

1) Is the Kernel separable $K = \begin{bmatrix} 1 & 2 & 3 & 2 & 1 \\$

$\begin{bmatrix} 2 & 4 & 6 & 3 & 2 \\$

$\begin{bmatrix} 3 & 6 & 9 & 6 & 3 \\$

$\begin{bmatrix} 2 & 4 & 6 & 3 & 2 \\$

$\begin{bmatrix} 1 & 2 & 3 & 2 & 1 \end{bmatrix}]$

2) Rank of kernel K

3) Find the determinant of K

1) No; if $x = [1 \ 2 \ 3 \ 2 \ 1].T$, $K = XX^t$; 2) 1. 3) 0

For a 3x3, 4 bit gray scale image [[4 5 6] [7 2 4] [0 3 2]], after applying the linear contrast stretching, what is the pixel value at location (1,1).

Solution:

4 bit grey scale min = 0 max = 15, Image min = 1 and Image max = 7

$$(2 - 1) (15-0/7-1) + (0)$$

2) If the image $I = \begin{bmatrix} 2 & -3 & 4 \\ 7 & -8 & 5 \\ 1 & 0 & 7 \end{bmatrix}$ is using the 2's complement representation, find the contrast of the I in the same format.

Solution:

For contrast in 2's complement map $(7, -8) (6, -7) (5, -6) (4, -5) (3, -4) (2, -3), (1, -2)$ and $(0, -1)$

4) Which of the following is the local, global and point operation on Image I and why ?

a) Convolution with kernel 3x3 b) cross correlation with the 1x1 kernel c) Fourier Transform of the Image

d) Schur Product with another Image I1 e) Flip the Image Upside Down

A) local B) point C) global d) point e) Global

5) For a key point localization method in SIFT, we get the following Hessian matrix H for a particular candidate point, is this point can be accepted, if the threshold is 0.3?

$$H = \begin{bmatrix} 6 & 3 \\ 1 & 4 \end{bmatrix}$$

Sol: Reject the key point as $\text{Trace}/\text{det} > \text{thr}$

Map the following operations from set A to the set B

A = {histogram equalization, Cross Correlation, Gaussian kernel}

B = {local operation, contrastive stretching, low pass filter}

Solution

histogram equalization -> contrastive stretching

Cross Correlation - > local operation

Gaussian kernel -> low pass filter