



Geometric transformation

Geometric transformation of images include operations like scaling, Translation, Rotation etc.

Scaling

Scaling in cv2 is done using the function `cv2.resize()` We can provide the size of the resulting image or we can specify the scale factor in the x and y axis

```
In [2]: import cv2
import numpy as np

img = cv2.imread('images/lena.jpg')

# res = cv2.resize(img, None, fx=2, fy=2, interpolation = cv2.INTER_CUBIC)

#OR

height, width = img.shape[:2]
res = cv2.resize(img, (2*width, 2*height), interpolation = cv2.INTER_CUBIC)

cv2.imshow('image', res)
cv2.waitKey(5000)
cv2.destroyAllWindows()
```

Translation

translation is the shifting of object's location. If you know the shift in (x,y) direction, let it be (t_x,t_y), you can create the transformation matrix {M} as follows:

`warpAffine(src_img, transformation matrix, output size)`

```
In [5]: import cv2
import numpy as np

img = cv2.imread('images/lena.jpg')
rows, cols, dim = img.shape

M = np.float32([[1, 0, 100], [0, 1, 50]])
dst = cv2.warpAffine(img, M, (cols, rows))

cv2.imshow('img', dst)
cv2.waitKey(0)
cv2.destroyAllWindows()
```

Roatation

```
cv2.getRotationMatrix2D(center, angle, scale)
```

```
In [8]: img = cv2.imread('images/lena.jpg',0)
rows,cols = img.shape

M = cv2.getRotationMatrix2D((cols/2,rows/2),45,1)
dst = cv2.warpAffine(img,M,(cols,rows))

cv2.imshow('img',dst)
cv2.waitKey(0)
cv2.destroyAllWindows()
```

Perspective Transformation

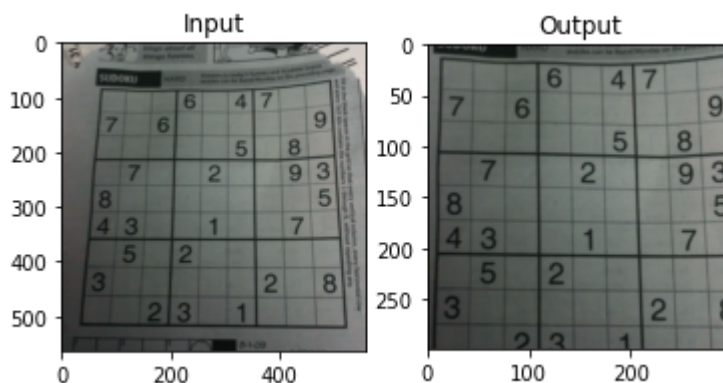
```
In [6]: import cv2
import numpy as np
from matplotlib import pyplot as plt
img = cv2.imread('images/sudoku.png')
rows,cols,ch = img.shape

pts1 = np.float32([[56,65],[500,52],[28,500],[500,500]])
pts2 = np.float32([[0,0],[300,0],[0,300],[300,300]])

M = cv2.getPerspectiveTransform(pts1,pts2)

dst = cv2.warpPerspective(img,M,(300,300))

plt.subplot(121),plt.imshow(img),plt.title('Input')
plt.subplot(122),plt.imshow(dst),plt.title('Output')
plt.show()
```



Home Work

1) Create an app that allows the user to click on the four corners of sudoku image which has to be perspective transformed and clicking on the 'T' button should do the transform and save the image.

blogs about all things furbies.

SUDOKU HARD

Answers to today's Sudoku and KenKen puzzles are in the back of the book. For more puzzles, see the KenKen website at www.kenken.com.

Fill in the blank spaces in the grid so that every row, every column, every 3x3 box contains the numbers 1 through 9, without repeating any number.

		6	4	7				
7		6						9
				5		8		
	7			2			9	3
8								5
4	3			1			7	
	5		2					
3						2		8
		2	3		1			

8-1-09