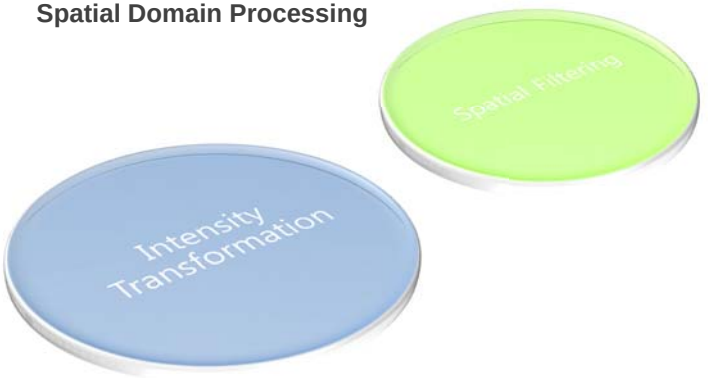
Image Processing

Intensity Transformation and Spatial Filtering (Part II)

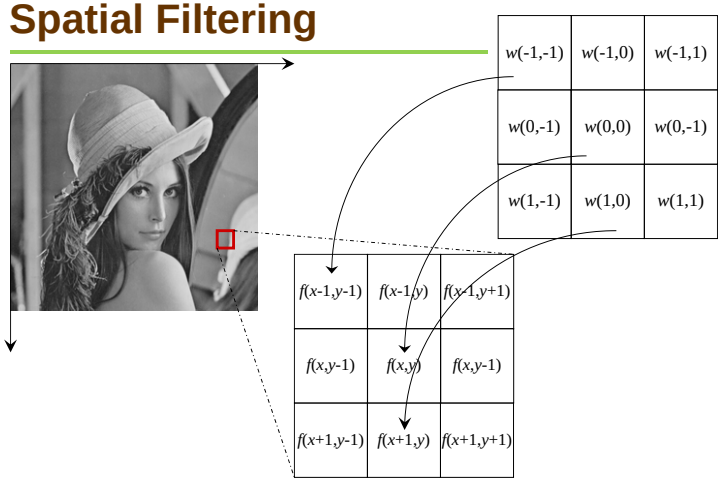
Pattern Recognition and Image Processing Laboratory (Since 2012)

Introduction

Spatial Domain Processing



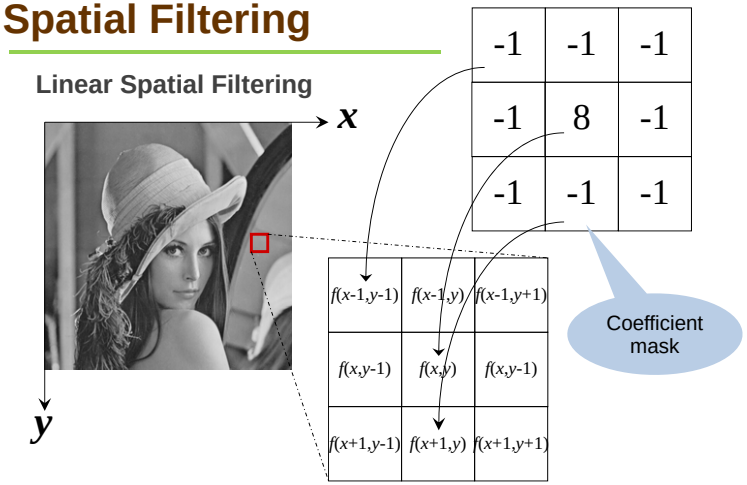
Spatial Filtering



Spatial Filtering

Spatial Filtering

Linear Spatial Filtering



Spatial Filtering

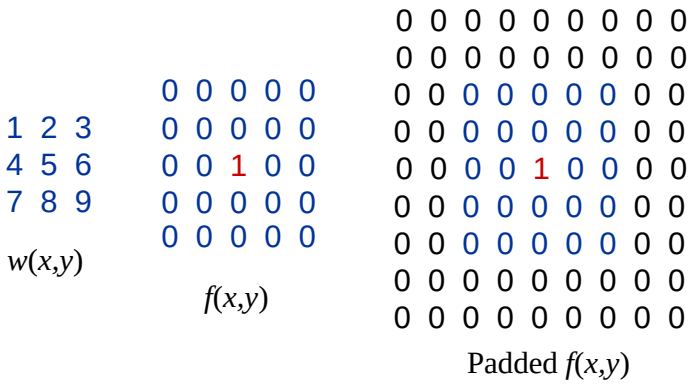
Linear Spatial Filtering

A 2-D linear spatial filter usually has the following properties:

- The mask size is symmetric, such as 3x3, 5x5, 7x7, ...
- The operation of a filter is based on convolution and correlation.

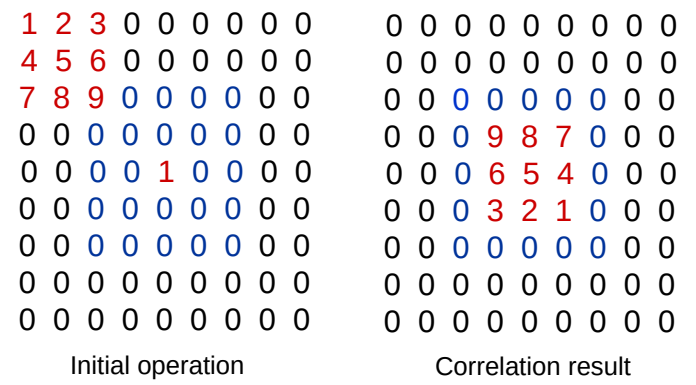
Spatial Filtering

Linear Spatial Filtering: Correlation



Spatial Filtering

Linear Spatial Filtering: Correlation



Spatial Filtering

Linear Spatial Filtering: Convolution

9	8	7	0	0	0	0	0	0
6	5	4	0	0	0	0	0	0
3	2	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	1	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

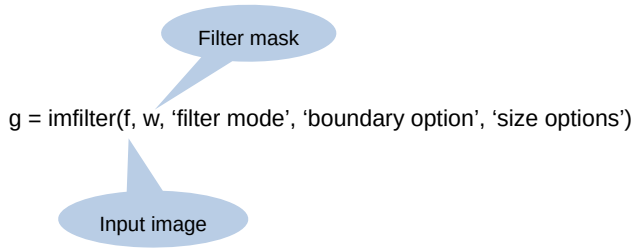
Initial operation

0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	1	2	3	0	0	0
0	0	0	4	5	6	0	0	0
0	0	0	7	8	9	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

Convolution result

Spatial Filtering

The following syntax is used when implementing IPT standard linear spatial filters.



Spatial Filtering

>> ex3_04 % See demonstration

Spatial Filtering

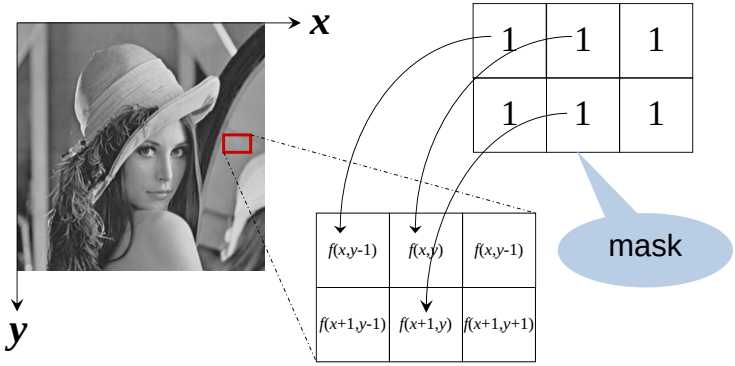
Non-linear Spatial Filtering

A 2-D non-linear spatial filter usually has the following properties:

- The mask size can be both symmetric and asymmetric forms, such as 2x2, 2x3, 3x3, 3x4, 5x7, …
- The operation is directly performed on image pixels.

Spatial Filtering

Non-linear Spatial Filtering



Spatial Filtering

The following syntax is used for implementing generalized non-linear spatial filters.

mask

g = colfilt(f, [m n], 'sliding',@function, parameter)

Input image

Applications of Non-linear Spatial Filtering: Image Enhancement

>> ex3_04 % See demonstration

Applications of Non-linear Spatial Filtering: Noise Filtering

>> ex3_04 % See demonstration


The end of
part II