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# Classification of Hyperspectral Data From Urban Areas Based on Extended Morphological Profiles

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# Proposta

- pré-processamento de imagens hiperespectrais
- Transformações morfológicas

# Motivação

- Paper de 2005
- Dados hiperespectrais
- Imagens de grande resolução espacial
- método espectral/espacial

# Operações Morfológicas

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- Operações básicas:  
*Erosão e Dilatação*
- Elemento Estruturante
- Combinação de operações básicas  
*Abertura e Fechamento*
- Abertura e Fechamento por reconstrução

# Elemento Estruturante

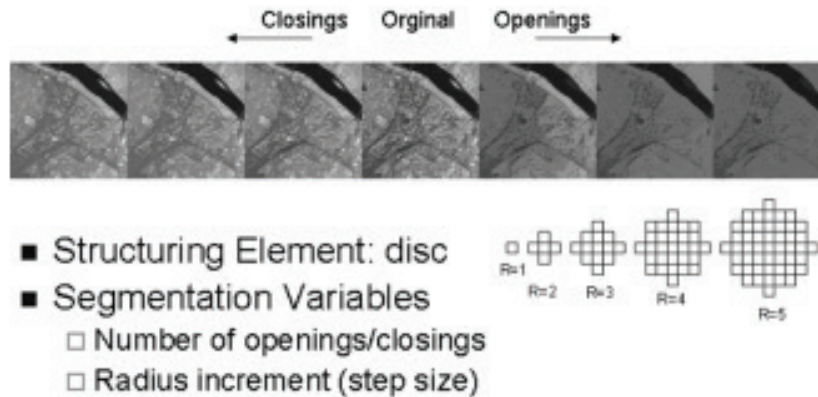
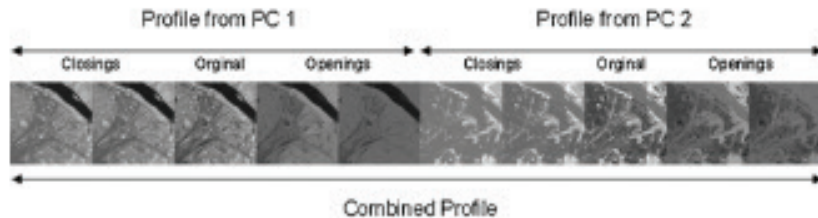
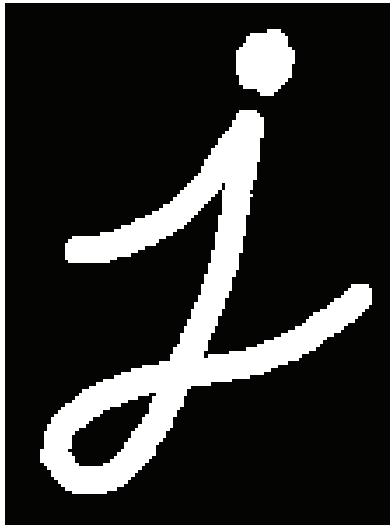


Fig. 1. Morphological profile based on a circular structuring element, three openings, and three closings. In the shown profile, circular structural elements with  $R = 2, 4$ , and  $6$  were used.



# Erosão



# Dilatação



# Abertura

*Erosão + Dilatação*





# Fechamento

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*Dilatação + Erosão*



# Abertura e Fechamento por reconstrução

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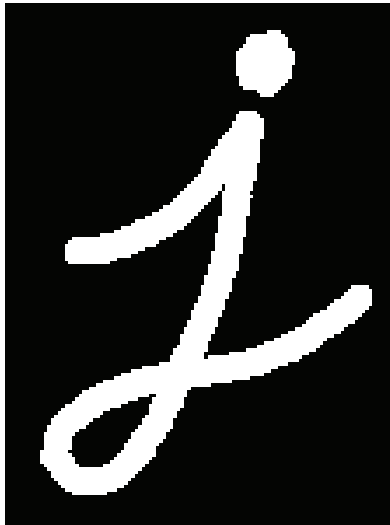
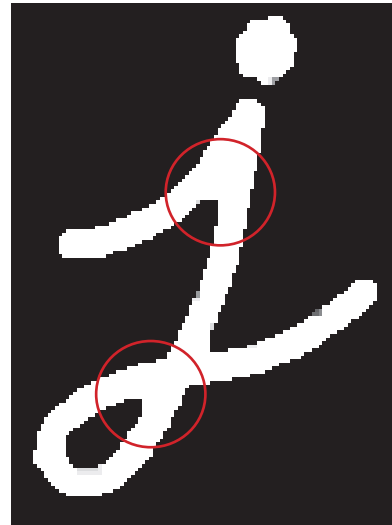


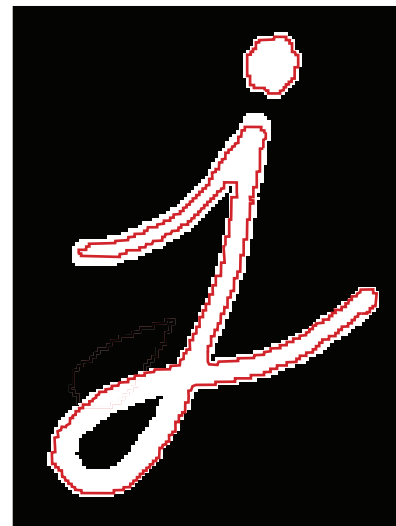
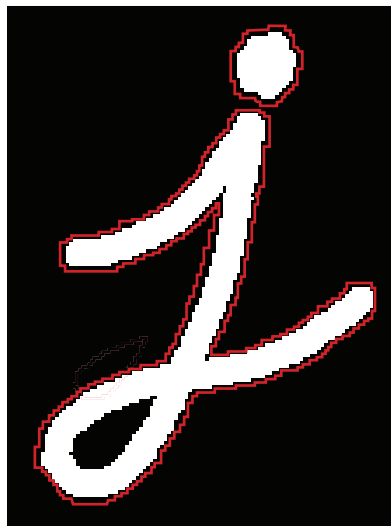
Imagem Original



Fechamento

# Abertura e Fechamento por reconstrução

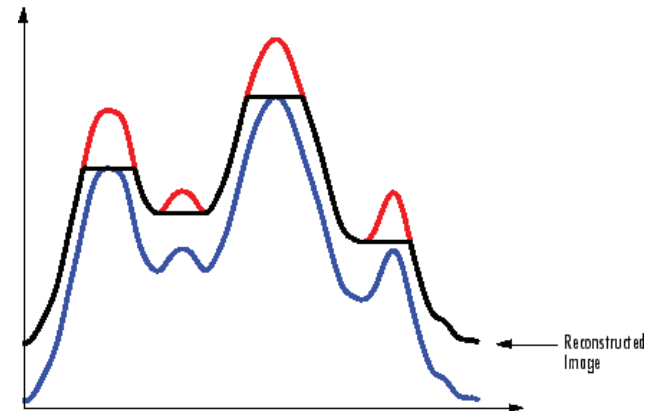
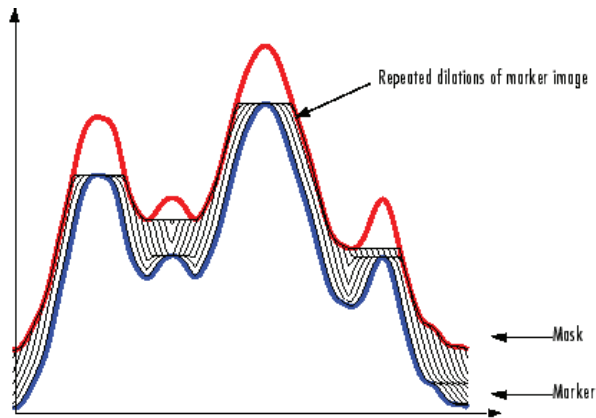
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-máscara

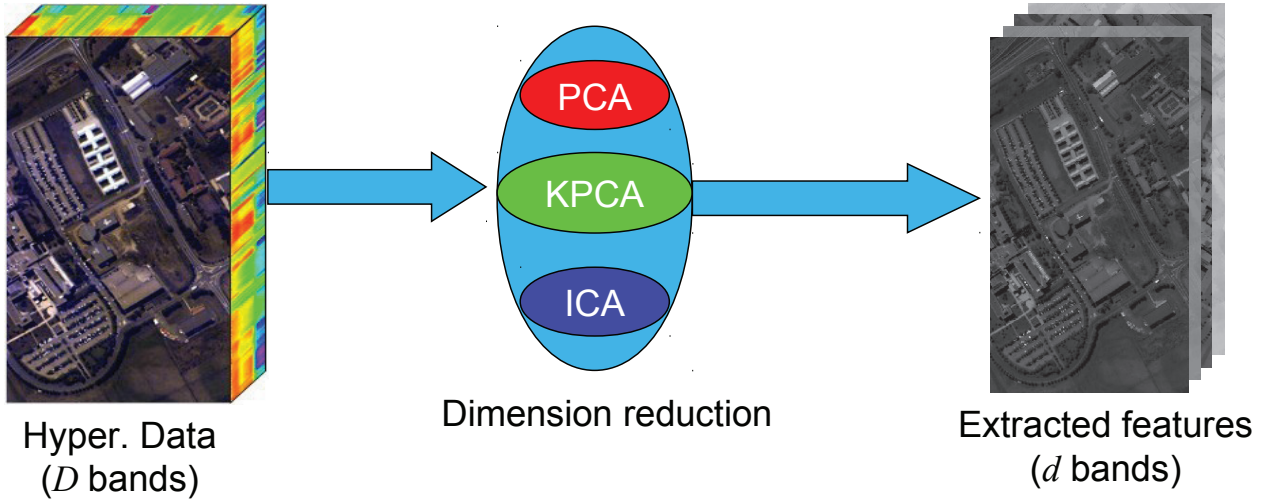
# Abertura e Fechamento por Reconstrução

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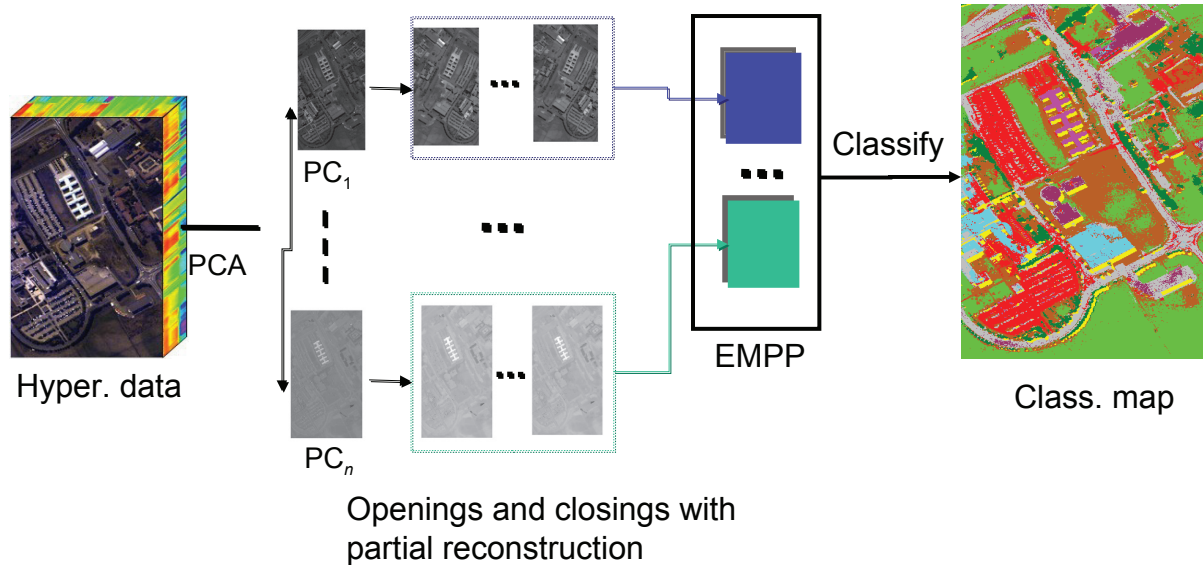
# Redução de Dimensionalidade

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# Extração de Características

Take features extracted by PCA as an example to build extended morphological profile with partial reconstruction



# Resultados e Conclusão

TABLE VI  
PAVIA DATA. CLASS-SPECIFIC TEST ACCURACIES IN PERCENTAGE FOR NEURAL NETWORK CLASSIFICATION OF MORPHOLOGICAL PROFILES

Index	Name	PC1	Morphological Profile Based on PC1	Morphological Profile Based on PC1 and PC2	Morphological Profile Based on PC1 and PC2 with DAFE	Morphological Profile Based on PC1 and PC2 with DBFE	Morphological Profile Based on PC1 and PC2 with NWFE
1	Shadows	100.0	100.0	100.0	100.0	100.0	100.0
2	Roofs	0.0	25.9	93.4	82.2	70.0	82.5
3	Parking lots	0.0	94.5	92.8	0.0	84.6	89.0
4	Asphalt	0.0	2.5	88.8	55.6	77.4	68.8
5	Trees	0.0	82.2	95.8	91.8	79.4	94.6
6	Meadow	0.0	94.0	100.0	86.4	89.4	97.7
7	Soil	94.0	89.8	79.0	86.5	74.8	86.4
8	Bitumen	96.1	85.7	81.5	73.3	74.5	82.3
9	Water	0.0	84.3	68.6	70.4	66.7	87.4
	AVE	32.2	62.8	89.1	62.2	79.6	87.6
	OA	48.8	72.6	93.9	79.5	83.4	89.4

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Imagens :  
[opencv-python-tutroals.readthedocs.org](http://opencv-python-tutroals.readthedocs.org)  
[www.mathworks.com](http://www.mathworks.com)  
Table VI- paper

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Fim

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