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CSCE460301 - Fundamental of Computer Vision

# Assignment #2:

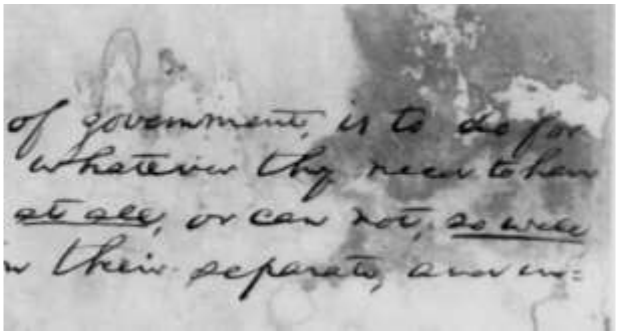
To come up with the highest accuracy, I tried several method and several combination of methods.

## 1- Auto Canny edge detection:

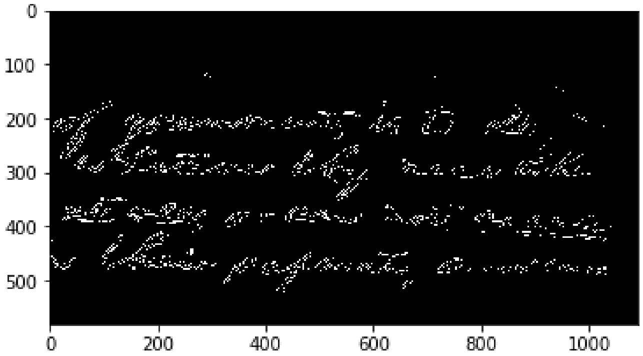
I developed a function to automatically calculate the upper and the lower limits and removes them using the previously developed Canny function.

```
def auto_canny(image, sigma=0.33):
    v = np.median(image)
    lower = int(max(0, (1.0 - sigma) * v))
    upper = int(min(255, (1.0 + sigma) * v))
    edged = cv.Canny(image, lower, upper)
    return edged
```

I used it on the image “H04.bmp” and the result was:

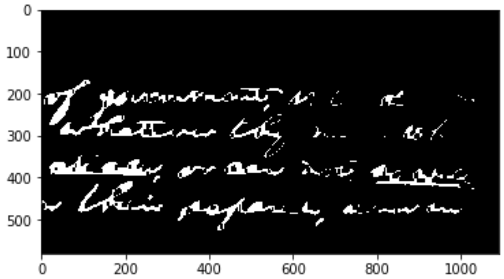

of government, is to do for
whatever they need to have
at all, or can not, so well
in their separate, and in-

the original image

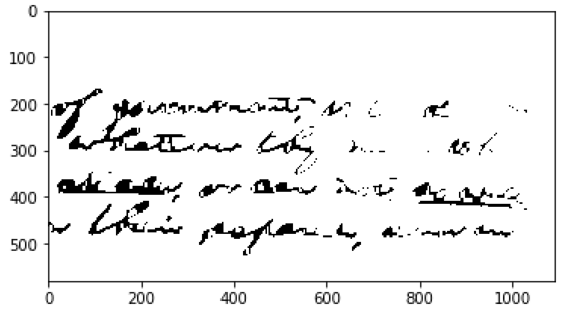


the edges of the image

Then I did closing operation on the edges detected and the output was:



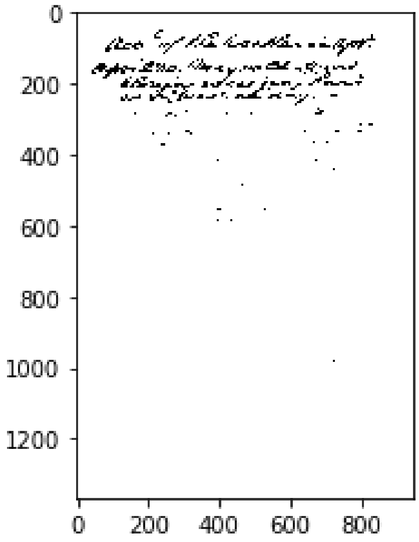
Then I inverted the image and the output was:



## 2- Otsu’s Method:

Otsu's method looks at the histogram and tries to minimize the within-class variance. In other words, it tries to find a threshold such that the variance of the resulting both classes in the Gaussian distributions is as small as possible.

I used a denoising function on “H02.bmp” image.



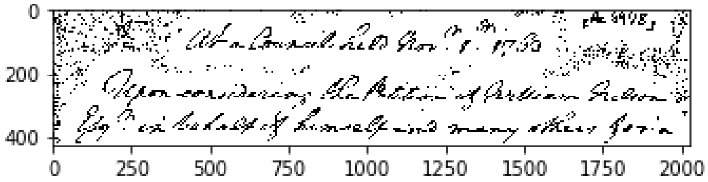
The original image

Otsu’s method output

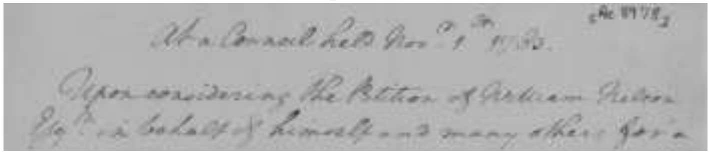
## 3- Niblack’s method:

It is another method used to document segmentation, however Otsu’s results proved more efficient.

I tried Niblack on “H01.bmp” image



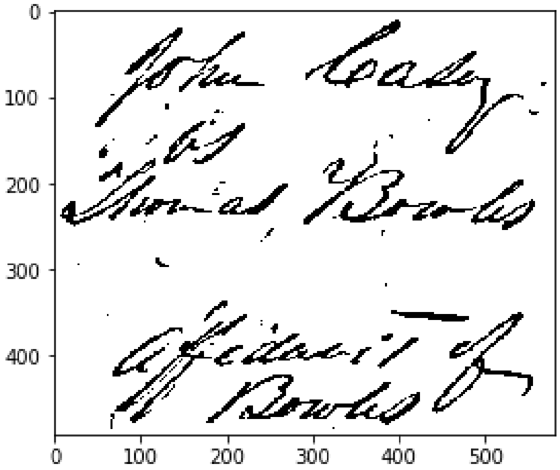
Niblack’s output

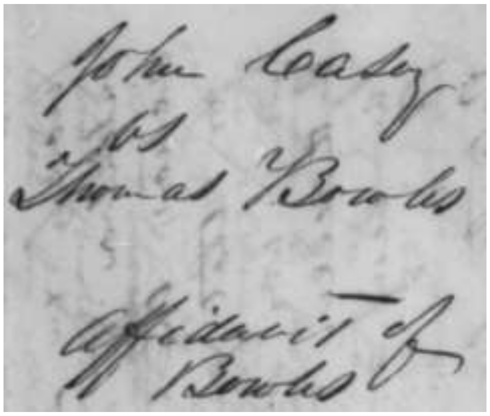


Original image

## 4- Sauvola’s method:

It is an adaptive document binarzation technisue and it proved to be the best among all the other techniques





Sauvola’s method output

Original image

## Results:

| image | Method | FM |
|---|---|---|
| H01 | Auto Canny edge detection | 79.05660521 % |
| | Otsu’s Method | 81.0672411 % |
| | Niblack’s method | 44.99012082 % |
| | Sauvola’s method | 80.18073909 % |
| H02 | Auto Canny edge detection | 55.66529377 % |
| | Otsu’s Method | 90.41945373 % |
| | Niblack’s method | 18.61916769 % |
| | Sauvola’s method | 64.86806558 % |
| H03 | Auto Canny edge detection | 80.14808915 % |
| | Otsu’s Method | 83.16374306 % |
| | Niblack’s method | 56.34987844 % |
| | Sauvola’s method | 88.51688586 % |
| H04 | Auto Canny edge detection | 77.6699806 % |
| | Otsu’s Method | 39.9647455 % |
| | Niblack’s method | 47.98723714 % |
| | Sauvola’s method | 86.75932258 % |
| H05 | Auto Canny edge detection | 52.75359278 % |
| | Otsu’s Method | 27.22674045 % |
| | Niblack’s method | 29.16763625 % |
| | Sauvola’s method | 83.54614001 % |