atividade-3

October 18, 2017

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In [1]: import cv2
        import numpy as np

        import pylab as plt
        %matplotlib inline

In [2]: def mean_std(image, win):
            height = image.shape[0]
            width = image.shape[1]

            mean = np.ones(image.shape)
            std = np.ones(image.shape)

            for h in range(0, height, win):
                for w in range(0, width, win):
                    mean[h:h+win, w:w+win]*=np.mean(image[h:h+win, w:w+win])
                    std[h:h+win, w:w+win]*=np.std(image[h:h+win, w:w+win])
            return mean, std

        def threshold_sauvola(image, window_size, k, r=None):
            result = np.zeros(image.shape)

            if r is None:
                r = 0.5*(image.max()-image.min())

            m, s = mean_std(image, window_size)
            T = m * (1 + k * ((s / r) - 1))

            bright = T >= image
            dark = T < image
            result[bright] = 1
            result[dark] = 0

            return result

In [3]: img = cv2.imread("../db_images/png/captcha.png", 0)

In [4]: image1 = threshold_sauvola(img, window_size=3, k=0.999, r=128)
        image2 = threshold_sauvola(img, window_size=5, k=0.05)
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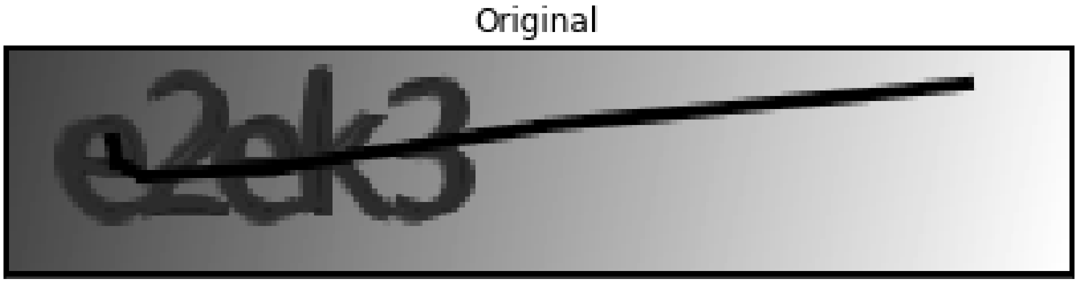
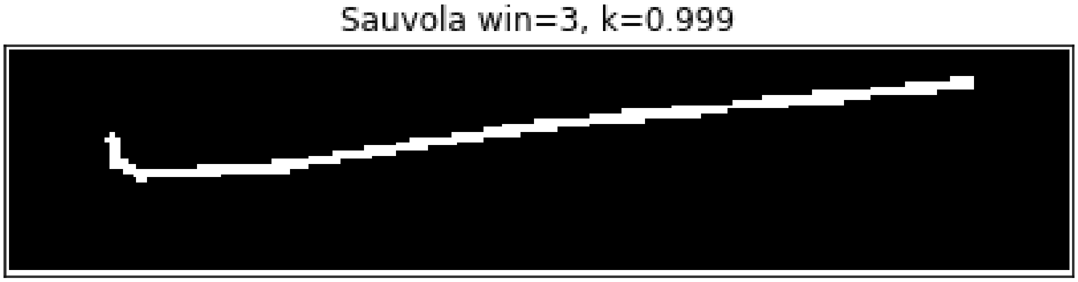
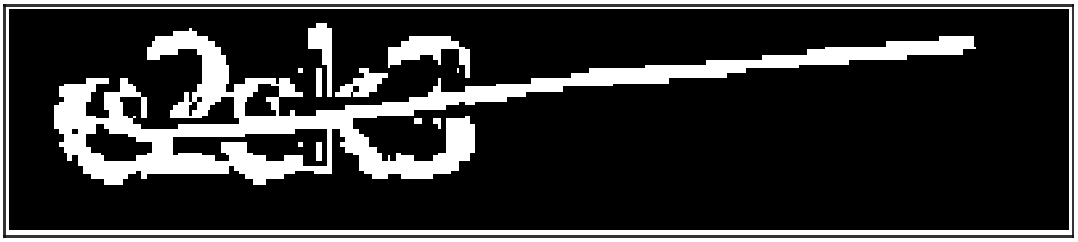
```
image3 = threshold_sauvola(img, window_size=7, k=0.032)
image4 = threshold_sauvola(img, window_size=3, k=0.999)

thresholds = [
    ('Original', img),
    ('Sauvola win=3, k=0.999', image1),
    ('Sauvola win=5, k=0.05', image2),
    ('Sauvola win=7, k=0.032', image3),
    ('Sauvola win=3, k=0.999', image4)
]

for title, image in thresholds:
    plt.figure()
    plt.title(title)
    plt.xticks([]), plt.yticks([])
    plt.imshow(image, cmap='gray')
    plt.tight_layout()
```

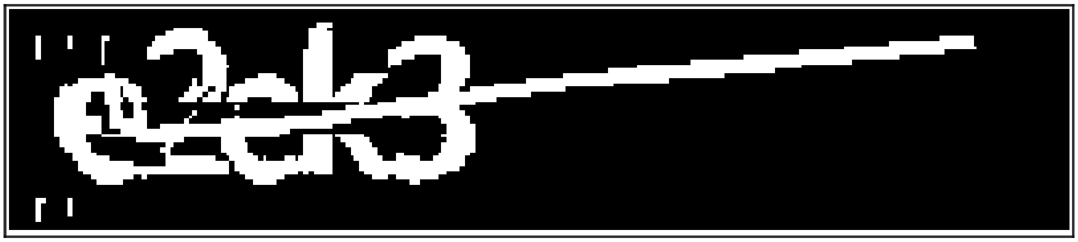




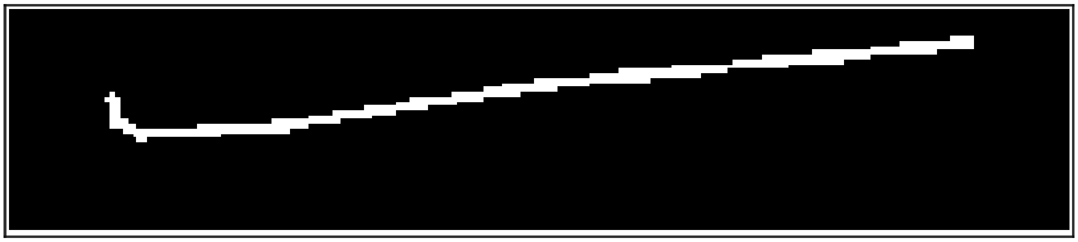
Sauvola win=5, k=0.05



Sauvola win=7, k=0.032

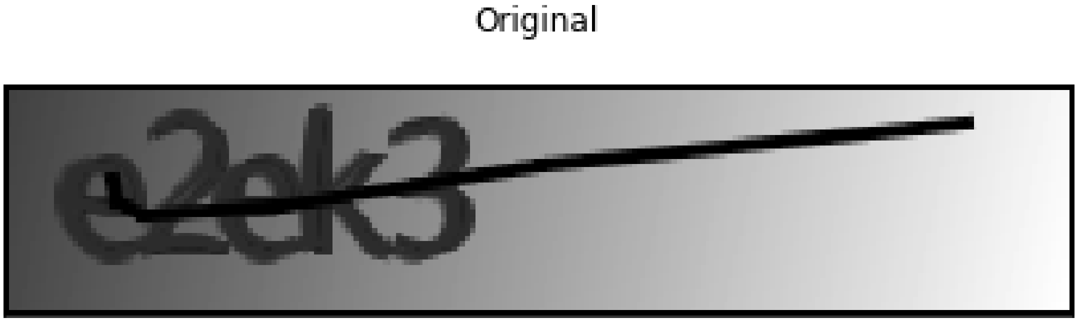


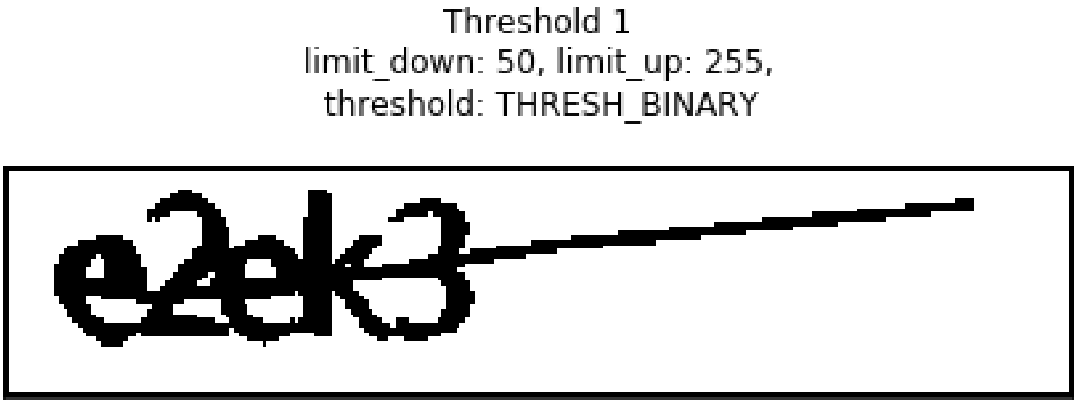
Sauvola win=3, k=0.999



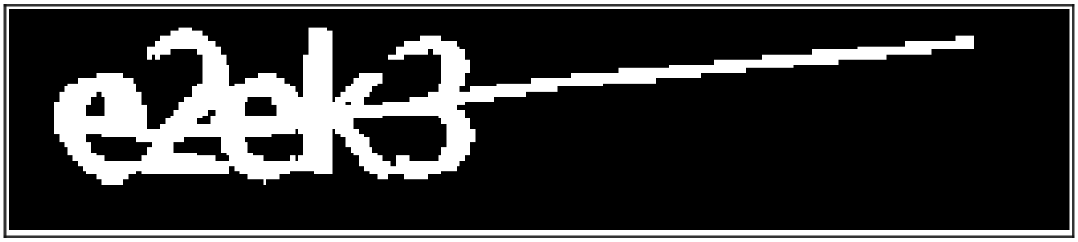
```
In [111]: ret, thresh1 = cv2.threshold(img, 60, 255, cv2.THRESH_BINARY)
          ret, thresh2 = cv2.threshold(img, 60, 255, cv2.THRESH_BINARY_INV)
          ret, thresh3 = cv2.threshold(img, 60, 255, cv2.THRESH_TRUNC)
          ret, thresh4 = cv2.threshold(img, 60, 255, cv2.THRESH_TOZERO)
          ret, thresh5 = cv2.threshold(img, 60, 255, cv2.THRESH_TOZERO_INV)
          ret, thresh6 = cv2.threshold(img, 60, 255, cv2.THRESH_OTSU)
          ret, thresh7 = cv2.threshold(img, 60, 255, cv2.THRESH_MASK)
          ret, thresh8 = cv2.threshold(img, 60, 255, cv2.THRESH_TRIANGLE)
          ret, thresh9 = cv2.threshold(img, 60, 255, cv2.ADAPTIVE_THRESH_GAUSSIAN_C)
          ret, thresh10 = cv2.threshold(img, 60, 255, cv2.ADAPTIVE_THRESH_MEAN_C)
```

```
thresholds = [
    ('Original\n', img),
    ('Threshold 1\nlimit_down: 50, limit_up: 255,\n threshold: THRESH_BINARY\n', thre
    ('Threshold 2\nlimit_down: 50, limit_up: 255,\n threshold: THRESH_BINARY_INV\n',
    ('Threshold 3\nlimit_down: 50, limit_up: 255,\n threshold: THRESH_TRUNC\n', thres
    ('Threshold 4\nlimit_down: 50, limit_up: 255,\n threshold: THRESH_TOZERO\n', thre
    ('Threshold 5\nlimit_down: 50, limit_up: 255,\n threshold: THRESH_TOZERO_INV\n',
    ('Threshold 6\nlimit_down: 50, limit_up: 255,\n threshold: THRESH_OTSU\n', thresh
    ('Threshold 7\nlimit_down: 50, limit_up: 255,\n threshold: THRESH_MASK\n', thresh
    ('Threshold 8\nlimit_down: 50, limit_up: 255,\n threshold: THRESH_TRIANGLE\n', t
    ('Threshold 9\nlimit_down: 50, limit_up: 255,\n threshold: ADAPTIVE_THRESH_GAUSS
    ('Threshold 10\nlimit_down: 50, limit_up: 255,\n threshold: ADAPTIVE_THRESH_MEAN_

]

for title, image in thresholds:
    plt.figure()
    plt.title(title)
    plt.xticks([]), plt.yticks([])
    plt.imshow(image, cmap='gray')
    plt.tight_layout()
```

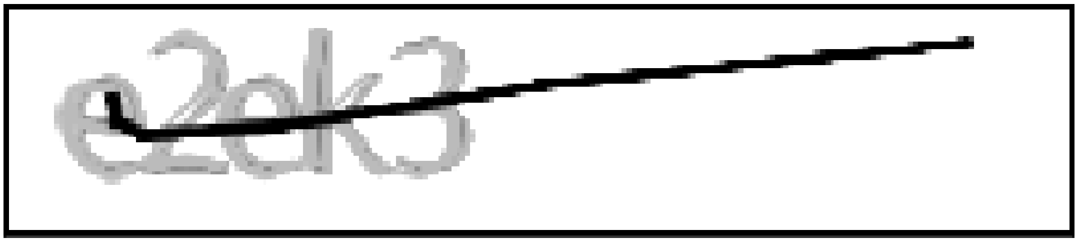




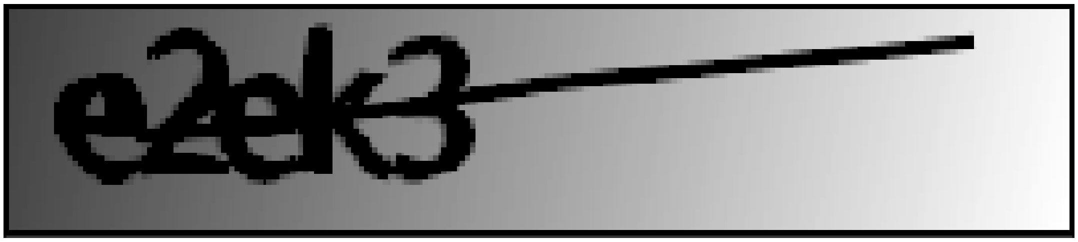
Threshold 2
limit_down: 50, limit_up: 255,
threshold: THRESH_BINARY_INV



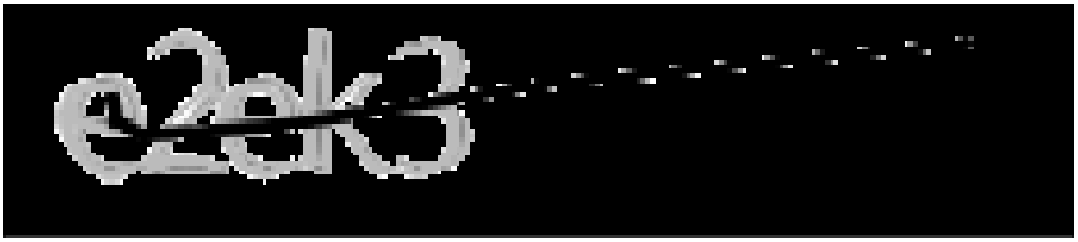
Threshold 3
limit_down: 50, limit_up: 255,
threshold: THRESH_TRUNC



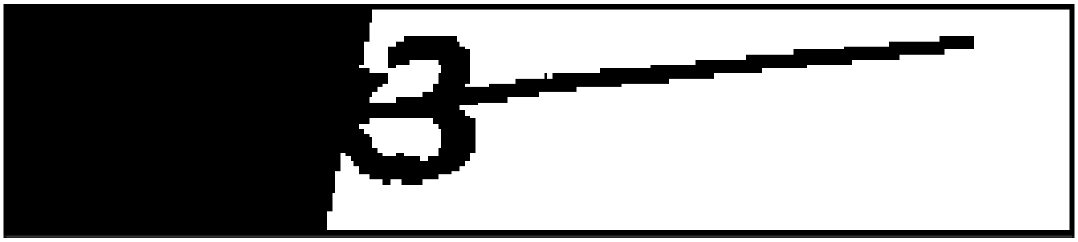
Threshold 4
limit_down: 50, limit_up: 255,
threshold: THRESH_TOZERO



Threshold 5
limit_down: 50, limit_up: 255,
threshold: THRESH_TOZERO_INV

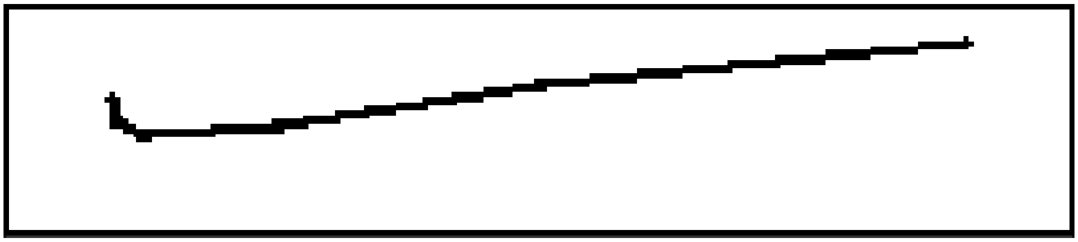


Threshold 6
limit_down: 50, limit_up: 255,
threshold: THRESH_OTSU

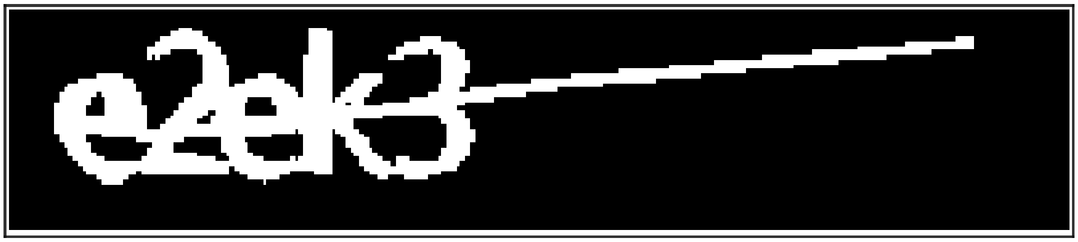


Threshold 7
limit_down: 50, limit_up: 255,
threshold: THRESH_MASK

Threshold 8
limit_down: 50, limit_up: 255,
threshold: THRESH_TRIANGLE



Threshold 9
limit_down: 50, limit_up: 255,
threshold: ADAPTIVE_THRESH_GAUSSIAN_C



Threshold 10
limit_down: 50, limit_up: 255,
threshold: ADAPTIVE_THRESH_MEAN_C