Visualization and analysis of very large 3D images

Anas Kharboutly
UM2 - Master 2 Informatics - IMAGINA

Sup. By: Gérard Subsol

Montpellier 03.06. 2013

Laboratoire
d'Informatique
de Robotique
et de Microélectronique
de Montpellier
LIRMM

UNIVERSITÉ MONTPELLIER 2
SCIENCES ET TECHNIQUES

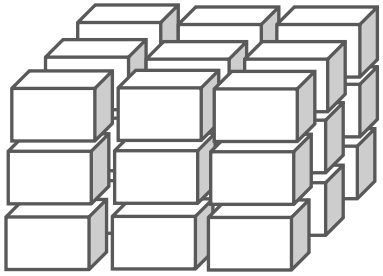
The Main Problem

- Visualization and analysis of very large 3D images
  - Very large 3D images: 2000*2000*2000 voxel
  - Problems:
    - Memory size
    - Time
    - Visualization window

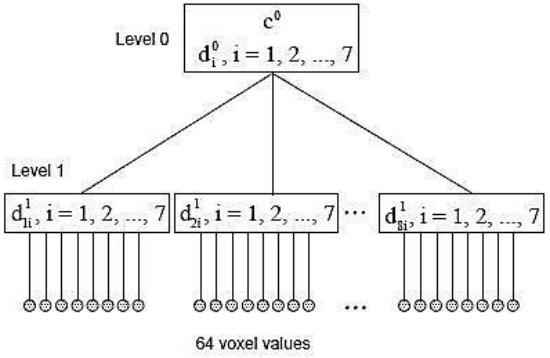
Visualization

Visualization

1. Blocks Decomposition



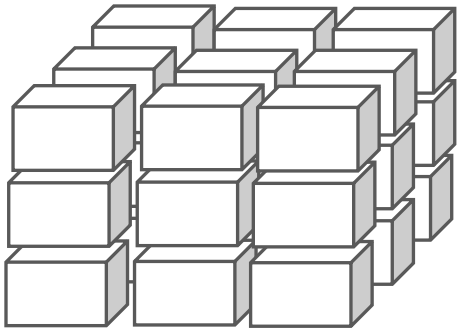
2. Multi–scale coding[*]



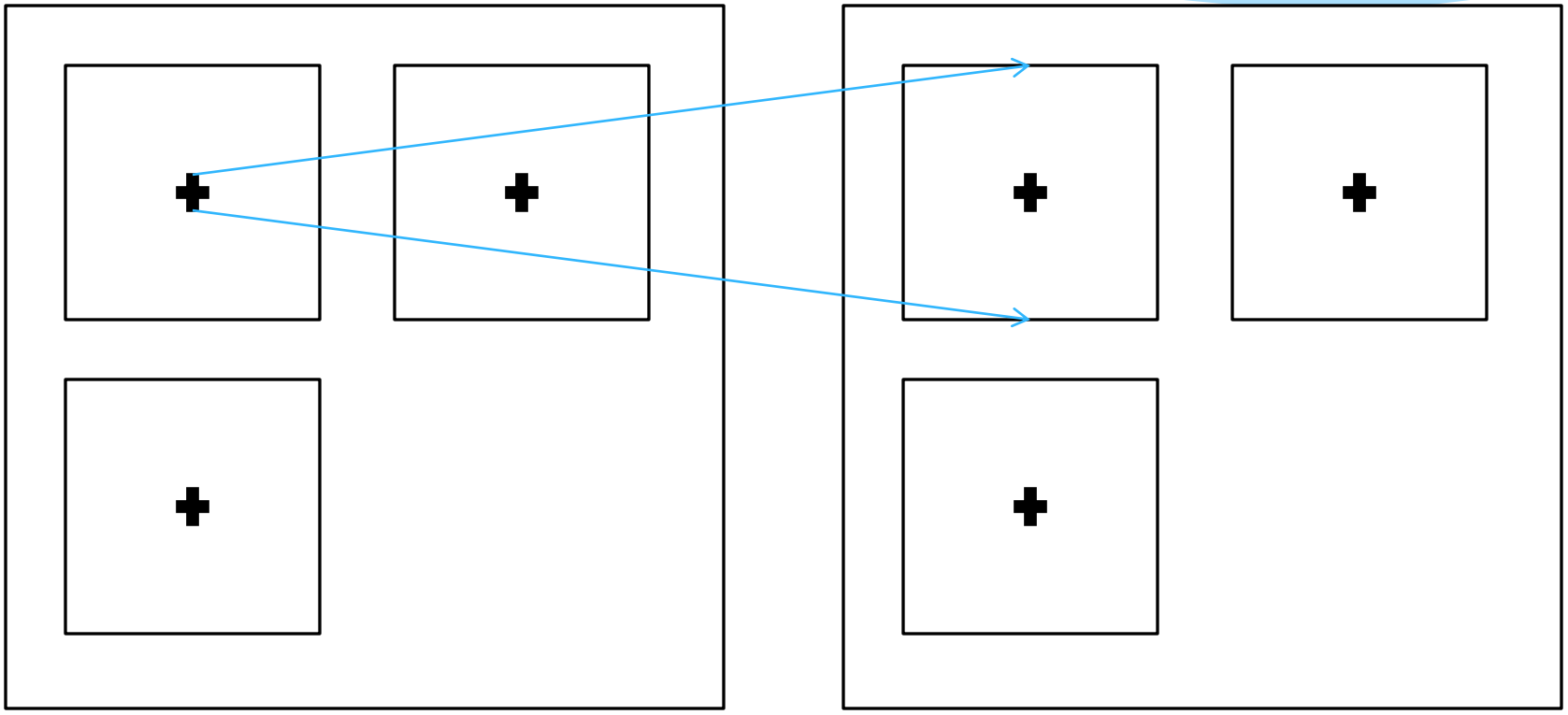
[*] Ihm, I., Park, S.: Wavelet-based 3D compression scheme for very large volume data. In: Graphics Interface .98, 107.116, 1998.

Visualization

1. Blocks Decomposition



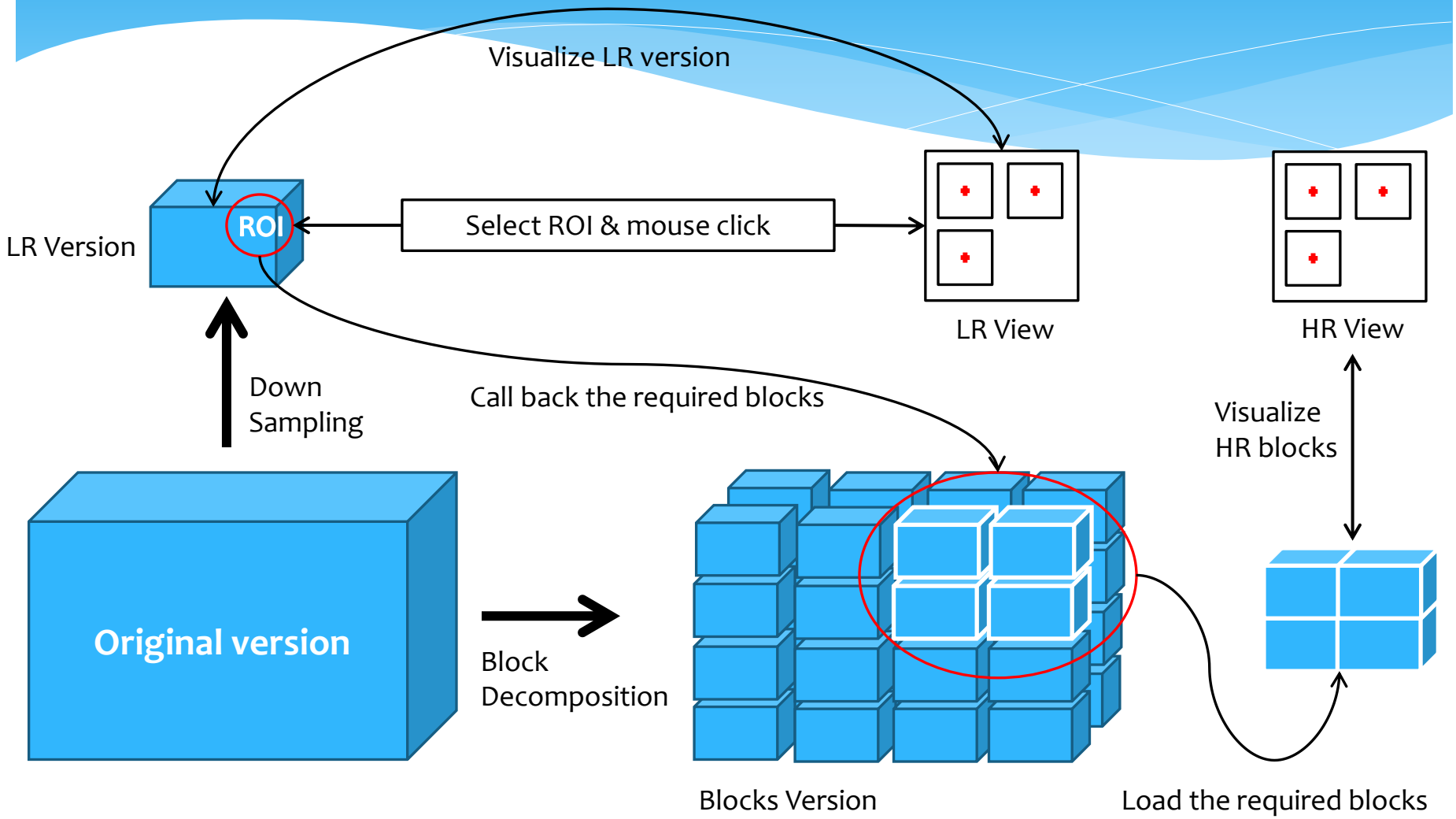
Visualization



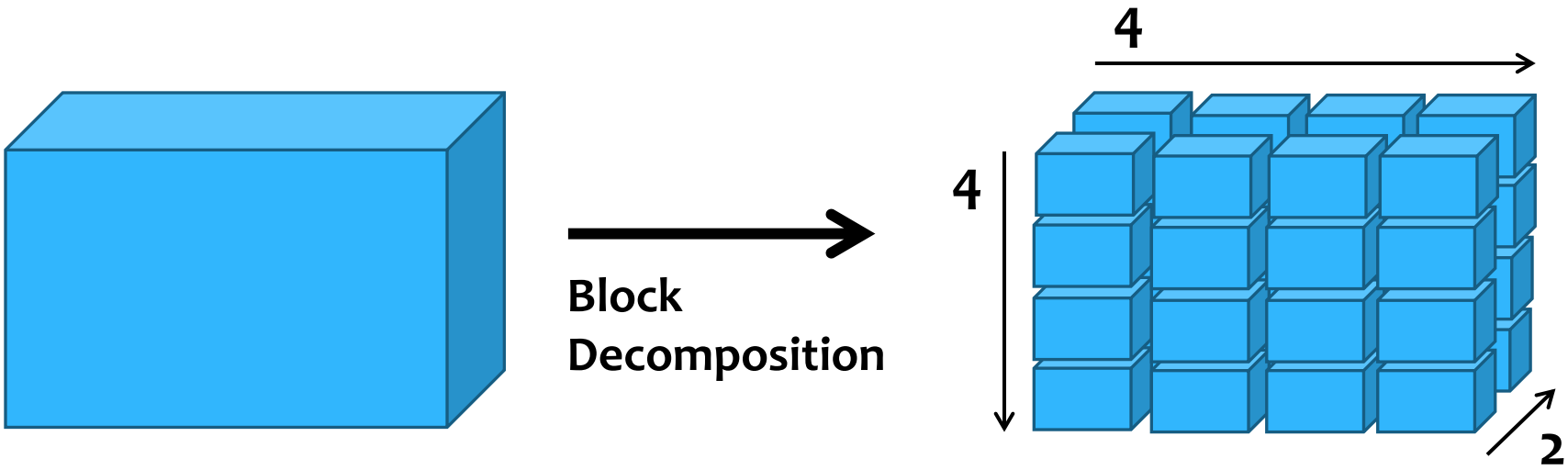
Low Resolution View

High Resolution Zoom View

Visualization



Block Decomposition



Original Version

Blocks Version

Decomposition Factor (4,4,2)

Visualization Parameters

* Decomposition Factor: **Two matters!**

1. Block size & Required memory
2. Number of blocks & Required time

Visualization Parameters

1. Block size & Required memory (2D)

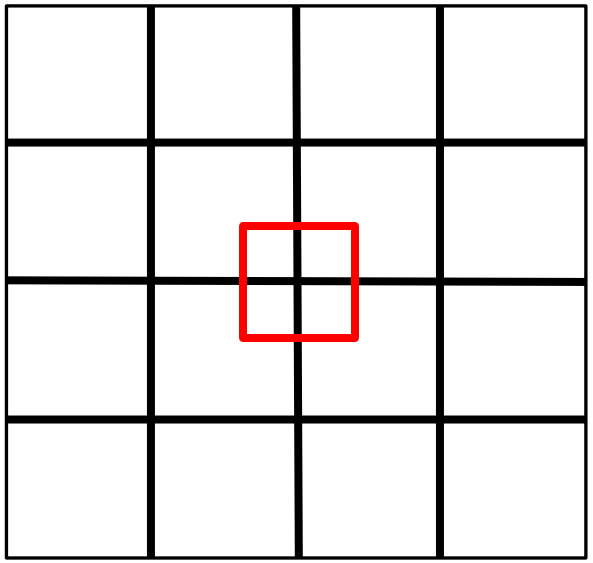
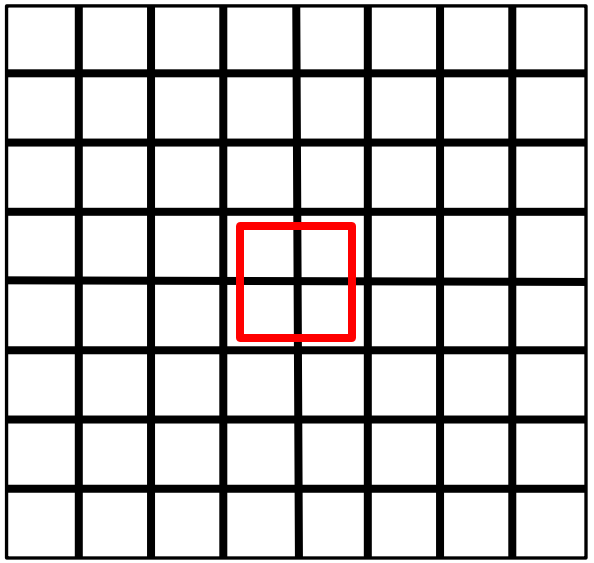


Image size

800 * 800

Window size

100 * 100

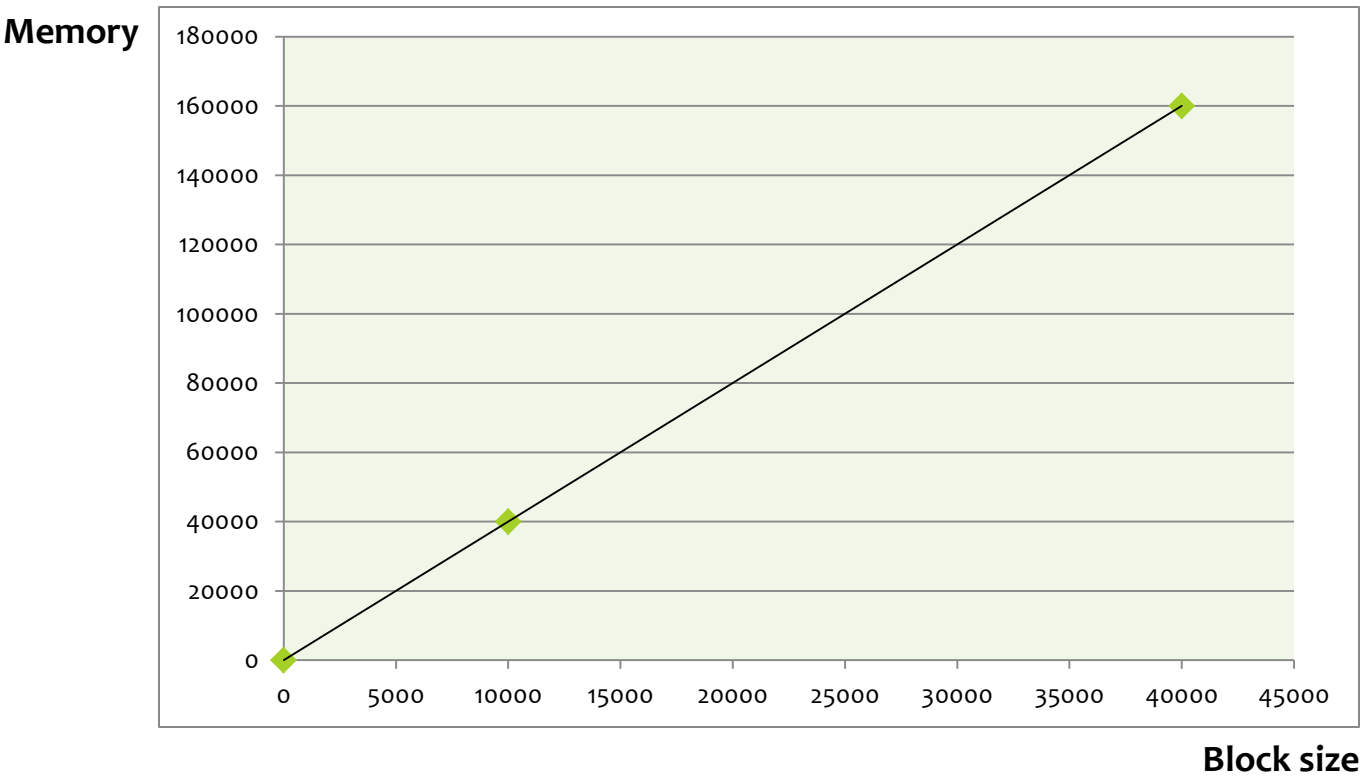


Decomposition Factor (4,4)
Block size: 200 * 200 : 40 000
Required Memory: 4 * (200*200) : 160 000

Decomposition Factor (8,8)
Block size: 100 * 100 : 10 000
Required Memory: 4 * (100*100) : 40 000

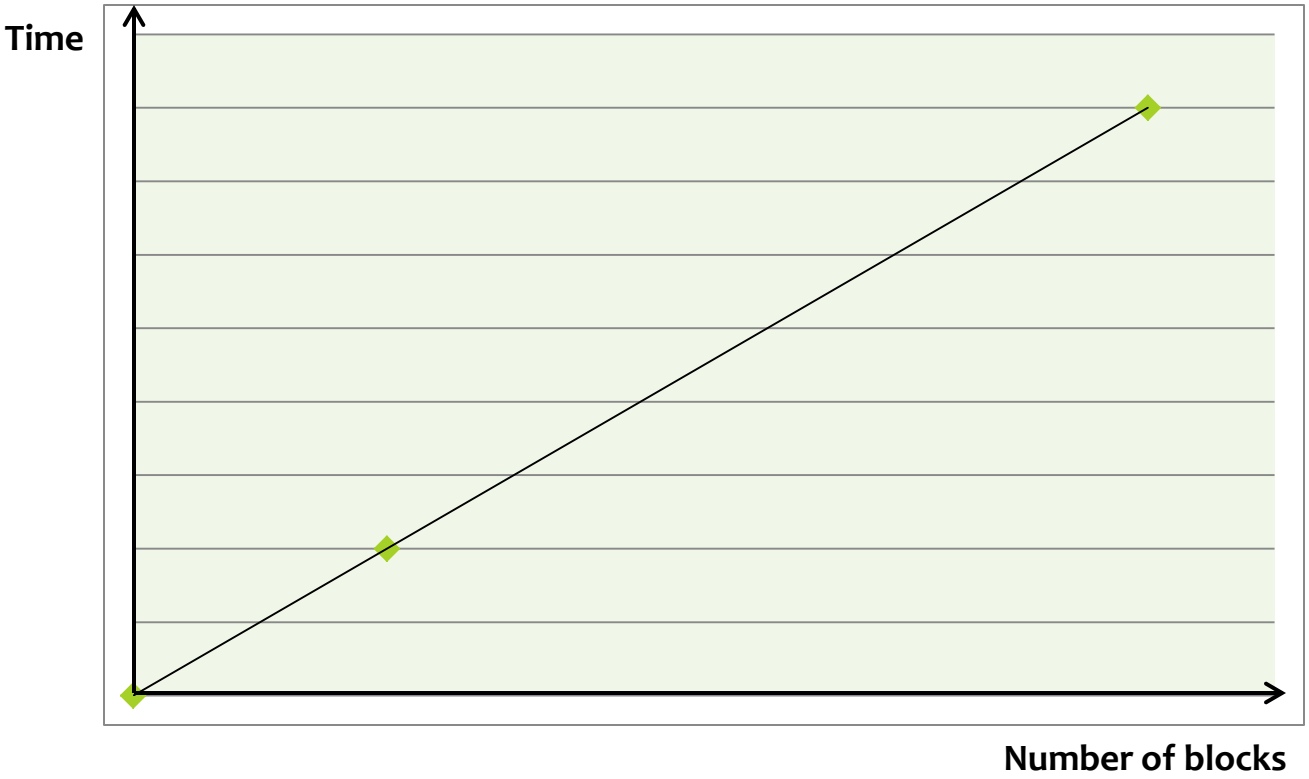
Visualization Parameters

1. Block size & Required memory (2D)



Visualization Parameters

2. Number of blocks & Required time



Visualization Parameters

* Down sampling parameters
  * Down sampling factor along each axis
* Block decomposition parameters
  * Number of blocks along each axis
  * Configuration file (DF, BS, ZS)

Application of Visualization

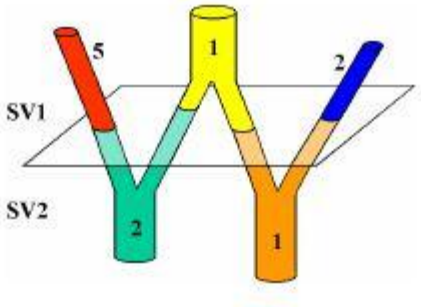
Processing

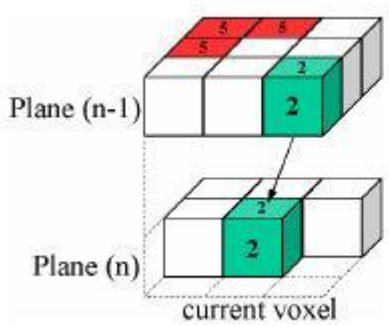
Processing

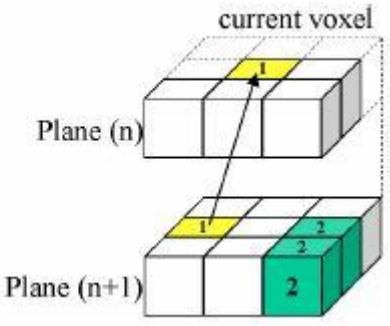
1. Extract the connected components
2. Erosion
3. Dilation
4. Thresholding

Processing

1. Extract the connected components[*]







[*] L.Apostol and F.Peyrin, Connectivity analysis in very large 3D microtomographic images.

Processing

1. Erosion
2. Dilation
3. Thresholding

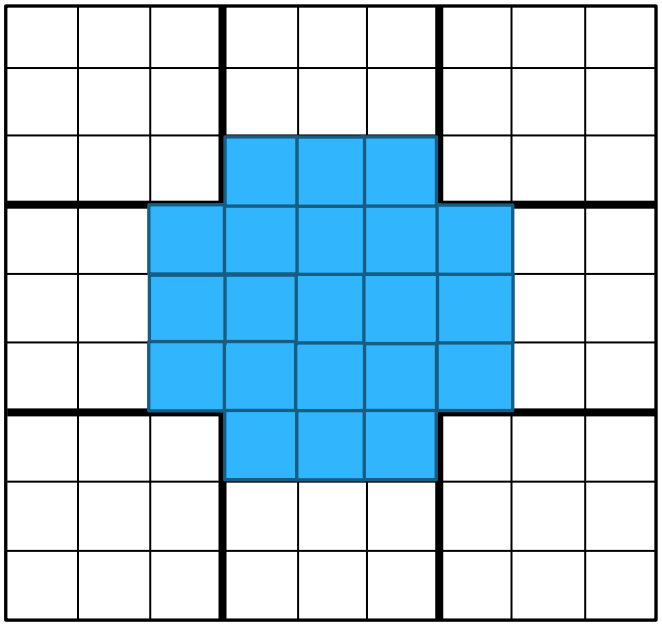
Processing Sections

1. Preview the process list
2. Select a process and provide the parameters
3. Apply on LR version and show the result
4. Select ROI to apply this process
5. Add this process to the process list
6. (Creating a process list file and load an existing one)

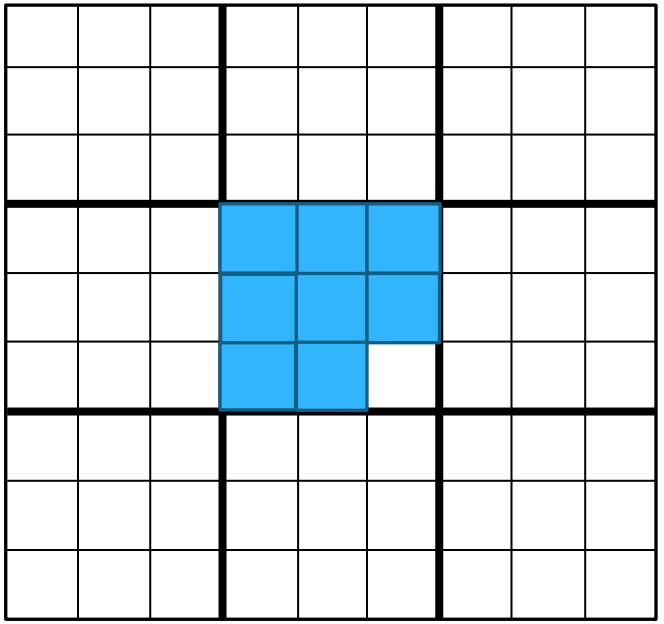
Processing Problems

1. Problems of applying process's operators
    1. Erosion
    2. Dilation

Processing

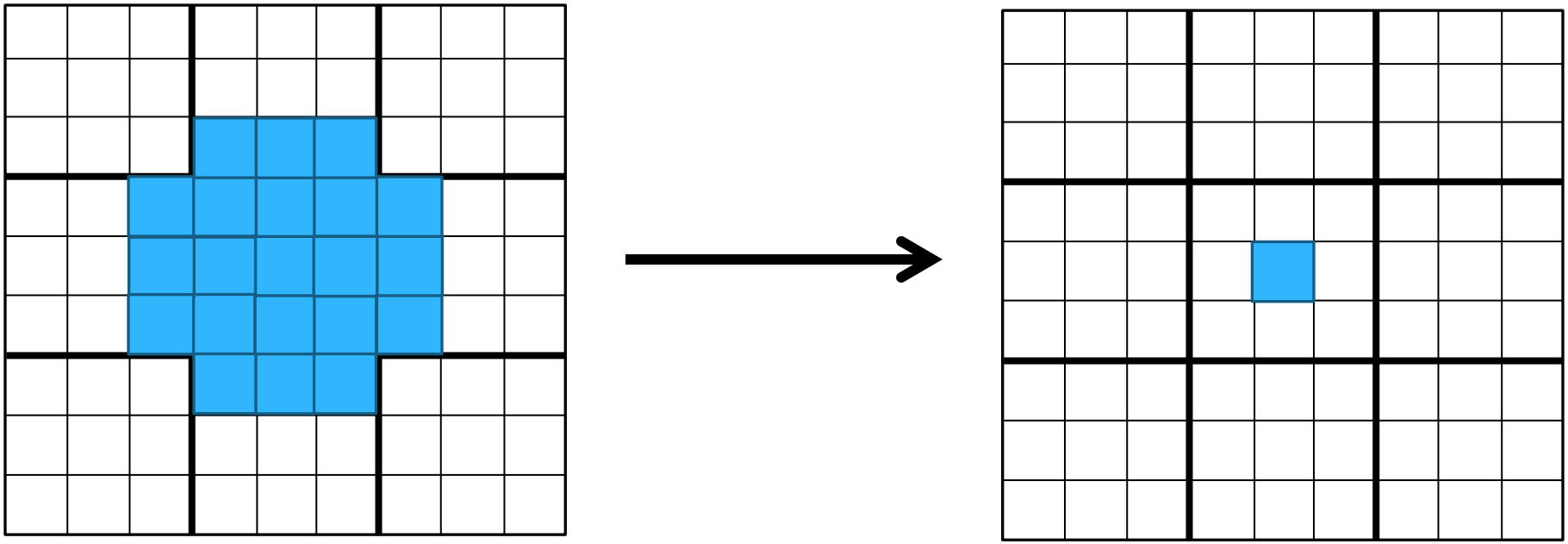


Problem of Erosion



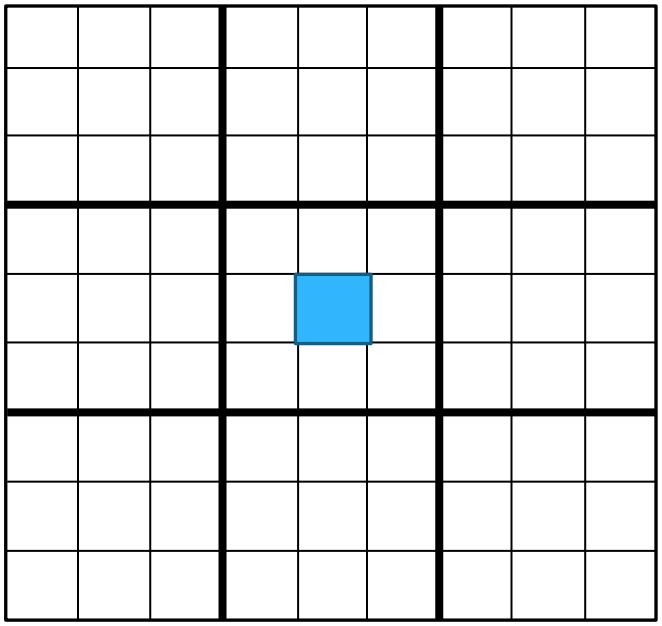
Problem of Dilation

Processing Problems

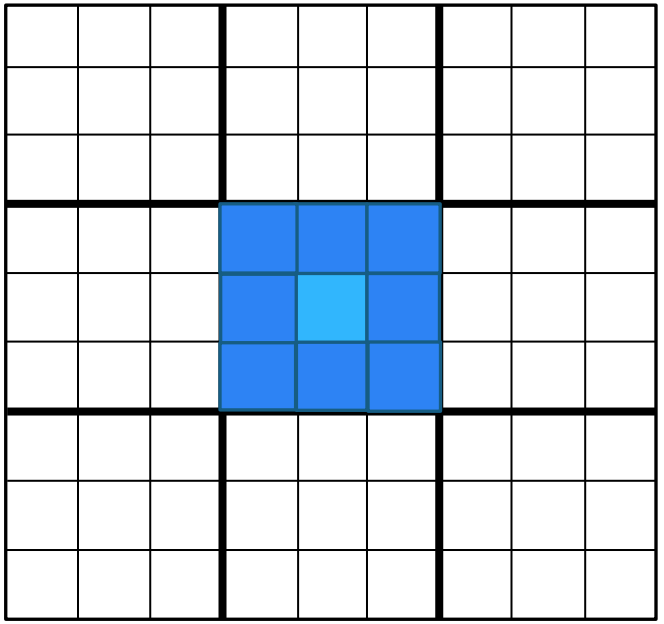


Problem of Erosion

Processing Problems

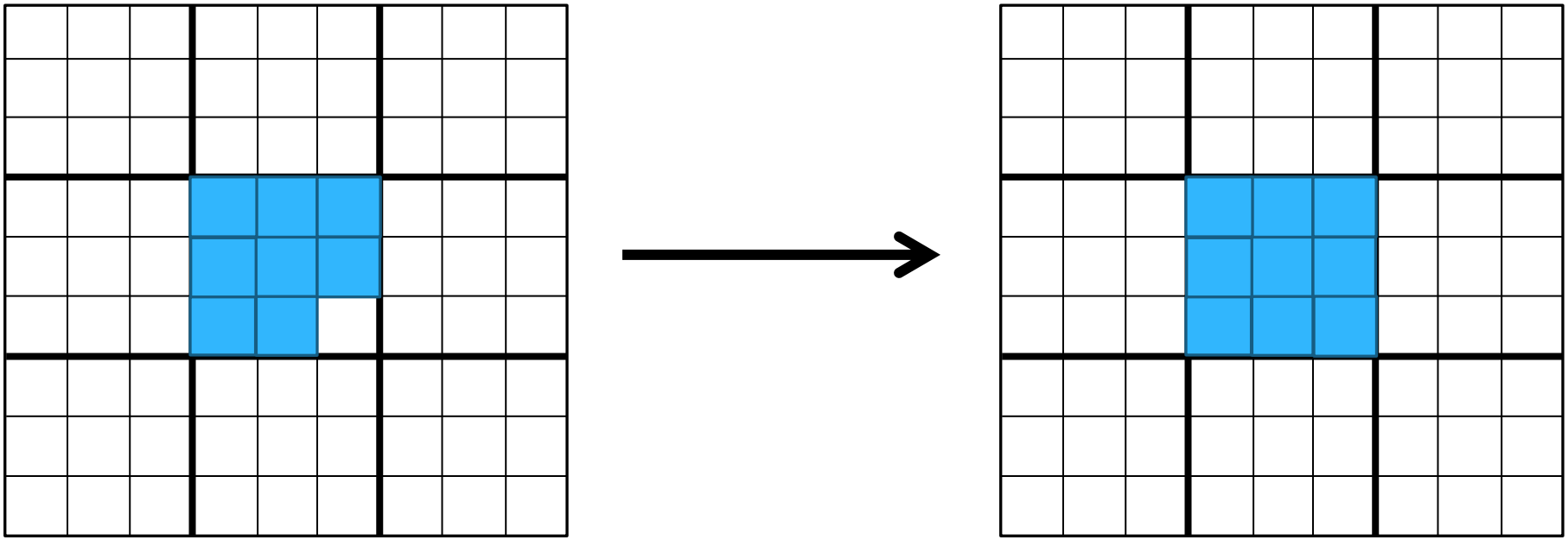


Erosion on the blocks



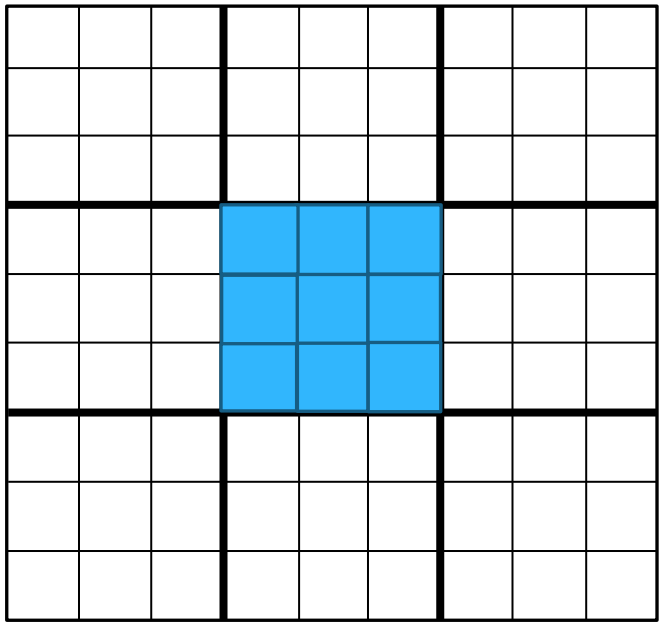
Correct Erosion

Processing Problems

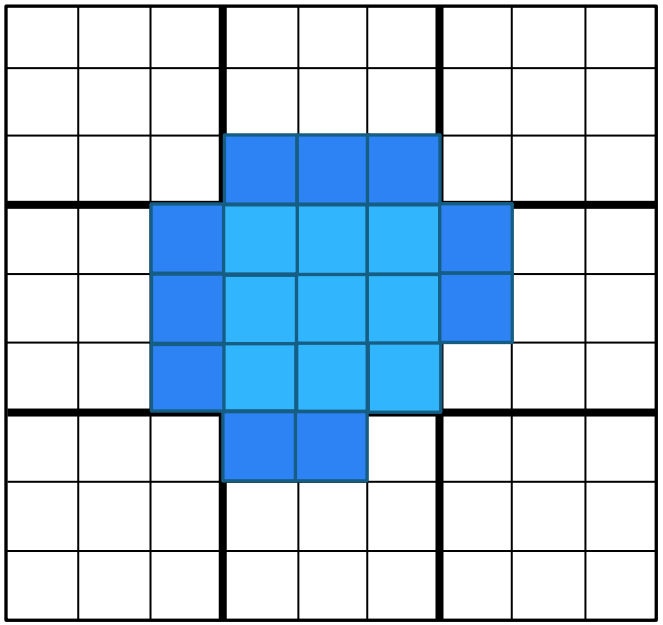


Problem of Dilation

Processing Problems



Dilation on the blocks



Correct Dilation

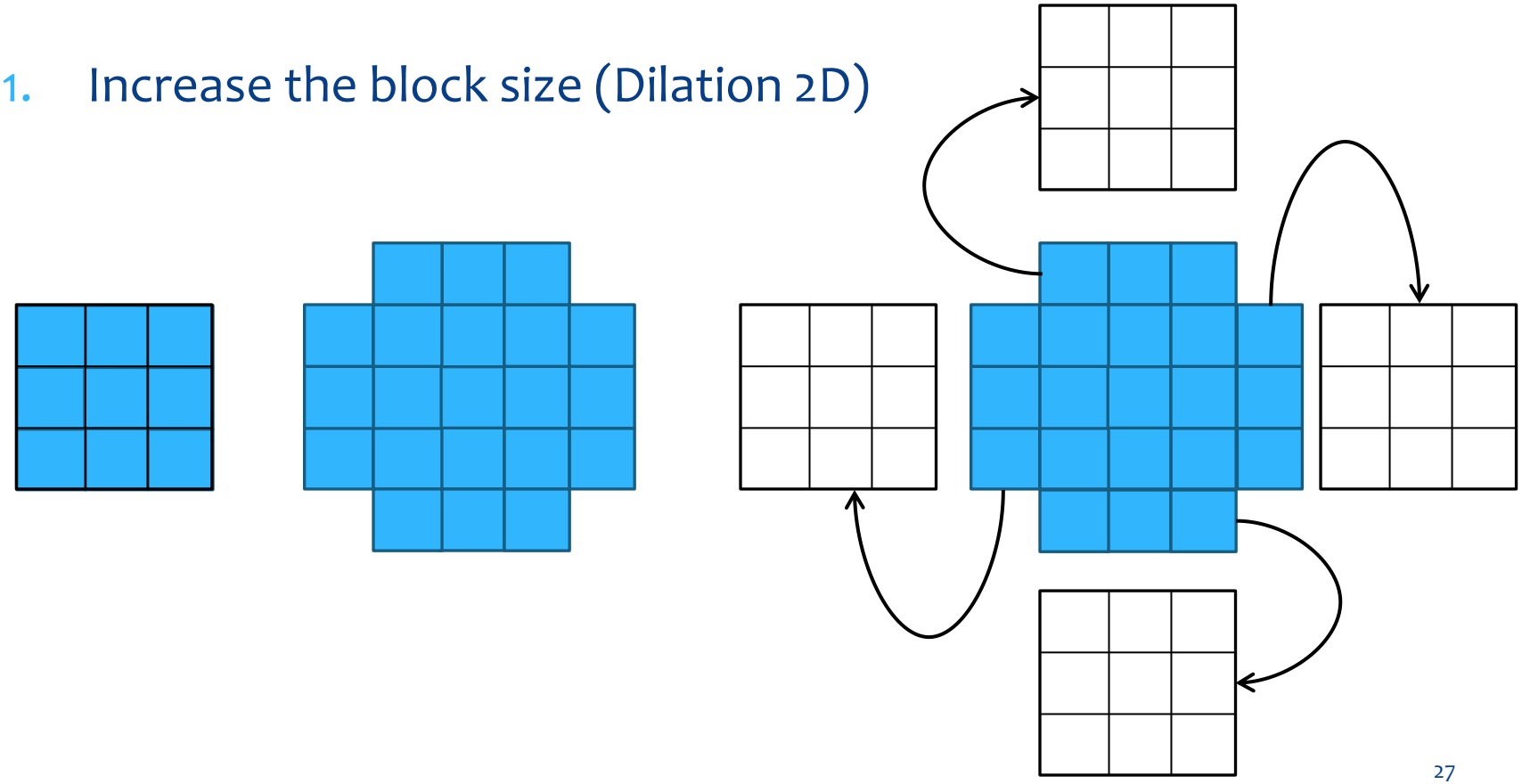
Processing Problems

To get deal with such kind of problems: Two point of view

1. Increase the block size
2. Apply the process on the block's neighbors.

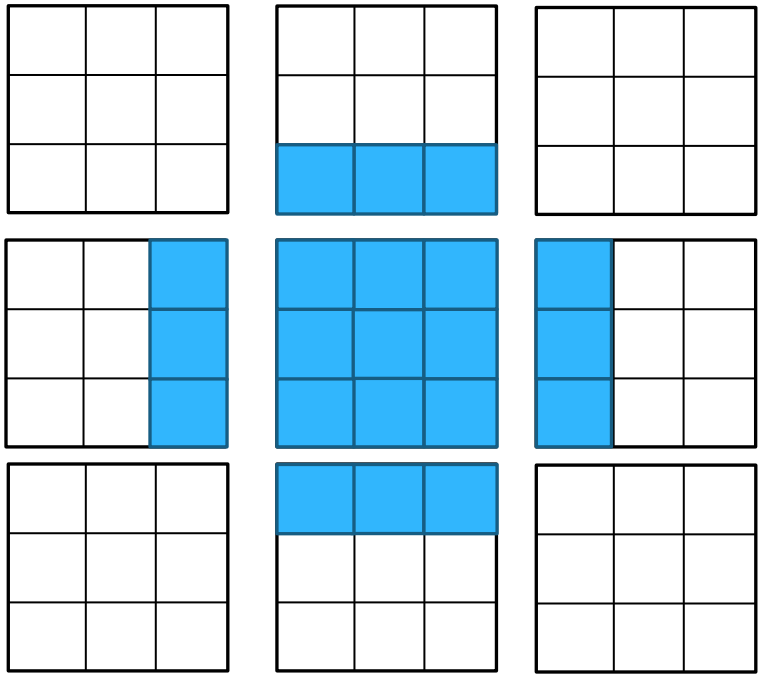
Processing Problems

1. Increase the block size (Dilation 2D)



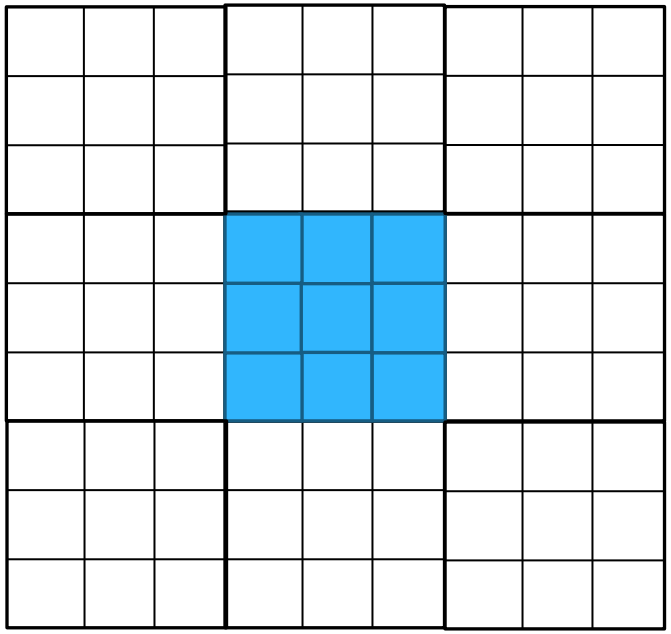
Processing Problems

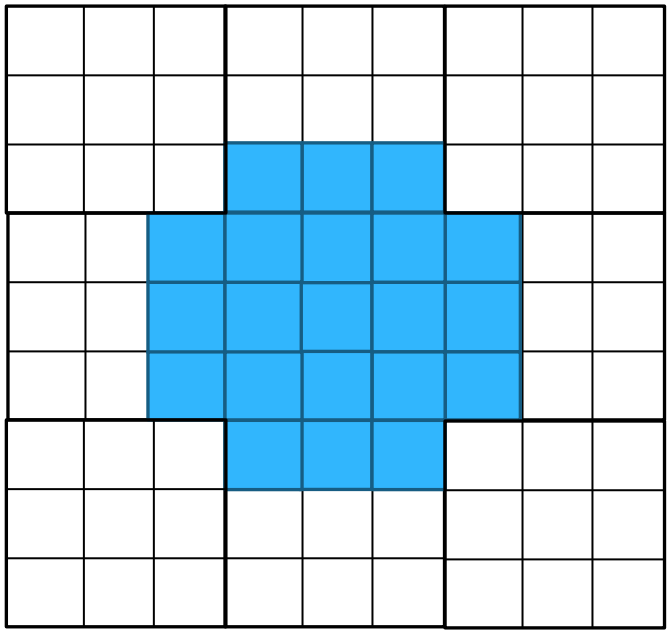
1. Increase the block size (Dilation 2D)



Processing Problems

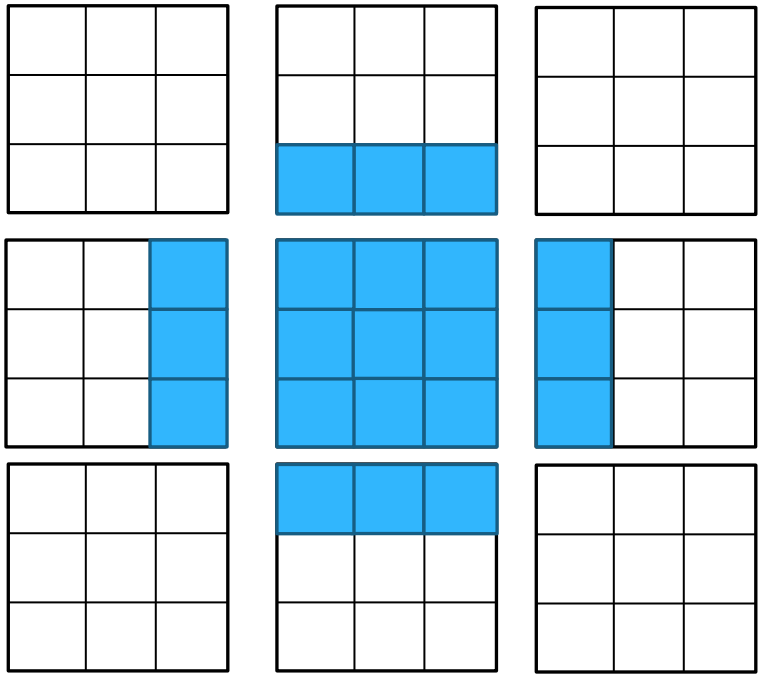
1. Apply the process on the block's neighbors (Dilation 2D)





Processing Problems

2. Apply the process on the block's neighbors (Dilation 2D)



Merci de votre attention

Questions