2022 Gen 11 Midterm

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Problem 1

1.

Why do we care about histogram?

Histograms are useful because they display the **frequency and distribution of data** in a graphical way. They allow you to analyze a large amount of data without having to read word descriptions. They also help you to determine trends, compare results with specifications, avoid clipping highlights or shadows, and identify potential problems in your process.

2.

Perform histogram equalization for the following image I. Visualize the output histogram in comparison with the input.

$$I = \begin{bmatrix} 3 & 6 & 1 & 1 & 6 & 3 \\ 3 & 6 & 6 & 5 & 0 & 6 \\ 4 & 6 & 3 & 6 & 2 & 6 \\ 1 & 6 & 5 & 6 & 0 & 2 \\ 3 & 6 & 5 & 6 & 5 & 6 \\ 2 & 6 & 3 & 6 & 2 & 3 \end{bmatrix}$$

Problem 2

1.

Why do we care about median filter?

The median filter is a **non-linear digital filtering technique**, often used to **remove noise** from an image or signal. Such noise reduction is a typical pre-processing step to improve the results of later processing (for example, edge detection on an image). Median filtering is very widely used in digital image processing because, under certain conditions, it **preserves edges while removing noise**.

2.

Perform median filter of size 3x3 on the following image J, with 1x1 padded border of 0

$$J = \begin{bmatrix} 102 & 125 & 128 & 119 & 110 & 130 \\ 140 & 145 & 148 & 153 & 167 & 170 \\ 130 & 154 & 172 & 132 & 159 & 132 \\ 125 & 110 & 125 & 110 & 125 & 175 \\ 164 & 170 & 132 & 142 & 173 & 150 \end{bmatrix}$$