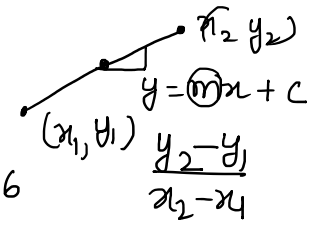
Contrast Stretching

11 July 2022 09:28

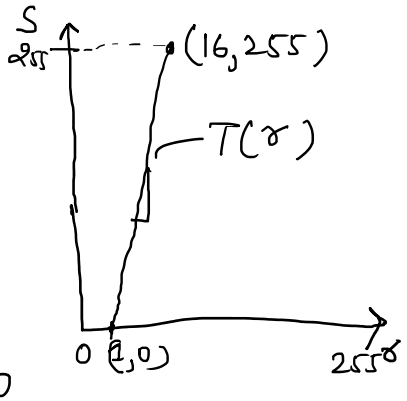
1. A 3 x 3 8 bits/pixel image is given by

7	12	8
16	9	6
10	15	1

Apply contrast stretch to the image so that the new image has a dynamic range of [0, 255]. Also show the output image. Sketch the transformation you used for contrast stretching.



$r_{min} = 1 \quad r_{max} = 16$



Sol.

$$S = \left(\frac{S_{max} - S_{min}}{r_{max} - r_{min}}\right)(r - r_{min}) + S_{min}$$

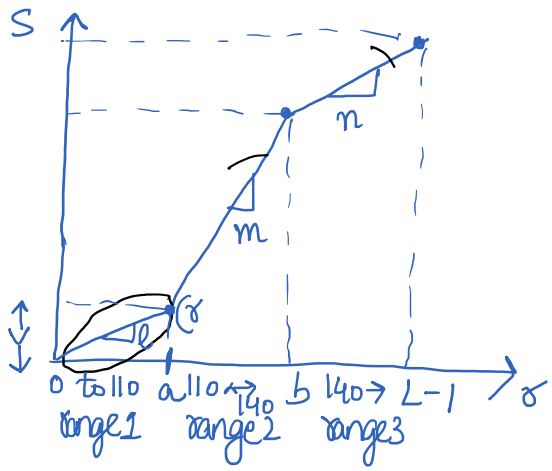
$140 - 70$ over $15 - 1$; $70 - 140$; 70

r	S
7	$\left(\frac{255-0}{16-1}\right) \times (7-1) + 0 = \frac{255}{15} \times 6 = 102$
12	$\frac{255}{15} \times 11 = 187$
8	$255/15 \times 7 = 119$
16	$17 \times 15 = 255$
9	$17 \times 8 = 136$
6	$17 \times 5 = 85$
10	$17 \times 9 = 153$
15	$17 \times 14 = 238$
1	$17 \times 0 = 0$

o/p image

102	187	119
255	136	85
153	238	0

→ For piecewise contrast stretching



$S = l \cdot r \qquad 0 \le r < a$

$S = m \cdot (r - a) + v \qquad a \le r < b$

$S = n \cdot (r - b) + w \qquad b \le r < L-1$

for range 1

$$S = \frac{S_{max1} - S_{min1}}{r_{max1} - r_{min1}} \times (r - r_{min1}) + S_{min1}$$