Import Libaries

In [1]:
```
import matplotlib.pyplot as plt
import numpy as np
import cv2 as cv
```

Read Image

In [19]:
```
def read_image():
    path = "/media/rifat/STUDY/4-1/LAB/Image_Processing/image/font.png"
    img = plt.imread(path)
    gray = cv.cvtColor(img,cv.COLOR_RGB2GRAY)
    gray = gray*255;
    th,binary = cv.threshold(gray,160,255,cv.THRESH_BINARY);
    return img,gray,binary
```

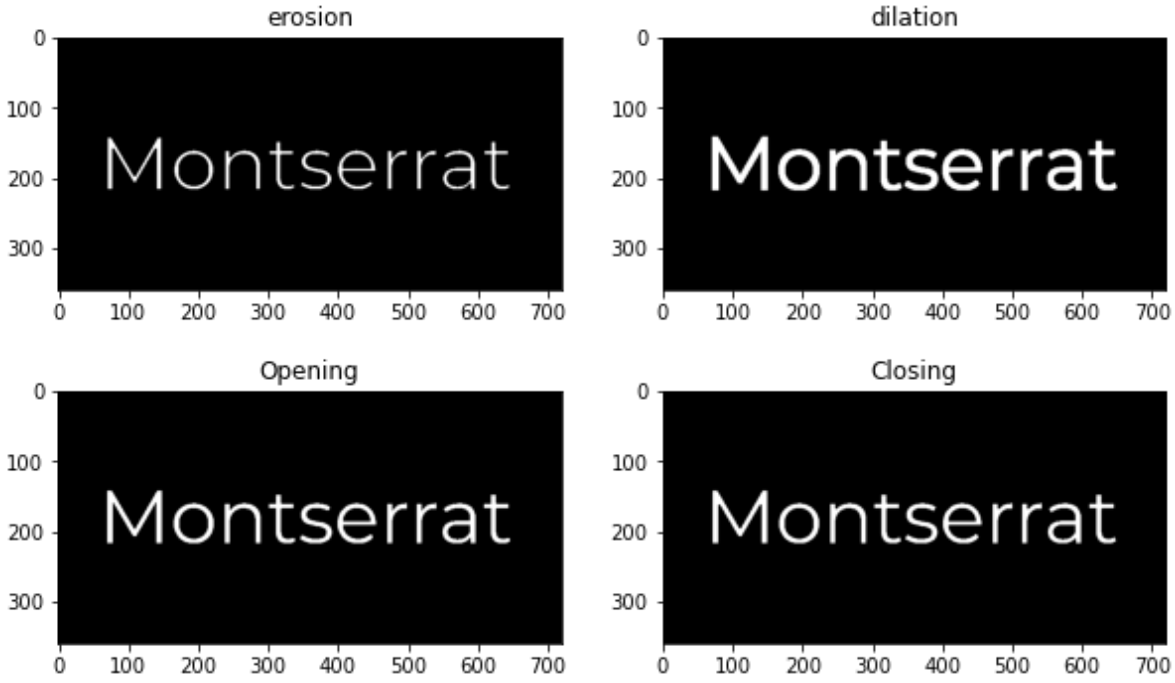
Morphological_processing

In [81]:
```
def morphological_change(binary, kernel):
    img_erosion = cv.erode(binary, kernel, iterations=1)
    img_dilation = cv.dilate(binary, kernel, iterations=1)
    opening = cv.morphologyEx(binary, cv.MORPH_OPEN, kernel)
    closing = cv.morphologyEx(binary, cv.MORPH_CLOSE, kernel)

    plt.figure(figsize=(10,6))

    plt.subplot(2,2,1)
    plt.imshow(img_erosion,cmap = 'gray')
    plt.title("erosion")

    plt.subplot(2,2,2)
    plt.imshow(img_dilation,cmap = 'gray')
    plt.title("dilation")

    plt.subplot(2,2,3)
    plt.imshow(opening,cmap = 'gray')
    plt.title("Opening")

    plt.subplot(2,2,4)
    plt.imshow(closing,cmap = 'gray')
    plt.title("Closing")

    plt.show()
```

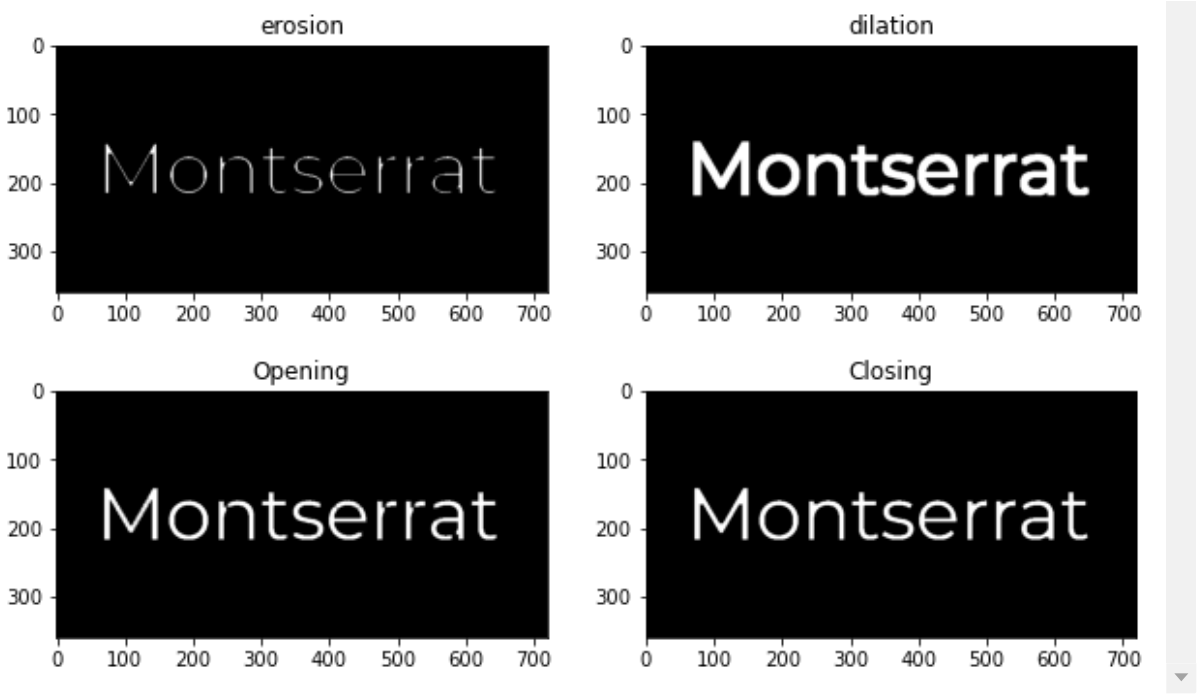
Main

In [82]:
```
if __name__ == "__main__":
    img,gray,binary = read_image()

    print("Using kernel 1")
    kernel1 = np.ones((5, 5), np.uint8)
    morphological_change(binary, kernel)

    print("Using kernel 2")
    kernel2 = np.array([[1, 0, 0, 0, 1],
                        [0, 1, 1, 1, 0],
                        [0, 1, 1, 1, 0],
                        [0, 1, 1, 1, 0],
                        [1, 0, 0, 0, 1]
                       ],np.uint8)
    morphological_change(binary, kernel2)


    print("Using kernel 3")
    kernel3 = np.array([[1, 1, 1, 1, 1],
                        [1, 0, 0, 0, 1],
                        [1, 0, 1, 0, 1],
                        [1, 0, 0, 0, 1],
                        [1, 1, 1, 1, 1]
                       ],np.uint8)
    morphological_change(binary, kernel3)
```

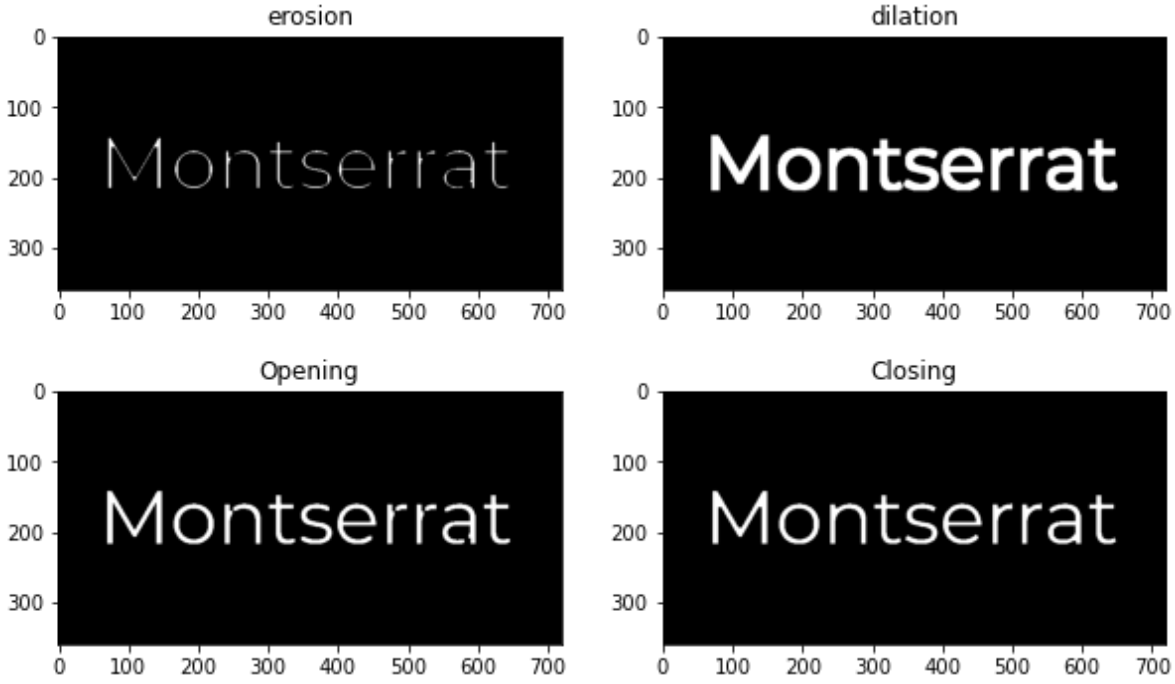
Using kernel 1



Using kernel 2




```
Using kernel 3
```



Erosion

Morphological erosion removes floating pixels and thin lines so that only substantive objects remain. Remaining lines appear thinner and shapes appear smaller.

Dilation

Morphological dilation makes objects more visible and fills in small holes in objects. Lines

appear thicker, and filled shapes appear larger.

Opening

The opening operation erodes an image and then dilates the eroded image, using the same structuring element for both operations.

Closing

The closing operation dilates an image and then erodes the dilated image, using the same structuring element for both operations.