Histogram Processing: Equalization

- Intensity image (3 bits): [0-7]
- Image size = 64x64 = 4096

Step 1: Compute the discrete PDF (histogram)

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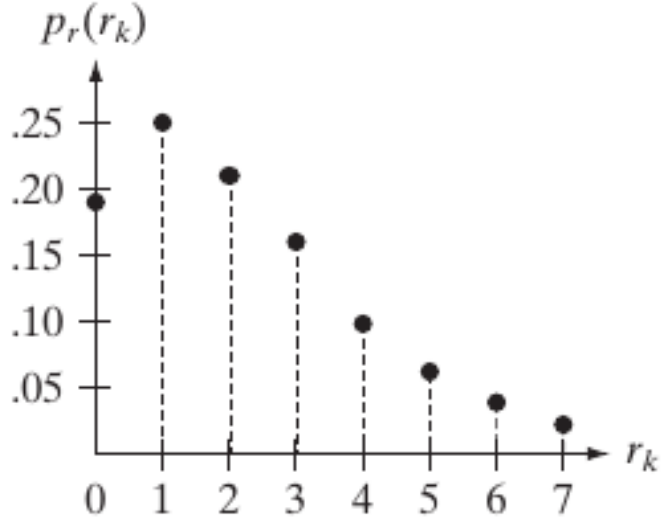
r_k	n_k	$p_r(r_k) = n_k/MN$
$r_0 = 0$	790	0.19
$r_1 = 1$	1023	0.25
$r_2 = 2$	850	0.21
$r_3 = 3$	656	0.16
$r_4 = 4$	329	0.08
$r_5 = 5$	245	0.06
$r_6 = 6$	122	0.03
$r_7 = 7$	81	0.02



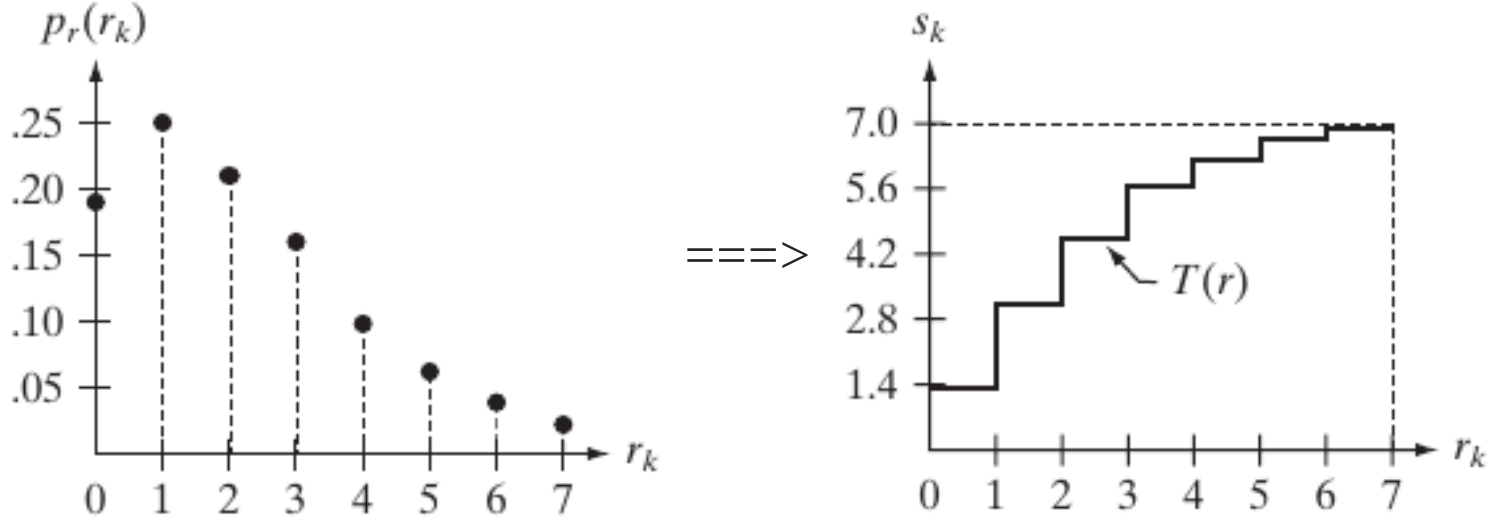
Histogram Processing: Equalization (cont'd)

Step 2: Compute the discrete CDF (cumulative histogram)

i	accumulative	accumulative x 7	rounded
s0	0.19	1.33	1
s1	0.44	3.08	3
s2	0.65	4.55	5
s3	0.81	5.67	6
s4	0.89	6.23	6
s5	0.95	6.65	7
s6	0.98	6.86	7
s7	1.00	7.00	7

Histogram Processing: Equalization (cont'd)

Step 2: Compute the discrete CDF (cumulative histogram)



Histogram Processing: Equalization (cont'd)

Step 3: Use the previous table to map the pixels values

Histogram Processing: Equalization (cont'd)

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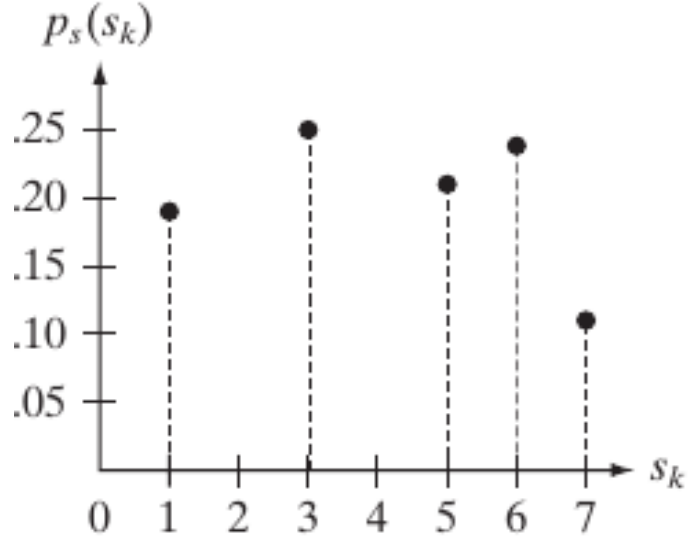

Histogram Processing: Matching

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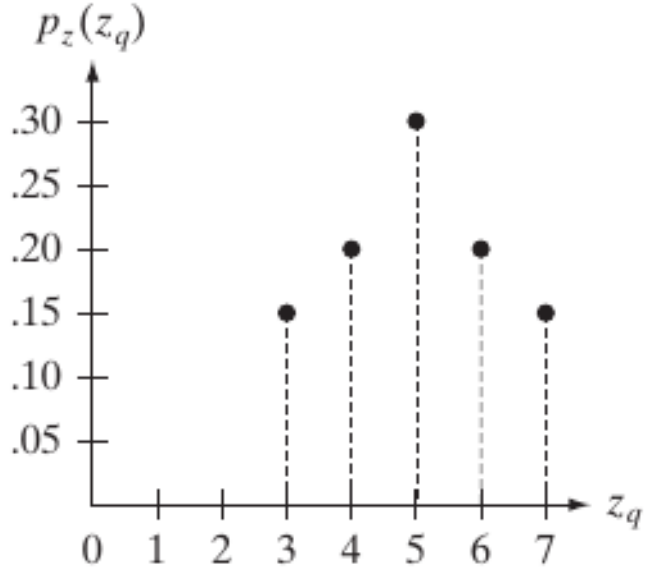
- Obtain an image with an **arbitrary distribution** instead of a uniform distribution

Histogram Processing: Matching

- Intensity image (3 bits): [0-7]
- Image size = 64x64 = 4096
- Obtain an image with an **arbitrary distribution** instead of a uniform distribution
- Target distribution



Histogram Processing: Matching (cont'd)

Step 1: Obtain the scaled histogram equalized values (previous example)

- `s0` = 1 `s1` = 3 `s2` = 5 `s3` = 6
- `s4` = 7 `s5` = 7 `s6` = 7 `s7` = 7

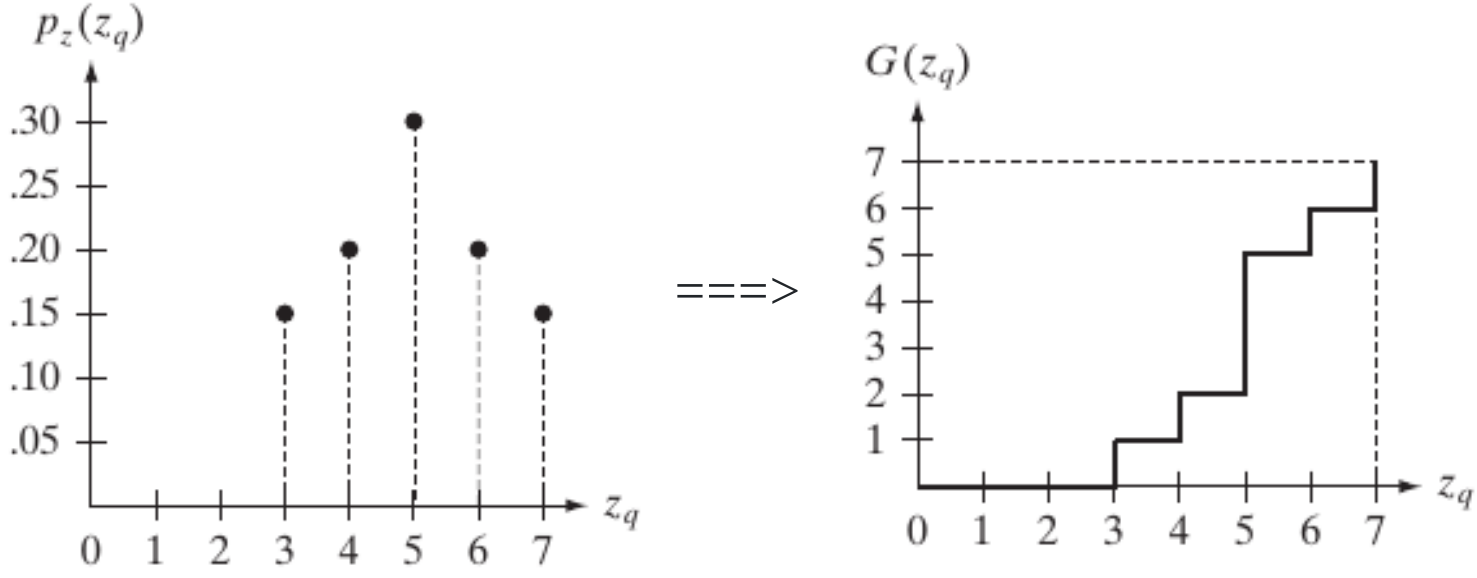
Histogram Processing: Matching (cont'd)

Step 2: compute the discrete CDF of the target distribution

`i`	accumulative x 7	rounded
`z0`	0.00	0
`z1`	0.00	0
`z2`	0.00	0
`z3`	1.05	1
`z4`	2.45	2
`z5`	4.55	5
`z6`	5.95	6
`z7`	7.00	7

Histogram Processing: Matching

Step 2: compute the discrete CDF of the target distribution

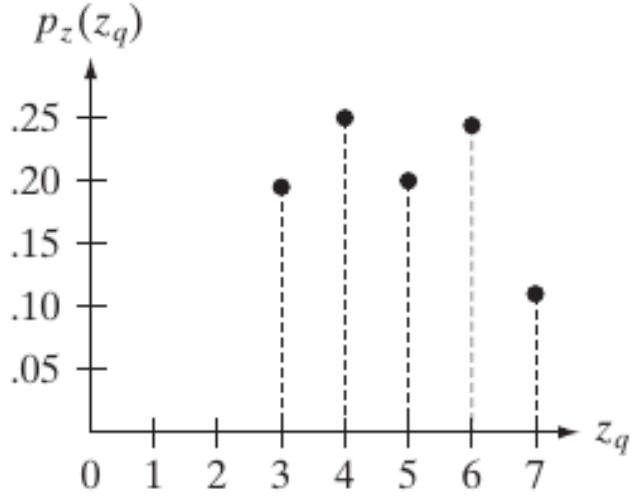


Histogram Processing: Matching

Step 3: use the previous table to map the pixels values

Histogram Processing: Matching

Step 3: use the previous table to map the pixels values



Histogram Processing: Demo

{histograms.ipnyb}

Filtration in Frequency Domain: Demo

{frequency_filter.ipnyb}