

Assignment 1

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Problem 1. For $V = \{1\}$,

- (a) S1 and S2 are not 4-adjacent
- (b) S1 and S2 are 8-adjacent
- (c) S1 and S2 are m-adjacent

Problem 2. For $V = \{0, 1\}$,

- i. 4-path size: None, because one's either blocked in by a 2 if you move up or will eventually be blocked by 2's if you move right and up.
- ii. 8-path size: 4
- iii. m-path size: 5

For $V = \{1, 2\}$,

- i. 4-path size: 6
- ii. 8-path size: 4
- iii. m-path size: 6

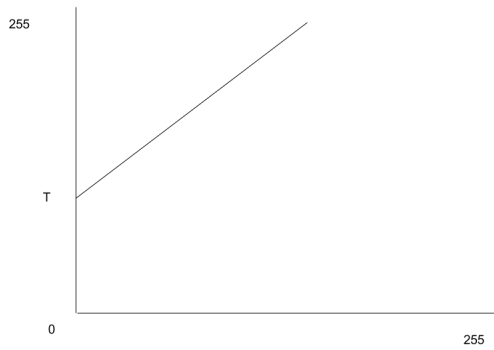
Problem 3. The EXTADD operation gives the following results:

$$EXTADD_{f,g}(1, 2) = 3.$$

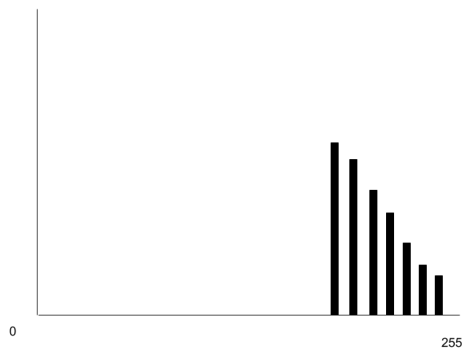
$$EXTADD_{f,g}(2, 2) = 9.$$

Problem 4. To transform A to B, every pixel value needs to be shifted up by T .
 $f(x, y) = image[x + y * width] + T$

Transformation curve:

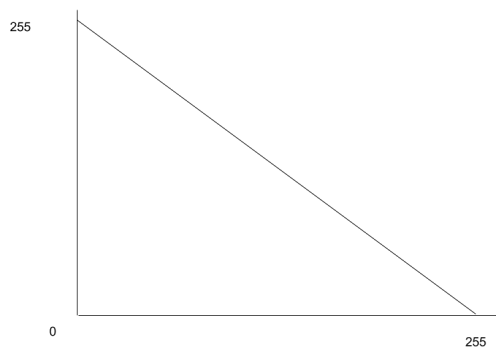


Problem 5. The transformation curve gives the negative of the image:

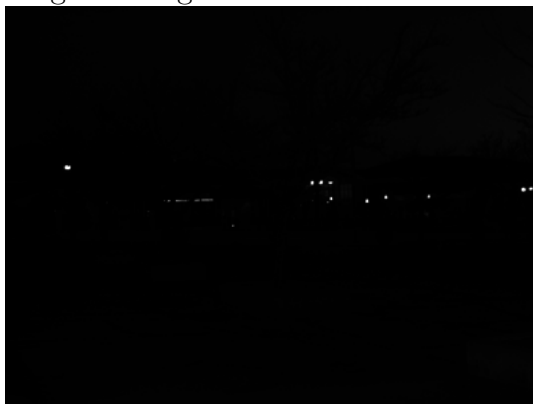


1 Grey-scale transformation and enhancement

- (1) Negative transformation: $neg(x) = 255 - x$
Transformation curve:



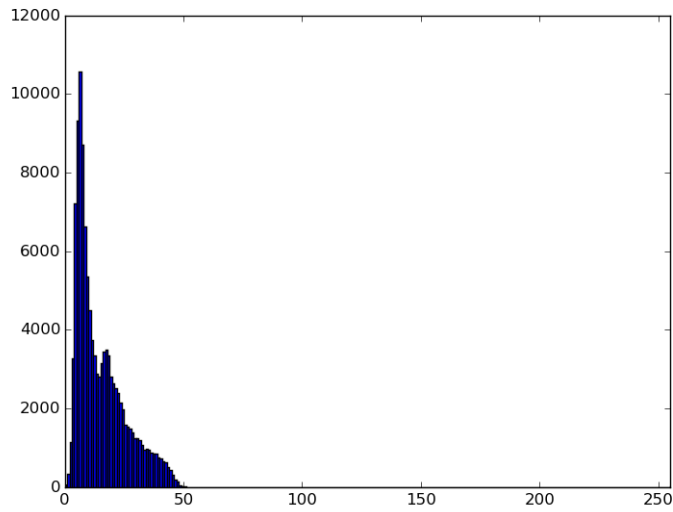
Original image:



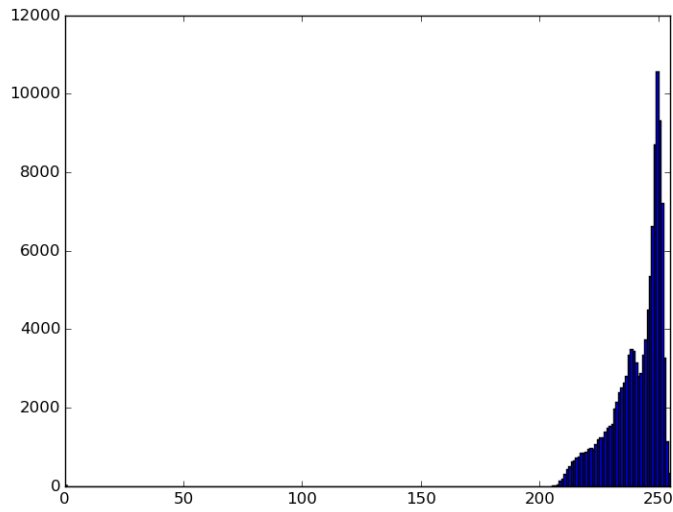
Negative image:



(2) Original histogram:



Negative histogram:

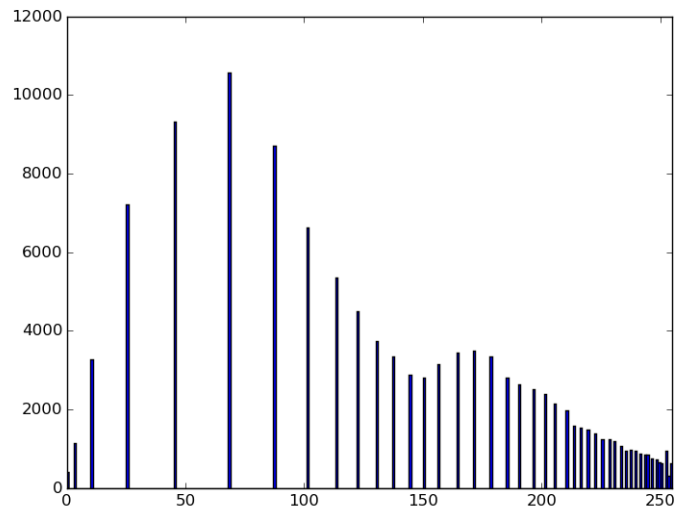


- (3) The equalization algorithm computes a CDF for the pixel values from 0 to 255, then uses the CDF to redistribute the pixels according to the formula $eq(i) = \frac{cdf[i]*255}{height*width}$ where i is the value of each pixel intensity from 0 to 255.

Equalized image:



Equalized histogram:



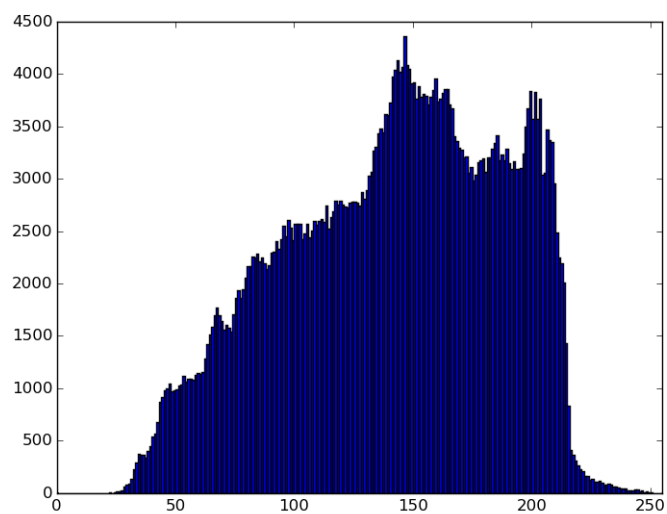
(4) Original image:



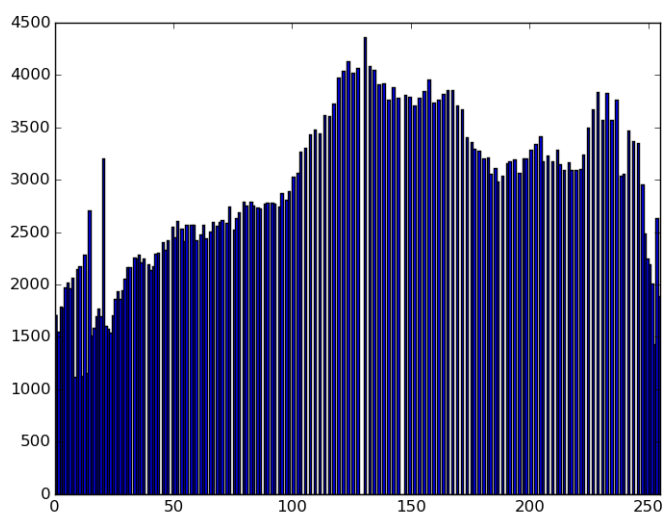
Equalized image:



Original histogram:



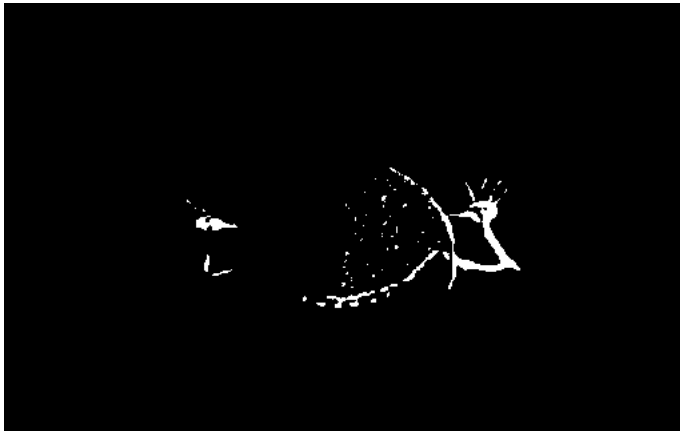
Equalized histogram:



2 Window level adjustment

Here are the modified versions of guide.tif for thresholds 50, 127, 200





3 Connected component labeling

We can automatically find a good threshold for the image by finding the average pixel intensity. Then we set every pixel below this value to black and every pixel above or equal to this pixel white. Then the image is scanned for white pixels and a 4-connected component is run via a breadth-first search through the white region, replacing white with a different gray value for each region.

(1) f1:



(2) f2:



4 References

OpenCV 3.0 Documentation: <http://docs.opencv.org/3.0.0/>