Assignment-1E4-Nachiketh-nxp251

February 21, 2018

Question - Different ROC curves for feature detection.

For this I have calculated the right values and then computed the predicted values using the feature detector. I have plotted the ROC curve - True Positive Rate vs False Positives.

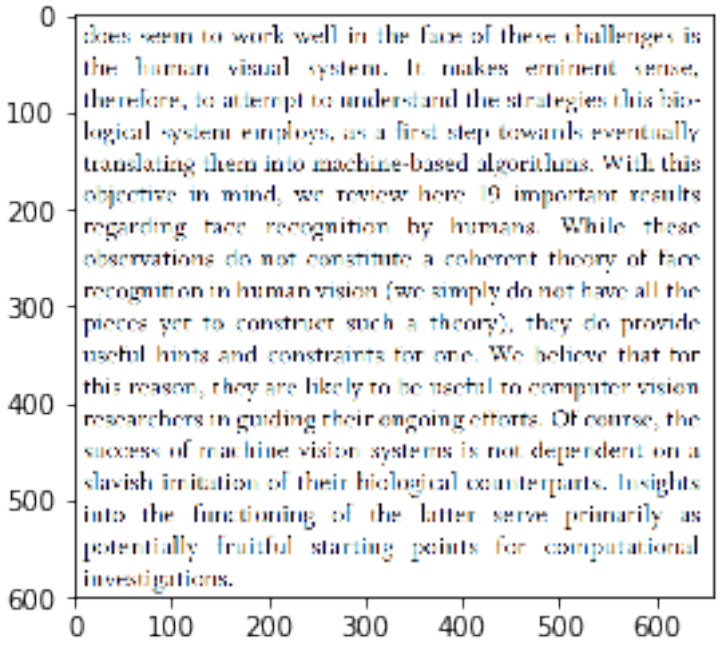
In [10]:
```
import numpy as np
import matplotlib.pyplot as plt
import matplotlib.patches as patches
```

In [36]:
```
image = plt.imread('../characters.png')
image_gray = image[:,:,0]
template = plt.imread('../template.png')
template = template[:,:,0]
```

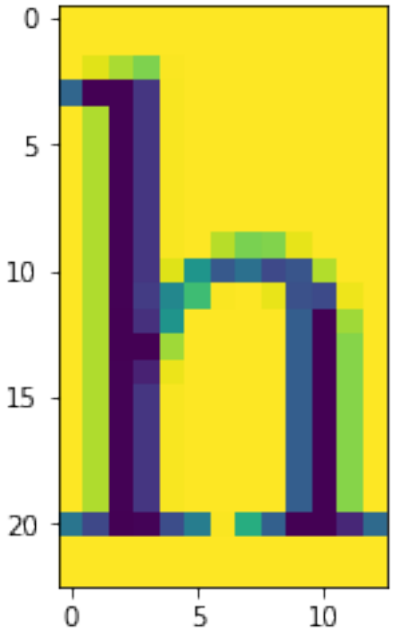
In [37]:
```
image_height = image_gray.shape[0]
image_width = image_gray.shape[1]
template_height = template.shape[0]
template_width = template.shape[1]
```

In [50]:
```
right_values = [(321, 9), (448, 9), (517, 9), (19, 42), (64, 42), (18, 75), (412, 75)
```

In [39]:
```
plt.imshow(image)
plt.show()
```



In [40]:
```
plt.imshow(template)
plt.show()
print(template.shape)
```



```
(23, 13)
```

```
In [4]: def calcMetrics(true_values, predicted_values):
            count_correct = 0
            for each_value in predicted_values:
                if each_value in true_values:
                    count_correct += 1
            TP = count_correct
            FN = len(true_values) - count_correct
            FP = len(predicted_values) - count_correct
            return TP, FP, FN
```

```
In [5]: def threshold(sub_img, template):
            equals = 0
            total = 0
            for i in range(0, template.shape[0]):
                for j in range(0, template.shape[1]):
                    total += 1
                    if sub_img[i,j] == template[i,j]:
                        equals += 1
            return equals / float(total)
```

```
In [6]: def detect_feature(image_gray, template, limit):
            #fig, ax = plt.subplots(1)
            image_height = image_gray.shape[0]
            image_width = image_gray.shape[1]
            template_height = template.shape[0]
            template_width = template.shape[1]
            count = 0
            bottom_left_points = []
            for i in range(0, (image_height - template_height)):

                for j in range(0, (image_width - template_width)):

                    sub_img = image_gray[i:template_height+i, j:template_width+j]
                    threshold_val = threshold(sub_img, template)
                    if threshold_val > limit: #Adding a rectangle box
                        count += 1
                        bottom_left_x = j
                        bottom_left_y = i
                        bottom_left_points.append((bottom_left_x, bottom_left_y))
                        rectangle = patches.Rectangle((bottom_left_x,bottom_left_y), template_w
                        ax.add_patch(rectangle)
            #ax.imshow(image)
            #plt.show()
            return count, bottom_left_points
```

```
In [71]: TPR_list = []
         FP_list = []
```

```
        count, predicted_values = detect_feature(image_gray, template, 0.60)
        TP, FP, FN = calcMetrics(right_values, predicted_values)
        TPR_list.append(float(TP)/(TP + FN))
        FP_list.append(FP)
        print(TP, FP, FN)
```

```
38 100 0
```

```
In [72]: count, predicted_values = detect_feature(image_gray, template, 0.61)
         TP, FP, FN = calcMetrics(right_values, predicted_values)
         TPR_list.append(float(TP)/(TP + FN))
         FP_list.append(FP)
         print(TP, FP, FN)
```

```
38 92 0
```

```
In [73]: count, predicted_values = detect_feature(image_gray, template, 0.62)
         TP, FP, FN = calcMetrics(right_values, predicted_values)
         TPR_list.append(float(TP)/(TP + FN))
         FP_list.append(FP)
         print(TP, FP, FN)
```

```
38 9 0
```

```
In [74]: count, predicted_values = detect_feature(image_gray, template, 0.63)
         TP, FP, FN = calcMetrics(right_values, predicted_values)
         TPR_list.append(float(TP)/(TP + FN))
         FP_list.append(FP)
         print(TP, FP, FN)
```

```
38 8 0
```

```
In [75]: count, predicted_values = detect_feature(image_gray, template, 0.64)
         TP, FP, FN = calcMetrics(right_values, predicted_values)
         TPR_list.append(float(TP)/(TP + FN))
         FP_list.append(FP)
         print(TP, FP, FN)
```

```
38 0 0
```

```
In [76]: count, predicted_values = detect_feature(image_gray, template, 0.66)
         TP, FP, FN = calcMetrics(right_values, predicted_values)
         TPR_list.append(float(TP)/(TP + FN))
         FP_list.append(FP)
         print(TP, FP, FN)
```

```
0 0 38
```

```
In [77]: count, predicted_values = detect_feature(image_gray, template, 0.67)
         TP, FP, FN = calcMetrics(right_values, predicted_values)
         TPR_list.append(float(TP)/(TP + FN))
         FP_list.append(FP)
         print(TP, FP, FN)
```

```
0 0 38
```

```
In [78]: plt.plot(FP_list, TPR_list, '-', linewidth=1)
         plt.xlabel("FP")
         plt.ylabel("TPR")
         plt.show()
```