ECE 6310 Introduction to Computer Vision

Fall 2020

Lab 3 – Letters

Submitted By –

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The binary images were created by cutting it from the original image with a size of 9x15. One of the binary images that was obtained is shown below.

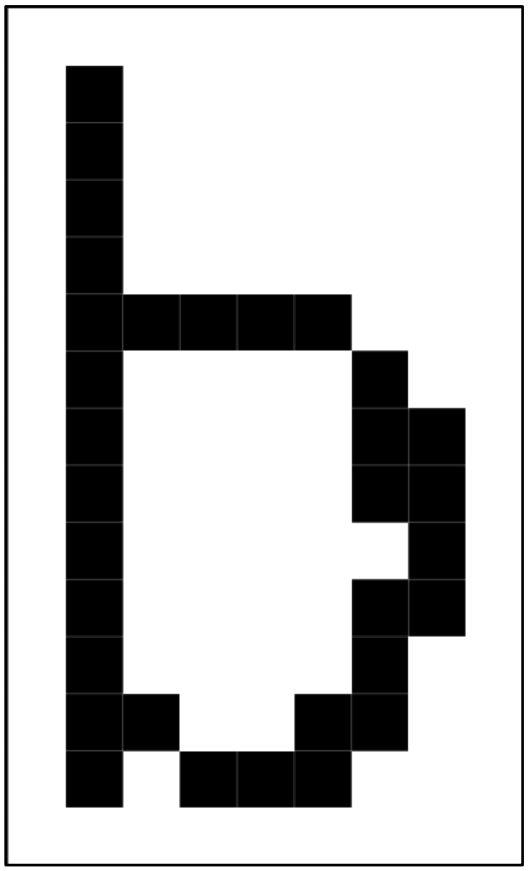

Figure 1:Binary Image example

The binary image obtained was first inflated from 9x15 size to 11x17 size for the edge correction while thinning. The inflated binary image was first color inverted. The white part was changed to black and black part was changed to white. This inverted image was sent to thinning loop. In the thinning loop we are checking for the following conditions by running 3x3 filter window for each pixel value:

- a = Number of edge to non-edge transitions
  Condition: a = 1 is true
- b = Number of edge neighbors
  Condition: 2 <= b <= 6 is true
- Condition: North neighbor || East neighbor || (West neighbor && South neighbor) is not edge neighbor then condition is true

If all the above three conditions were true for a pixel then that pixel was marked for erase and all suck marked pixels were erased when the whole image was scanned. This thinning process was done continuously until all the marked pixels are erased.

Once this process is done we obtain the following thinned binary image.

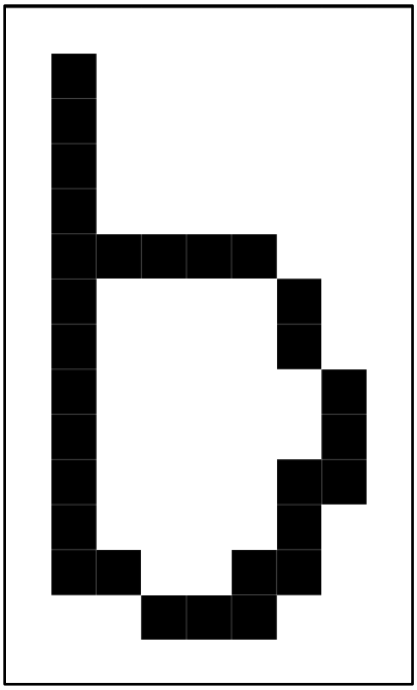

Figure 2: Thinned image example

The thinned image was then checked for endpoints and branchpoints. For the letter ‘e’, number of endpoints is equal to 1 and number of branchpoints is equal to 1. When this was done. Then the TP, FP, TN, FN< TPR and FPR values were calculated and the resultant ROC curve was generated.

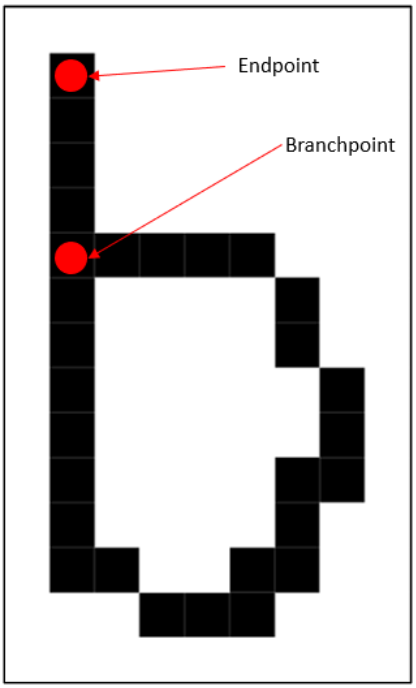

Figure 3: thinned image with branchpoint and endpoint

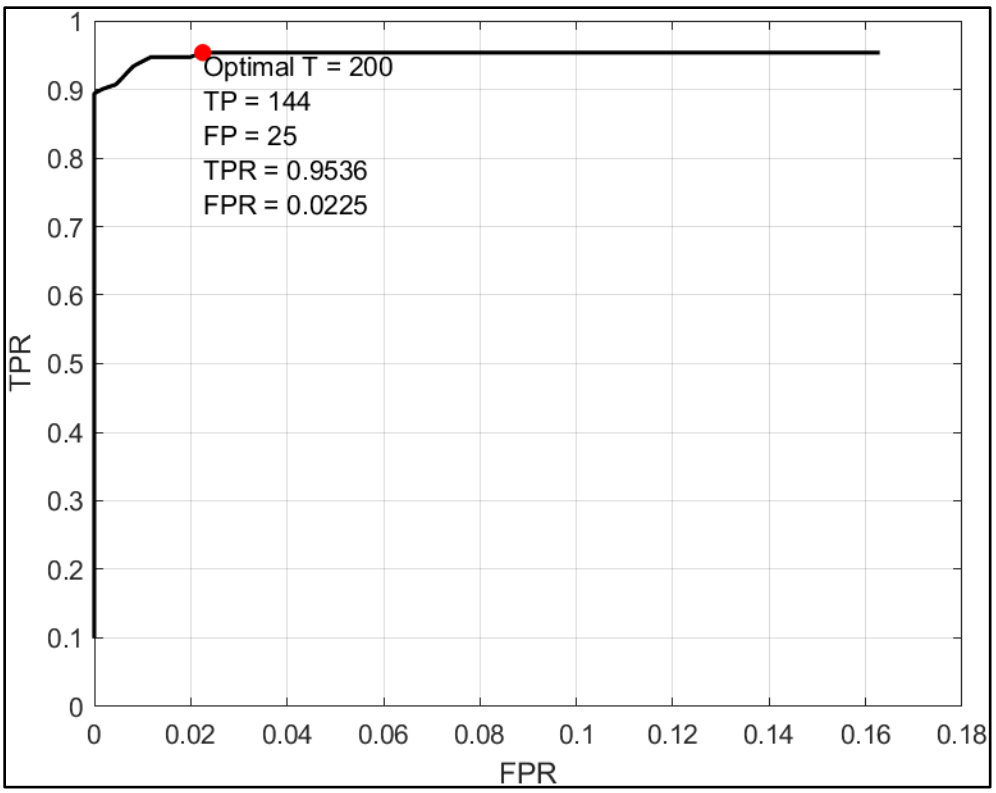

Figure 4: ROC Curve

The optimal T, FP and TP values can be obtained if the x-coordinate (FPR value) of the point on ROC curve is close to 0 (zero) and the y-coordinate (TPR value) of the same point is close to 1. This is calculated by finding the minimum of all the Euclidean distances of FPR and TPR values for each T.

For the given image, the optimal T is 200. The corresponding TP value is 144 and FP value is 25, as shown in the ROC curve above.