ANKARA UNIVERSITY

Computer Engineering

466 – Digital Image Processing

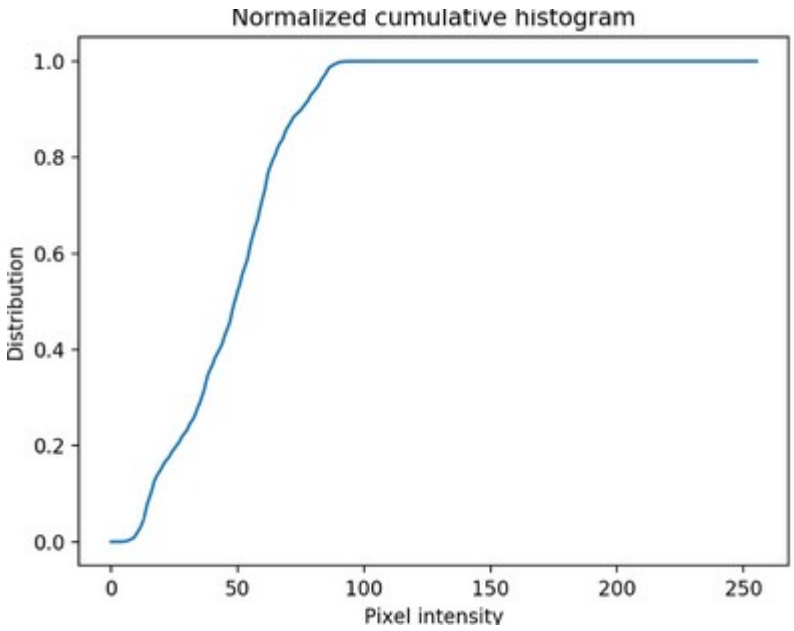
Final Examination

11.6.2021

1. Write the code for a function "AddSaltPepper", which takes three parameters (1) the image, (2) salt probability (the probability for a pixel to become white), and (3) pepper probability (the probability for a pixel to become black). This function will go over the pixels of the image and either make pixels white/black or leave them as they are depending on the given probabilities.

You can assume the input image is grayscale. Do not write the code that reads an actual image or that calls this function or uses its output. Only give the function. You can use things from OpenCV library. The code can be in a language you prefered for the coursework (C/C++, Python, etc.).

2. Briefly explain in your own sentences what Mach band effect is.



3. Which of the sentences below can be said about the image by looking at this cumulative histogram?

(You can select multiple options! Selecting an incorrect option gives you negative points!)

a.

There are a lot of pixels with intensities higher than 100.

b.

There are no pixels with intensities higher than 100.

c.

The image is bright.

d.

The image has high contrast.

e.

The image has low contrast.

f.

The image is dark.

We look at the normalized sensor values coming from an imaging device and we see that for nearly all the pixels, values are in the range [0, 0.1], and only a few pixels are 1. Applying which of the following operations makes sense if we want to make near-dark details more visible?

a.

Contrast Stretching

b.

Sharpening

c.

Thresholding

d.

Low-Pass Filtering in the Frequency Domain

e.

Log Transformation