh_y, cv2.INTER_LINEAR)
mirrorv=cv2.remap(img, map_mirrorv_x, map_mirrorv_y, cv2.INTER_LINEAR)

# cv2.imshow('horizontal mirroring', mirrorh)
# cv2.imshow('vertical mirroring', mirrorv)
# cv2.waitKey(0)
# cv2.destroyAllWindows()

from matplotlib import pyplot as plt

plt.figure(figsize=(15, 10), dpi=100)

plt.subplot(131),plt.imshow(cv2.cvtColor(img, cv2.COLOR_BGR2RGB)), plt.title('c
plt.subplot(132),plt.imshow(cv2.cvtColor(mirrorh, cv2.COLOR_BGR2RGB)), plt.titl
plt.subplot(133),plt.imshow(cv2.cvtColor(mirrorv, cv2.COLOR_BGR2RGB)), plt.titl
plt.show()
```

2. Waving

```
In [8]:  # wave distortion
         map_wave_x, map_wave_y = map_x.copy(), map_y.copy()
         map_wave_x =
         map_wave_y =
         wave = cv2.remap(                                              )

         cv2.imshow('wave', wave)
         cv2.waitKey(0)
         cv2.destroyAllWindows()

         from matplotlib import pyplot as plt
         from matplotlib.pyplot import figure
         figure(figsize=(15, 10), dpi=100)

         plt.subplot(121),plt.imshow(cv2.cvtColor(img, cv2.COLOR_BGR2RGB)),plt.title('or
         plt.subplot(122),plt.imshow(cv2.cvtColor(wave, cv2.COLOR_BGR2RGB)),plt.title('w
         plt.show()
```
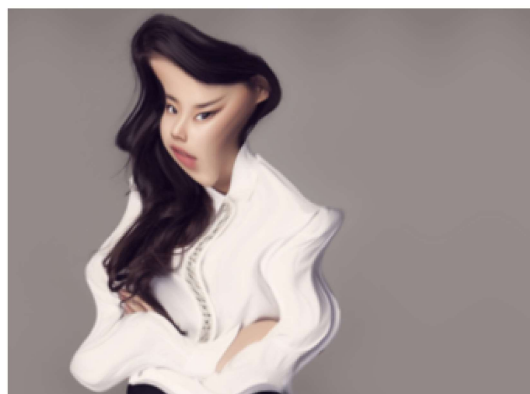
original

wave

Answer

In [43]:
```python
# wave distortion
map_wave_x, map_wave_y = map_x.copy(), map_y.copy()
map_wave_x = map_wave_x + 25*np.sin(map_y/20)
map_wave_y = map_wave_y + 25*np.sin(map_x/70)
wave = cv2.remap(img,map_wave_x,
                 map_wave_y,cv2.INTER_LINEAR,
                 None,
                 cv2.BORDER_REPLICATE )

# cv2.imshow('wave', wave)
# cv2.waitKey(0)
# cv2.destroyAllWindows()

from matplotlib import pyplot as plt
from matplotlib.pyplot import figure
figure(figsize=(15, 10), dpi=100)

plt.subplot(121),plt.imshow(cv2.cvtColor(img, cv2.COLOR_BGR2RGB)),plt.title('or
plt.subplot(122),plt.imshow(cv2.cvtColor(wave, cv2.COLOR_BGR2RGB)),plt.title('w
plt.show()
```
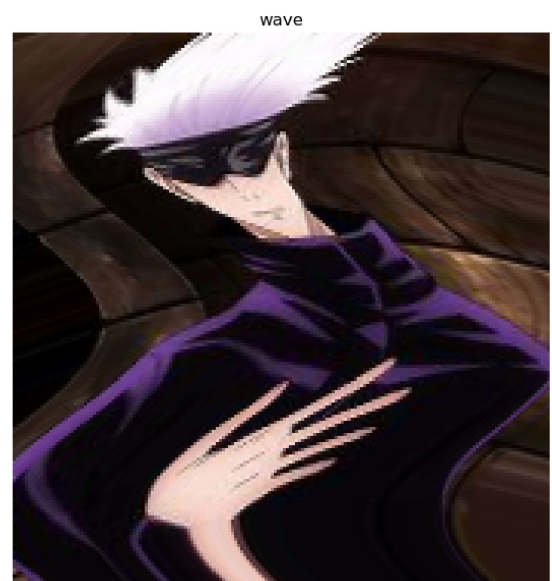
3. Lenz Convex/Concave Distortion

In [17]:
```python
# Lenz Distortion
map_lenz_x =                        # move center point
map_lenz_y =
r, theta = cv2.               # change to polar coord
r_convex = r.copy()
r_concave = r.copy()
r_convex[r< 1] =                        # convex
# print(r.shape, r_convex[r<1].shape)
r_concave[r< 1] =                        # concave

map_convex_x, map_convex_y = cv2.                    # convex back to Cart co
map_concave_x, map_concave_y = cv2.                  # concave

map_convex_x =                                # convex restore left top coord
map_convex_y =

map_concave_x =                              # concave
map_concave_y =

convex = cv2.remap(                              )
concave = cv2.remap(                              )

cv2.imshow('convex', convex)
cv2.imshow('concave', concave)
cv2.waitKey(0)
cv2.destroyAllWindows()

from matplotlib import pyplot as plt
from matplotlib.pyplot import figure
figure(figsize=(15, 10), dpi=100)

plt.subplot(121),plt.imshow(cv2.cvtColor(convex, cv2.COLOR_BGR2RGB)),plt.title(
plt.subplot(122),plt.imshow(cv2.cvtColor(concave, cv2.COLOR_BGR2RGB)),plt.title
plt.show()
```

(432, 589) (198990,)

Answer

In [44]:
```python
# Lenz Distortion
map_lenz_x = 2*map_x /(cols-1)-1                    # move center point
map_lenz_y = 2*map_y/(rows-1)-1
r, theta = cv2.cartToPolar(map_lenz_x, map_lenz_y)         # change to polar
r_convex = r.copy()
r_concave = r.copy()
r_convex[r< 1] = r_convex[r< 1]**2                  # convex
# print(r.shape, r_convex[r<1].shape)
r_concave[r< 1] = r_concave[r< 1]**.5               # concave

map_convex_x, map_convex_y = cv2.polarToCart(r_convex, theta)
map_concave_x, map_concave_y = cv2.polarToCart(r_concave, theta)

map_convex_x = ((map_convex_x + 1.3)*img.shape[1]-1)/2
map_convex_y = ((map_convex_y + 1)*img.shape[0]-1)/2

map_concave_x = ((map_concave_x + 1.5)*img.shape[1]-1)/2
map_concave_y = ((map_concave_y + 1)*img.shape[0]-1)/2

convex = cv2.remap(img,map_convex_x,map_convex_y,cv2.INTER_LINEAR)
concave = cv2.remap(img,map_concave_x,map_concave_y,cv2.INTER_LINEAR)

# cv2.imshow('convex', convex)
# cv2.waitKey(0)
# cv2.destroyAllWindows()

from matplotlib import pyplot as plt
from matplotlib.pyplot import figure
figure(figsize=(15, 10), dpi=100)

plt.subplot(121),plt.imshow(cv2.cvtColor(convex, cv2.COLOR_BGR2RGB)),plt.title(
plt.subplot(122),plt.imshow(cv2.cvtColor(concave, cv2.COLOR_BGR2RGB)),plt.title
plt.show()
```


convex   concave