Aula 3c – Transformações de intensidade

Prof. João Fernando Mari
joaof.mari@ufv.br

Equalização de histograma

Imagem original:

	0	1	2	3	4
0	1	2	2	3	1
1	1	3	3	4	2
2	1	2	3	3	2
3	0	2	2	3	2
4	0	0	1	1	1

5 x 5 pixels = 25 pixels
3 bits ou 2^3 = 8 níveis de cinza (L).
Intervalo de níveis de cinza: [0, 7]

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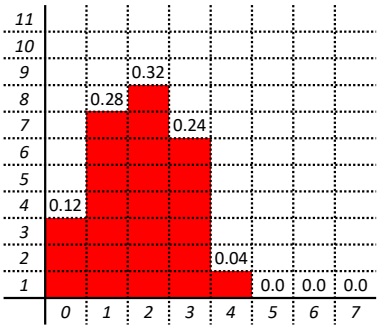
Histograma normalizado:



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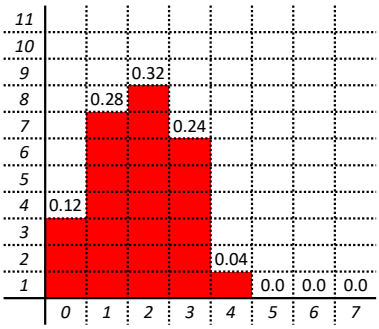
Intervalo de níveis de cinza: [0, 7]

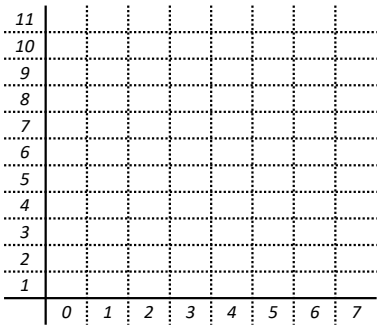
Imagem processada:

	0	1	2	3	4
0	0	0	0	0	0
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0

Histograma normalizado:



Histograma normalizado:



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Intervalo de níveis de cinza: [0, 7]

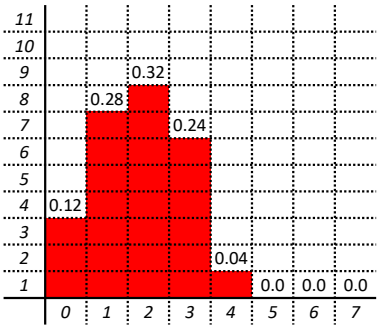
$$s_k = T(r_k) = L - 1 \sum_{j=0}^{k} p_r(r_j)$$

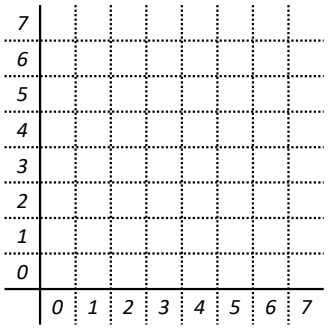
k	p'	$s_k=T(r_k)$
0		
1		
2		
3		
4		
5		
6		
7		

Imagem processada:

	0	1	2	3	4
0	0	0	0	0	0
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0

Histograma normalizado:





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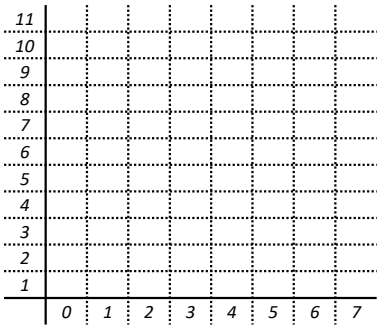

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3 bits ou 2^3 = 8 níveis de cinza (L).
Intervalo de níveis de cinza: [0, 7]

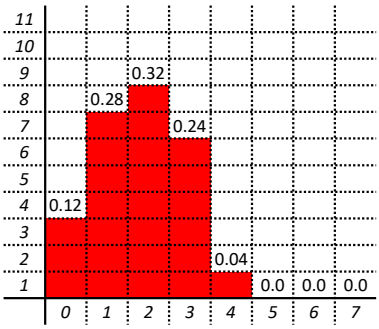
$$s_k = T(r_k) = L - 1 \sum_{j=0}^{k} p_r(r_j)$$

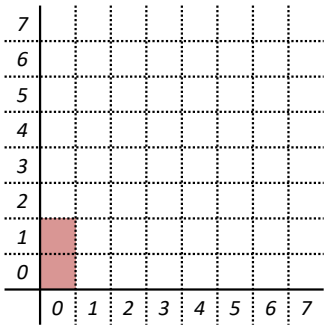
k	p'	$s_k=T(r_k)$
0	7 × (0.12) = 0.84	= 1
1		
2		
3		
4		
5		
6		
7		

Imagem processada:

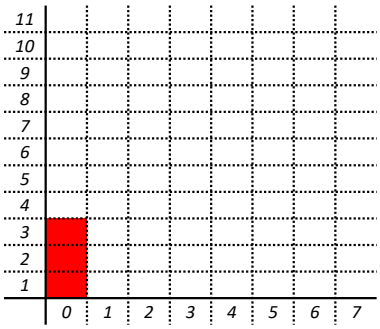
	0	1	2	3	4
0	0	0	0	0	0
1	0	0	0	0	0
2	0	0	0	0	0
3	1	0	0	0	0
4	1	1	0	0	0

Histograma normalizado:





Histograma normalizado:



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Intervalo de níveis de cinza: [0, 7]

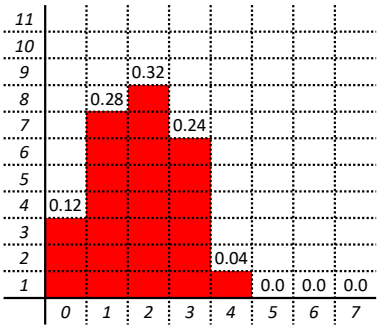
$$s_k = T(r_k) = L - 1 \sum_{j=0}^{k} p_r(r_j)$$

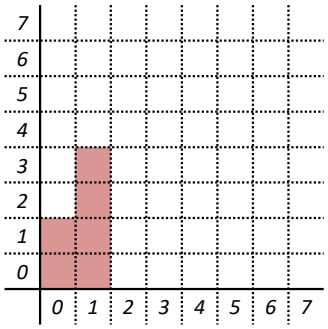
k		p'	$s_k=T(r_k)$
0	7 × (0.12)	= 0.84	= 1
1	7 × (0.12 + 0.28)	= 2.80	= 3
2			
3			
4			
5			
6			
7			

Imagem processada:

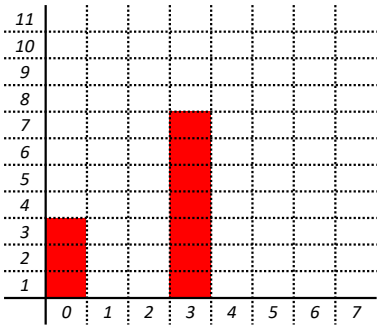
	0	1	2	3	4
0	3	0	0	0	3
1	3	0	0	0	0
2	3	0	0	0	0
3	1	0	0	0	0
4	1	1	3	3	3

Histograma normalizado:





Histograma normalizado:



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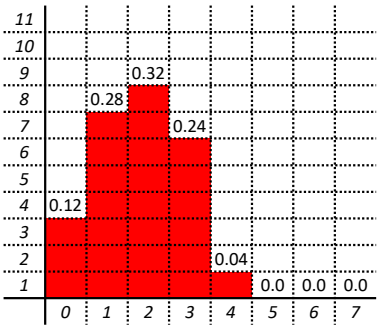
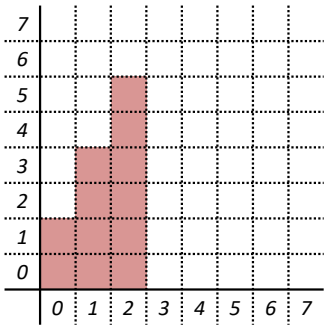
0	7 × (0.12)	= 0.84	= 1
1	7 × (0.12 + 0.28)	= 2.80	= 3
2	7 × (0.12 + 0.28 + 0.32)	= 5.04	= 5
3			
4			
5			
6			
7			

Imagem processada:

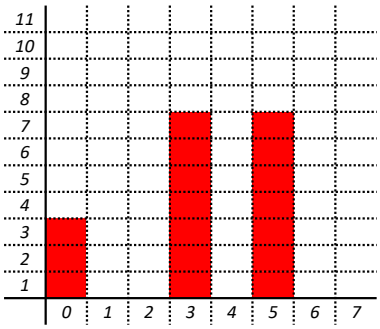
	0	1	2	3	4
0	3	5	5	0	3
1	3	0	0	0	5
2	3	5	0	0	5
3	1	5	5	0	5
4	1	1	3	3	3

Histograma normalizado:





Histograma normalizado:



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1	7 × (0.12 + 0.28)	= 2.80	= 3
2	7 × (0.12 + 0.28 + 0.32)	= 5.04	= 5
3	7 × (0.12 + 0.28 + 0.32 + 0.24)	= 6.72	= 7
4			
5			
6			
7			

Imagem processada:

	0	1	2	3	4
0	3	5	5	7	3
1	3	7	7	0	5
2	3	5	7	7	5
3	1	5	5	7	5
4	1	1	3	3	3

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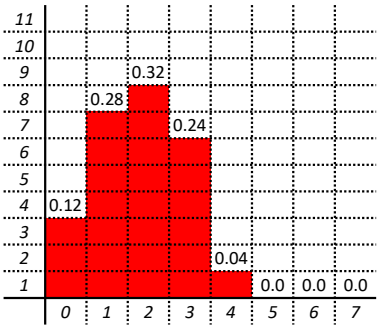

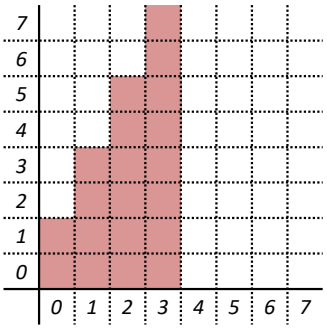

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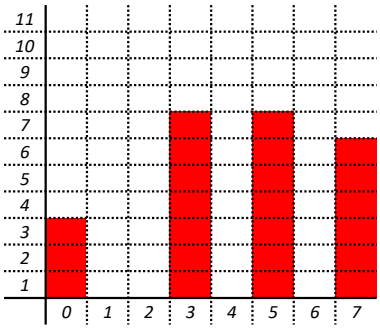

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4	7 × (0.12 + 0.28 + 0.32 + 0.24 + 0.04)	= 7.00	= 7
5			
6			
7			

Imagem processada:

	0	1	2	3	4
0	3	5	5	7	3
1	3	7	7	7	5
2	3	5	7	7	5
3	1	5	5	7	5
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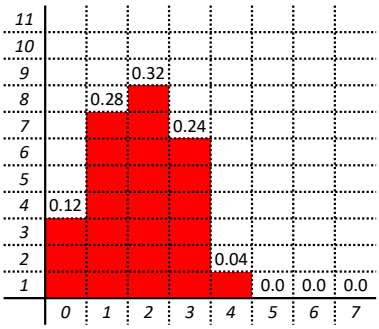

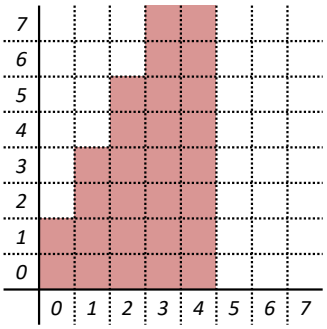

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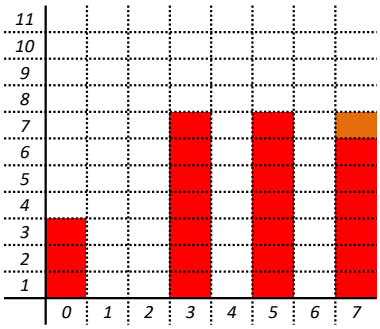

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4	7 × (0.12 + 0.28 + 0.32 + 0.24 + 0.04)	= 7.00	= 7
5	7 × (0.12 + 0.28 + 0.32 + 0.24 + 0.04 + 0)	= 7.00	= 7
6			
7			

Imagem processada:

	0	1	2	3	4
0	3	5	5	7	3
1	3	7	7	7	5
2	3	5	7	7	5
3	1	5	5	7	5
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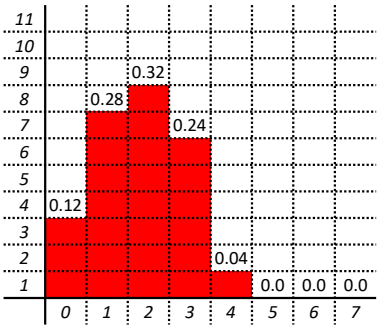

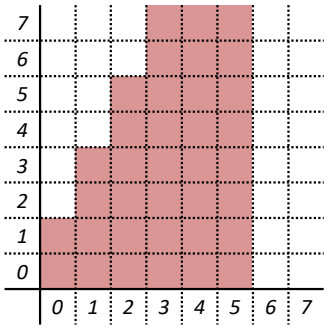

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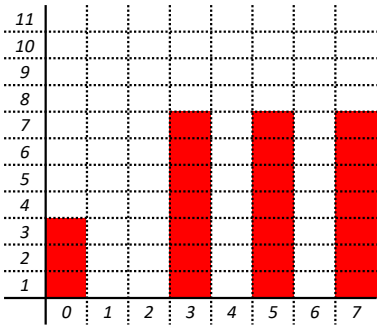

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4	7 × (0.12 + 0.28 + 0.32 + 0.24 + 0.04)	= 7.00	= 7
5	7 × (0.12 + 0.28 + 0.32 + 0.24 + 0.04 + 0)	= 7.00	= 7
6	7 × (0.12 + 0.28 + 0.32 + 0.24 + 0.04 + 0 + 0)	= 7.00	= 7
7			

Imagem processada:

	0	1	2	3	4
0	3	5	5	7	3
1	3	7	7	7	5
2	3	5	7	7	5
3	1	5	5	7	5
4	1	1	3	3	3

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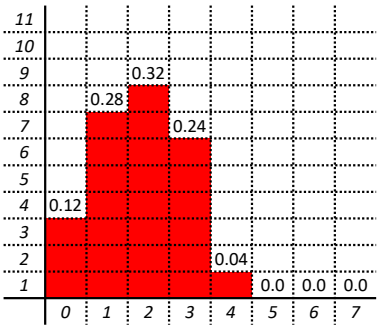
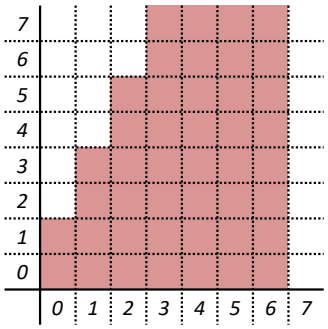
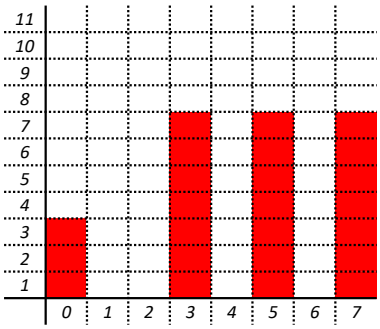




Histograma normalizado:



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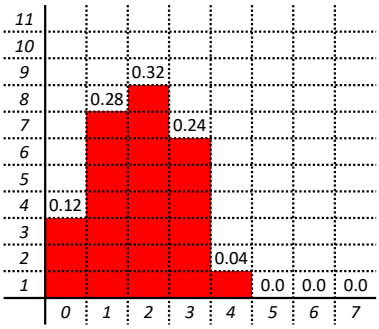
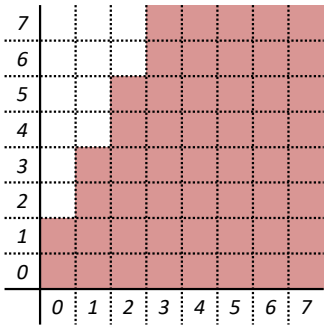
4	7 × (0.12 + 0.28 + 0.32 + 0.24 + 0.04)	= 7.00	= 7
5	7 × (0.12 + 0.28 + 0.32 + 0.24 + 0.04 + 0)	= 7.00	= 7
6	7 × (0.12 + 0.28 + 0.32 + 0.24 + 0.04 + 0 + 0)	= 7.00	= 7
7	7 × (0.12 + 0.28 + 0.32 + 0.24 + 0.04 + 0 + 0)	= 7.00	= 7

Imagem processada:

	0	1	2	3	4
0	3	5	5	7	3
1	3	7	7	7	5
2	3	5	7	7	5
3	1	5	5	7	5
4	1	1	3	3	3

Histograma normalizado:





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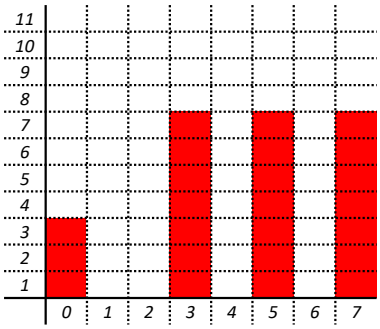


Equalização de histograma

Imagem original:

	0	1	2	3	4
0	1	2	2	3	1
1	1	3	3	4	2
2	1	2	3	3	2
3	0	2	2	3	2
4	0	0	1	1	1

5 x 5 pixels = 25 pixels
3 bits ou $2^3 = 8$ níveis de cinza (L).
Intervalo de níveis de cinza: [0, 7]

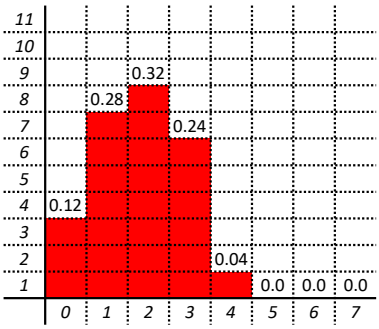
$$s_k = T(r_k) = L - 1 \sum_{j=0}^{k} p_r(r_j)$$

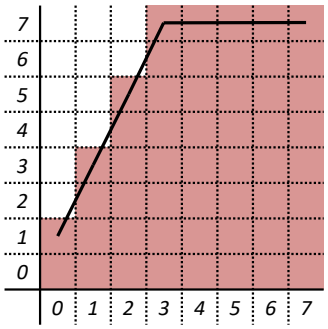
k		p'	$s_k = T(r_k)$
0	7 × (0.12)	= 0.84	= 1
1	7 × (0.12 + 0.28)	= 2.80	= 3
2	7 × (0.12 + 0.28 + 0.32)	= 5.04	= 5
3	7 × (0.12 + 0.28 + 0.32 + 0.24)	= 6.72	= 7
4	7 × (0.12 + 0.28 + 0.32 + 0.24 + 0.04)	= 7.00	= 7
5	7 × (0.12 + 0.28 + 0.32 + 0.24 + 0.04 + 0)	= 7.00	= 7
6	7 × (0.12 + 0.28 + 0.32 + 0.24 + 0.04 + 0 + 0)	= 7.00	= 7
7	7 × (0.12 + 0.28 + 0.32 + 0.24 + 0.04 + 0 + 0)	= 7.00	= 7

Imagem processada:

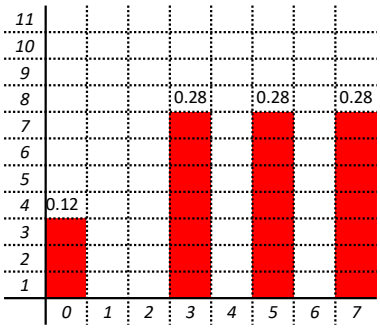
	0	1	2	3	4
0	3	5	5	7	3
1	3	7	7	7	5
2	3	5	7	7	5
3	1	5	5	7	5
4	1	1	3	3	3

Histograma normalizado:





Histograma normalizado:



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Disponível para download no site do autor (Exclusivo para uso pessoal)

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Seções 3.3

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Seção 3.2

FIM