TRAITEMENT D'IMAGES

Partie Introductive

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L'INSTITUT NATIONAL D'ENSEIGNEMENT SUPÉRIEUR POUR L'AGRICULTURE, L'ALIMENTATION ET L'ENVIRONNEMENT

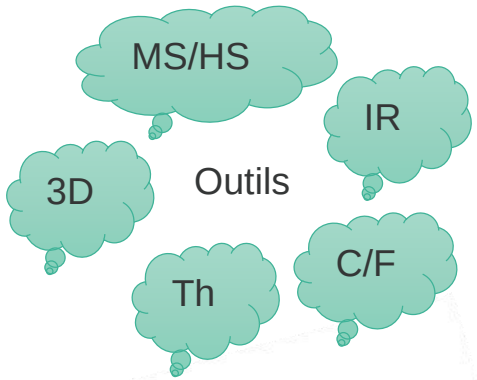
0 - PREAMBULE

Phénotypage (aérien et racinaire)

- Pois, Blé, Vigne, Maïs, Betteraves

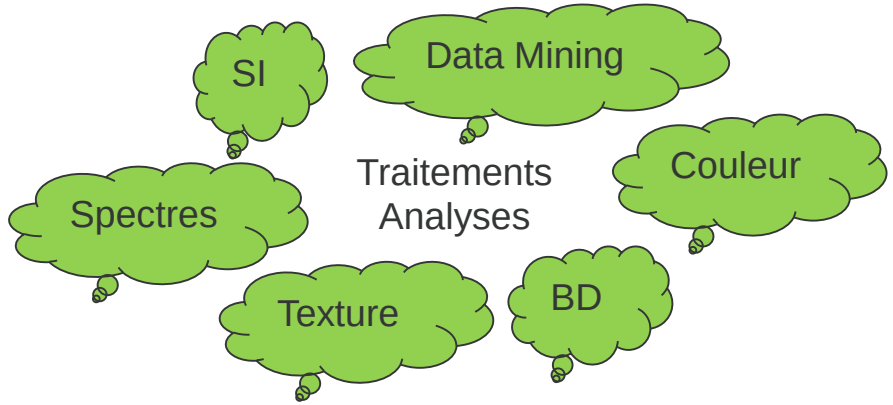
Détection de pathologies

- Vigne, Blé, Betteraves

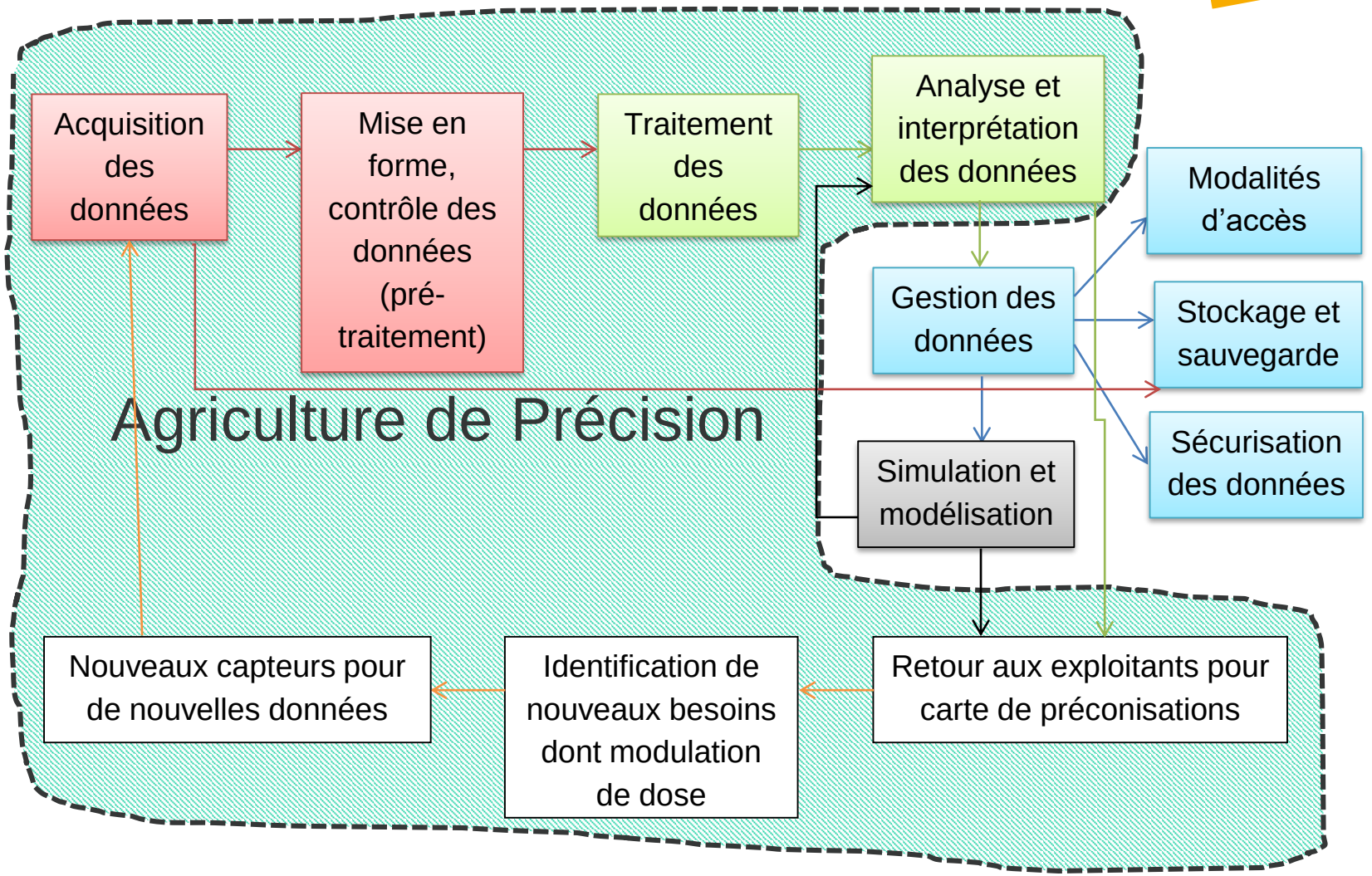


Autres projets

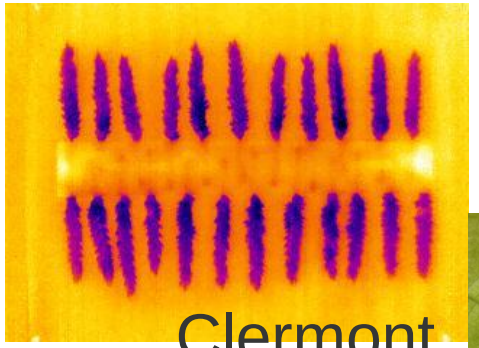
- Estimation de rendement (Blé, Colza)
- Pulvérisation de précision



0 - PREAMBULE


Acquisition des données
Mise en forme, contrôle des données (pré-traitement)
Traitement des données
Analyse et interprétation des données
Modalités d'accès
Gestion des données
Stockage et sauvegarde
Sécurisation des données
Simulation et modélisation
Agriculture de Précision
Nouveaux capteurs pour de nouvelles données
Identification de nouveaux besoins dont modulation de dose
Retour aux exploitants pour carte de préconisations

0 - PREAMBULE



Clermont

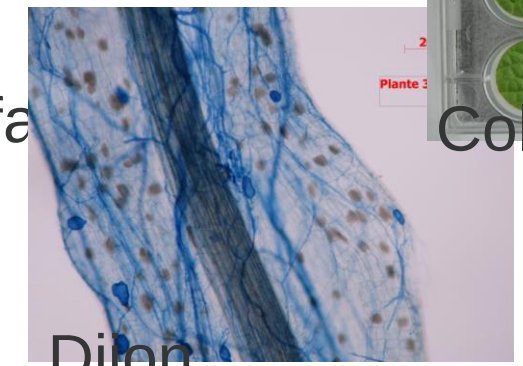
Montfavet

Montfavet

Colr

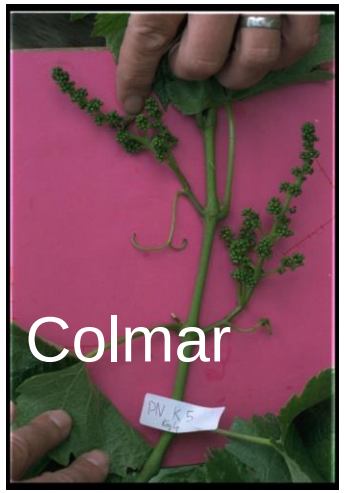
Colmar

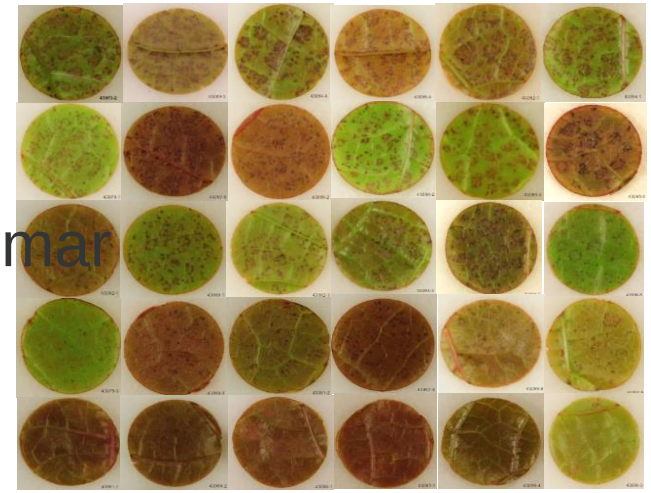
Montfa

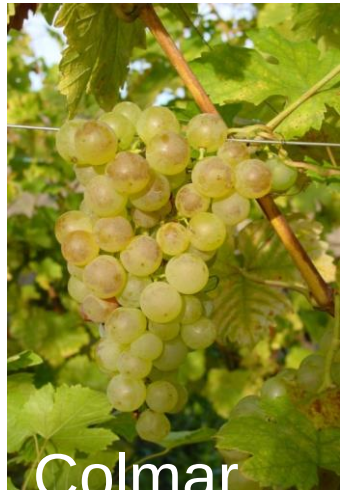


Dijon

0 - PREAMBULE







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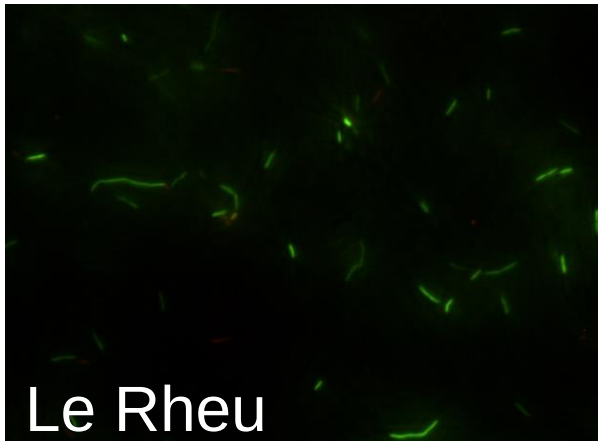
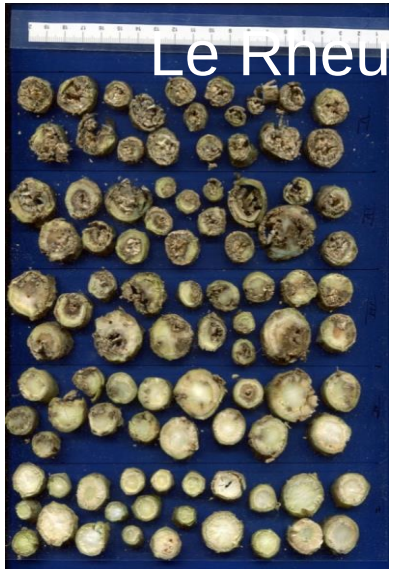
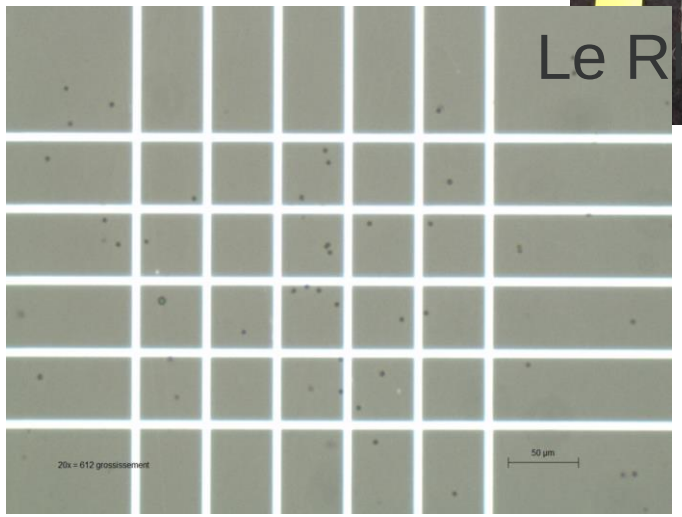

Le Rheu

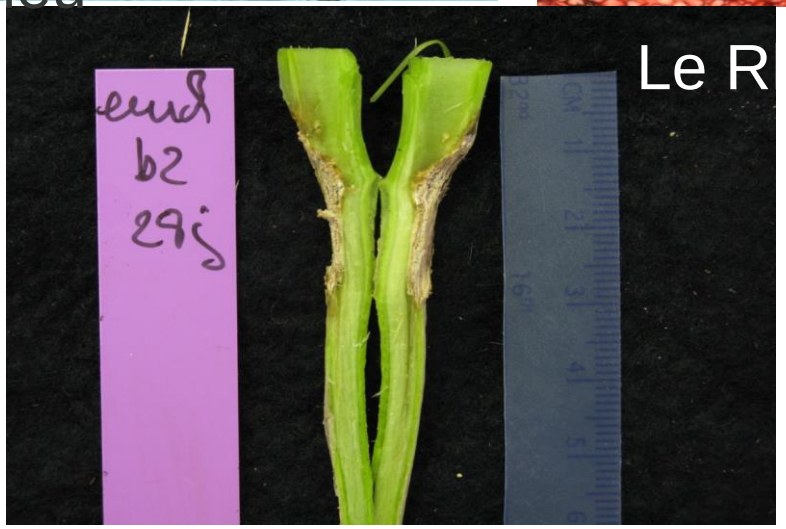

Le Rheu


Le Rheu


Le Rheu


Le R
20x = 612 grossissement
50 µm

0 - PREAMBULE

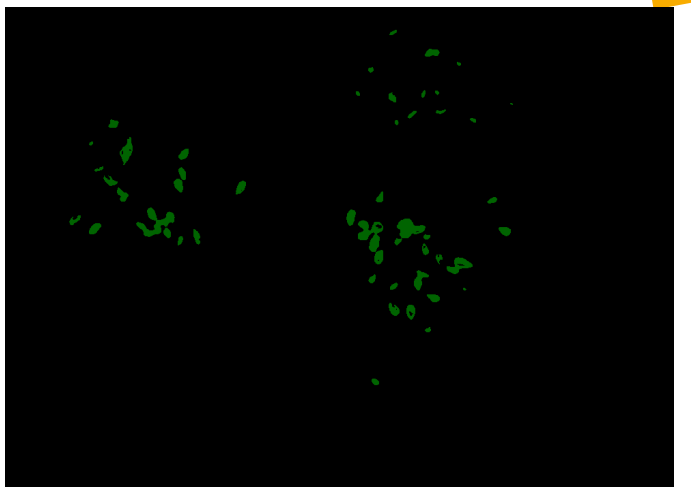


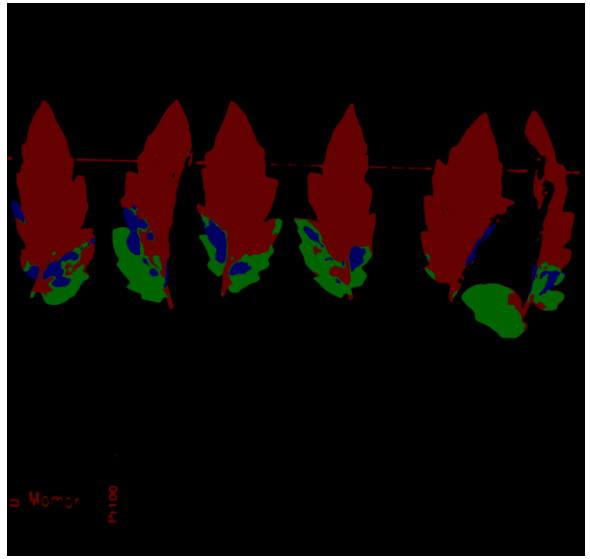
0 - PREAMBULE

Comment traiter ces images ?

Sont-elles bien acquises ?

0 - PREAMBULE





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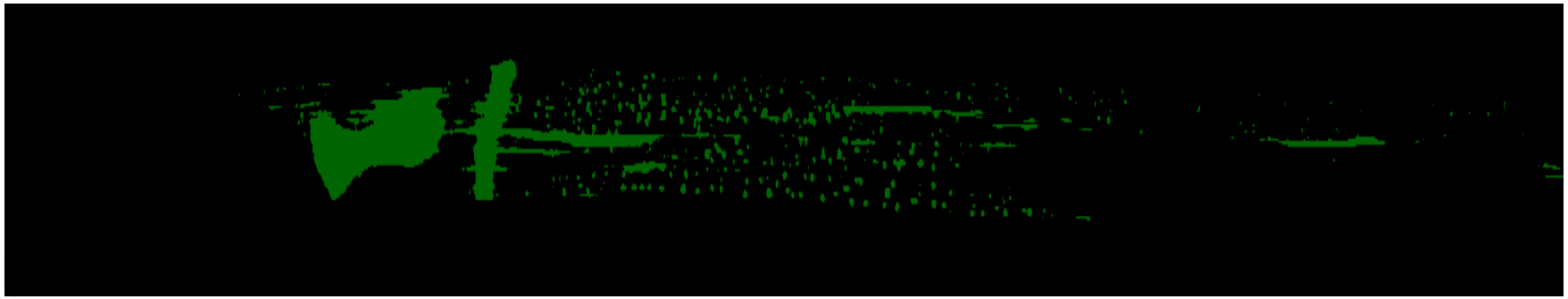
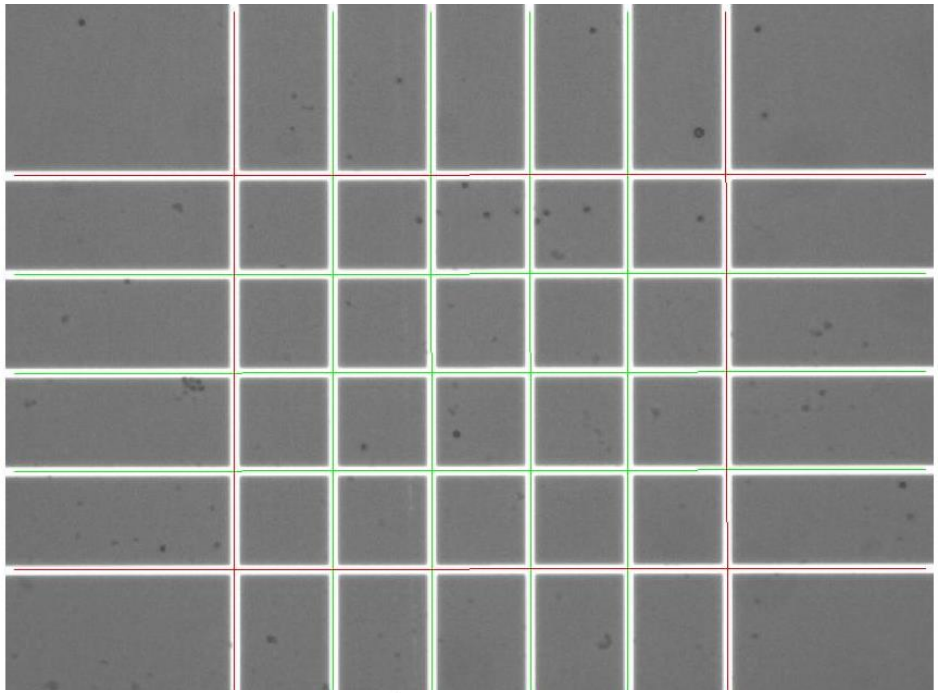
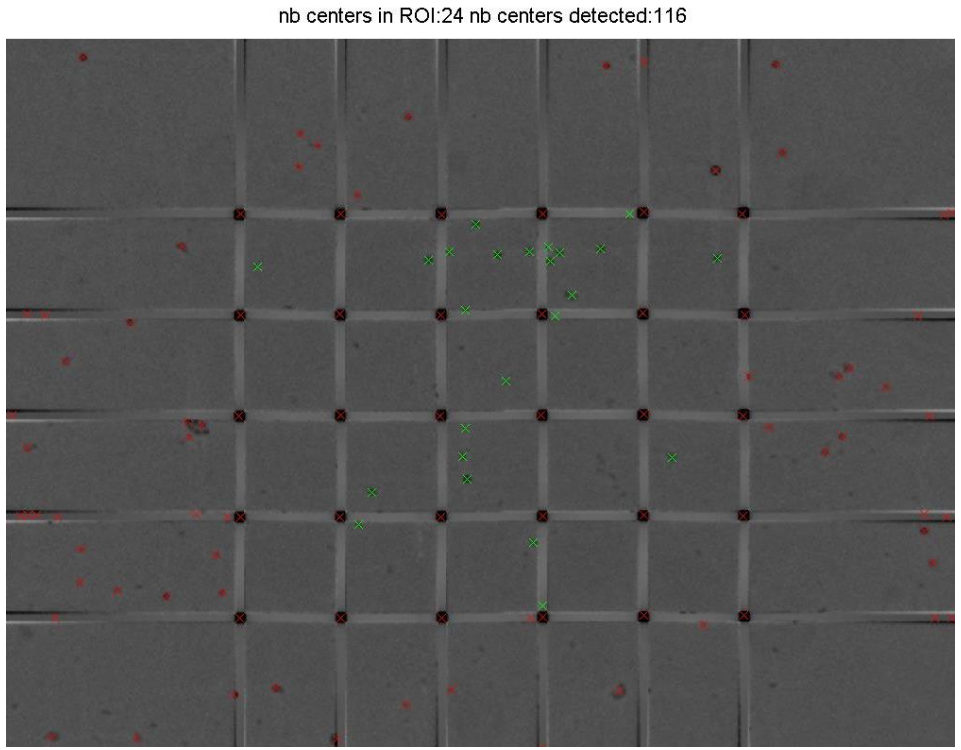


0 - PREAMBULE

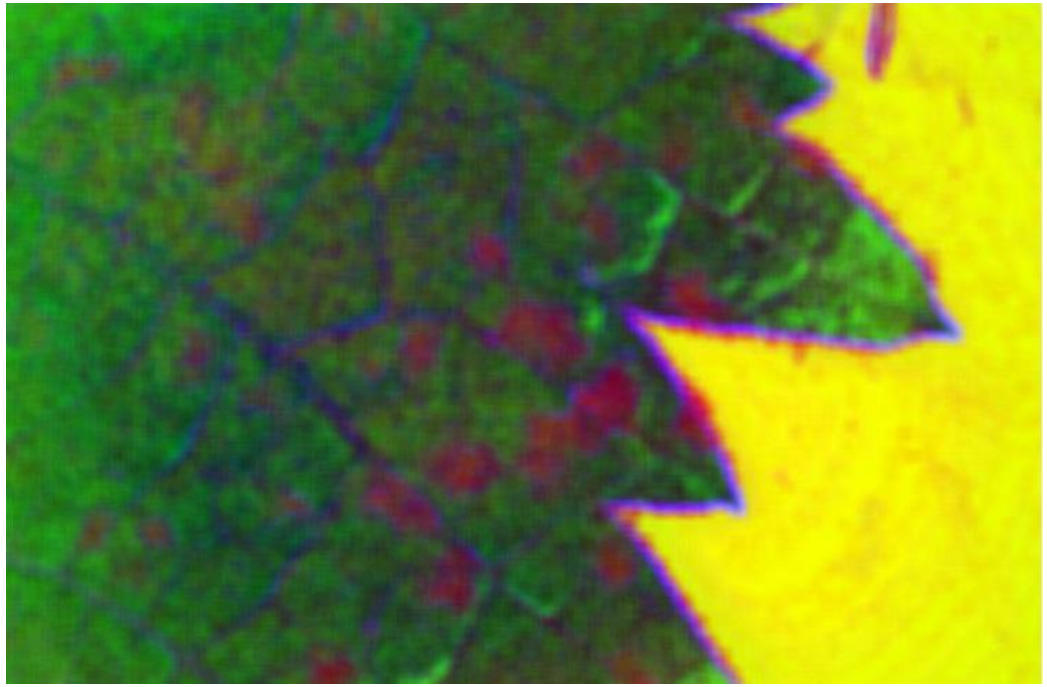




0 - PREAMBULE

Image d’origine

Image résultat



0 - PREAMBULE

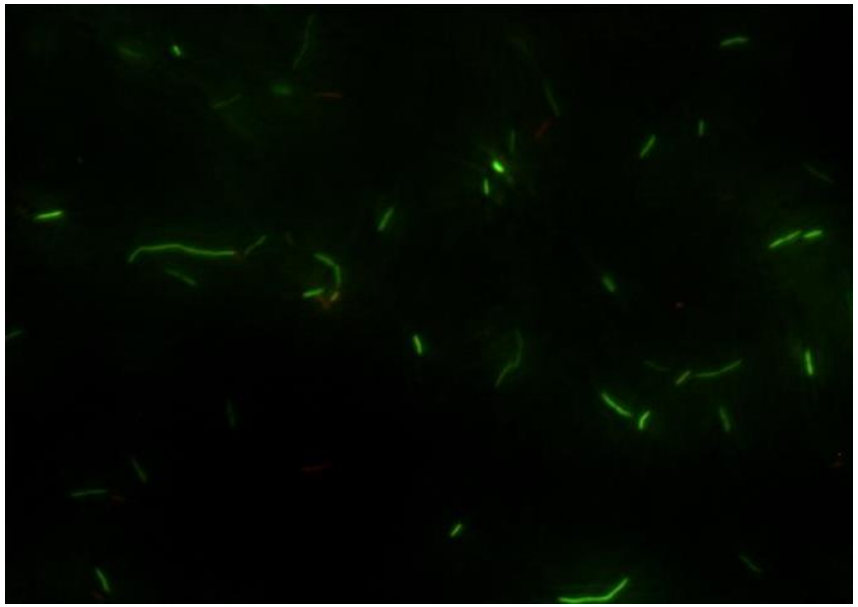
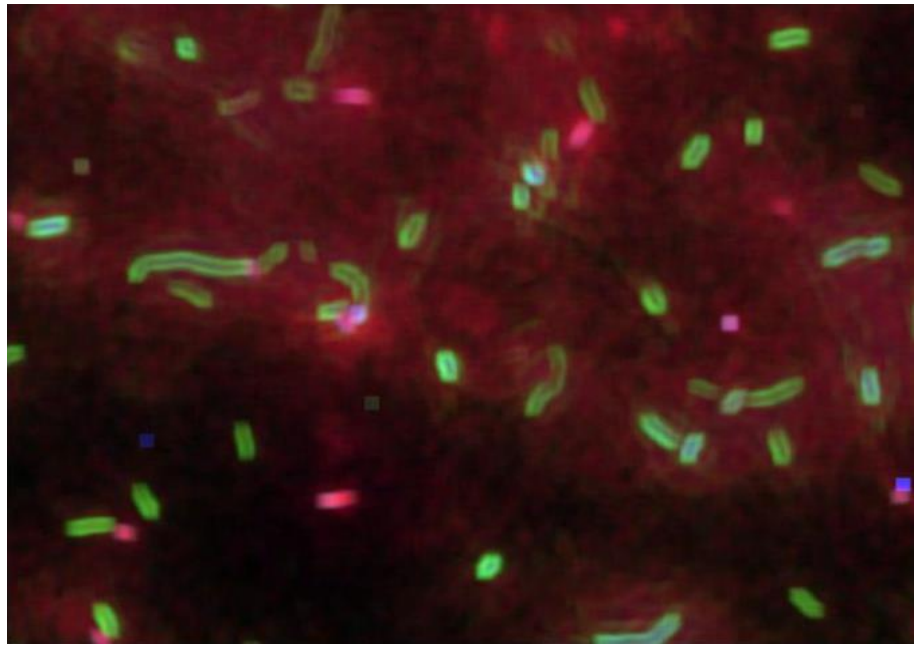


Image d’origine

Image résultat



0 - Préambule

I - Introduction

II - Définitions

III - Pré-traitement des images

IV - Segmentation image et contours

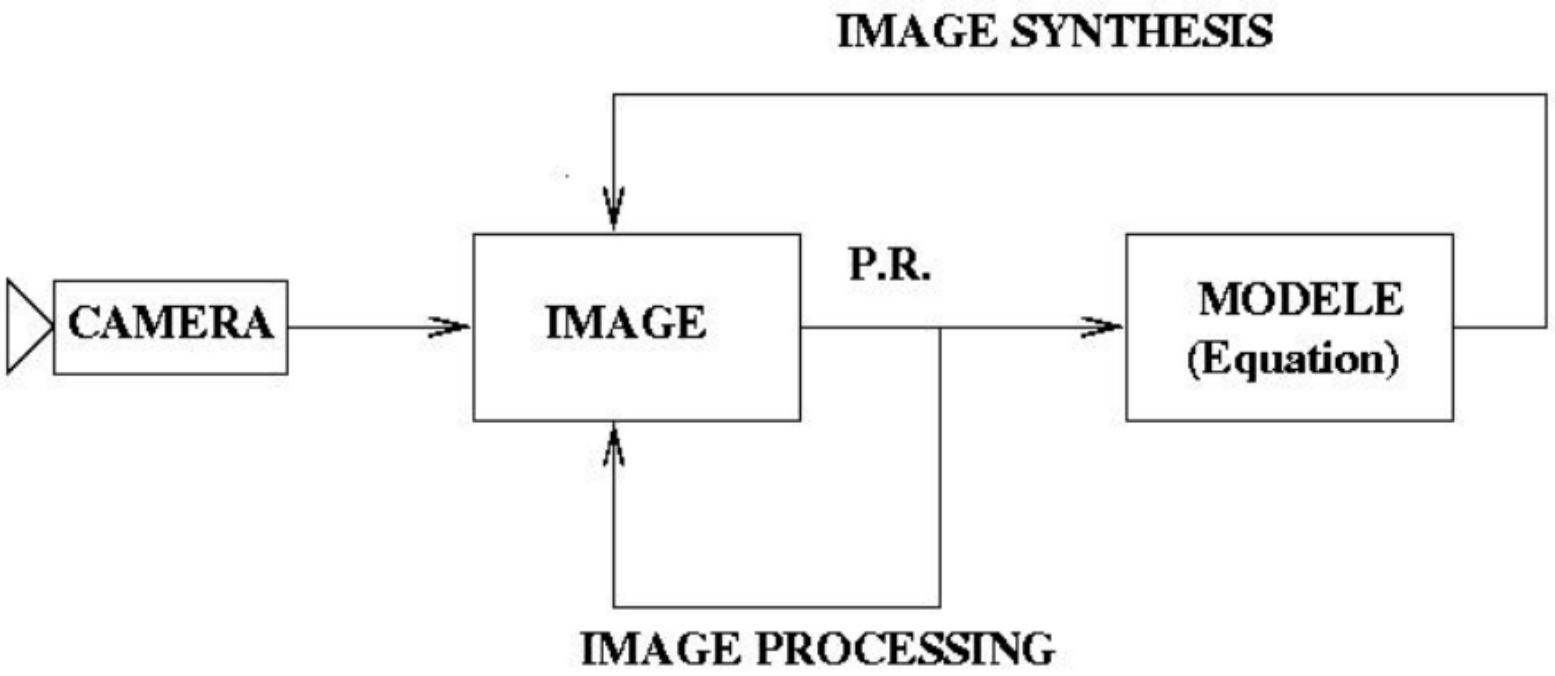
V - Hough et morphologie mathématique

VI – Analyse et Reconnaissance de formes

VII – Détection de mouvement

VIII – Introduction au Deep Learning

I - INTRODUCTION



P.R. : PATTERN RECOGNITION

I - INTRODUCTION

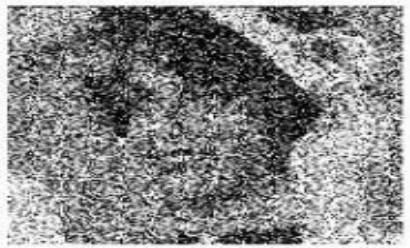


Image Originale Bruitée

Image Traitée

I - INTRODUCTION

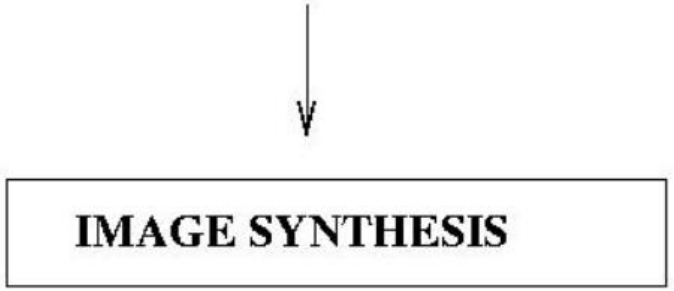
Image Originale

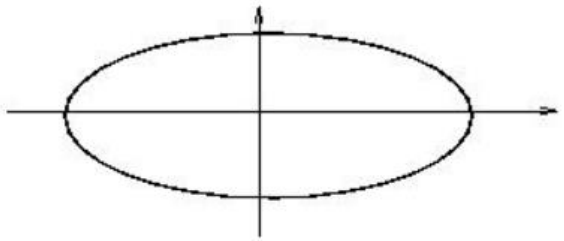
PATTERN RECOGNITION

ANSWER: WOMAN RECOGNIZED

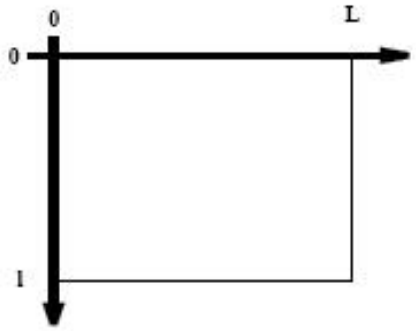
I - INTRODUCTION

Equation originale: $\frac{X^2}{a^2} + \frac{Y^2}{b^2} = 1$

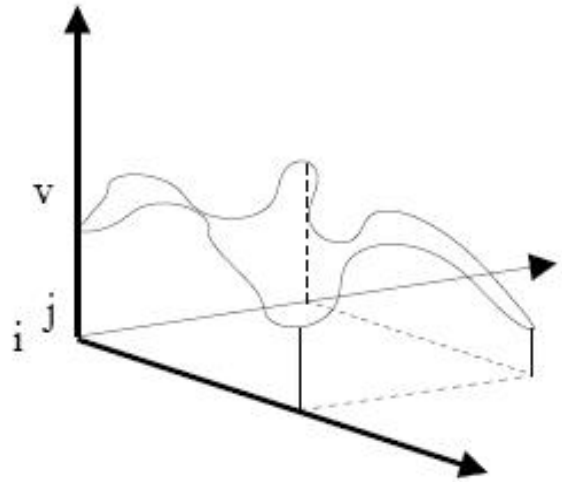




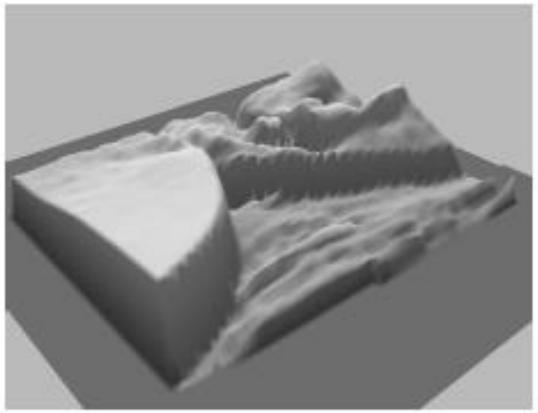
I - INTRODUCTION



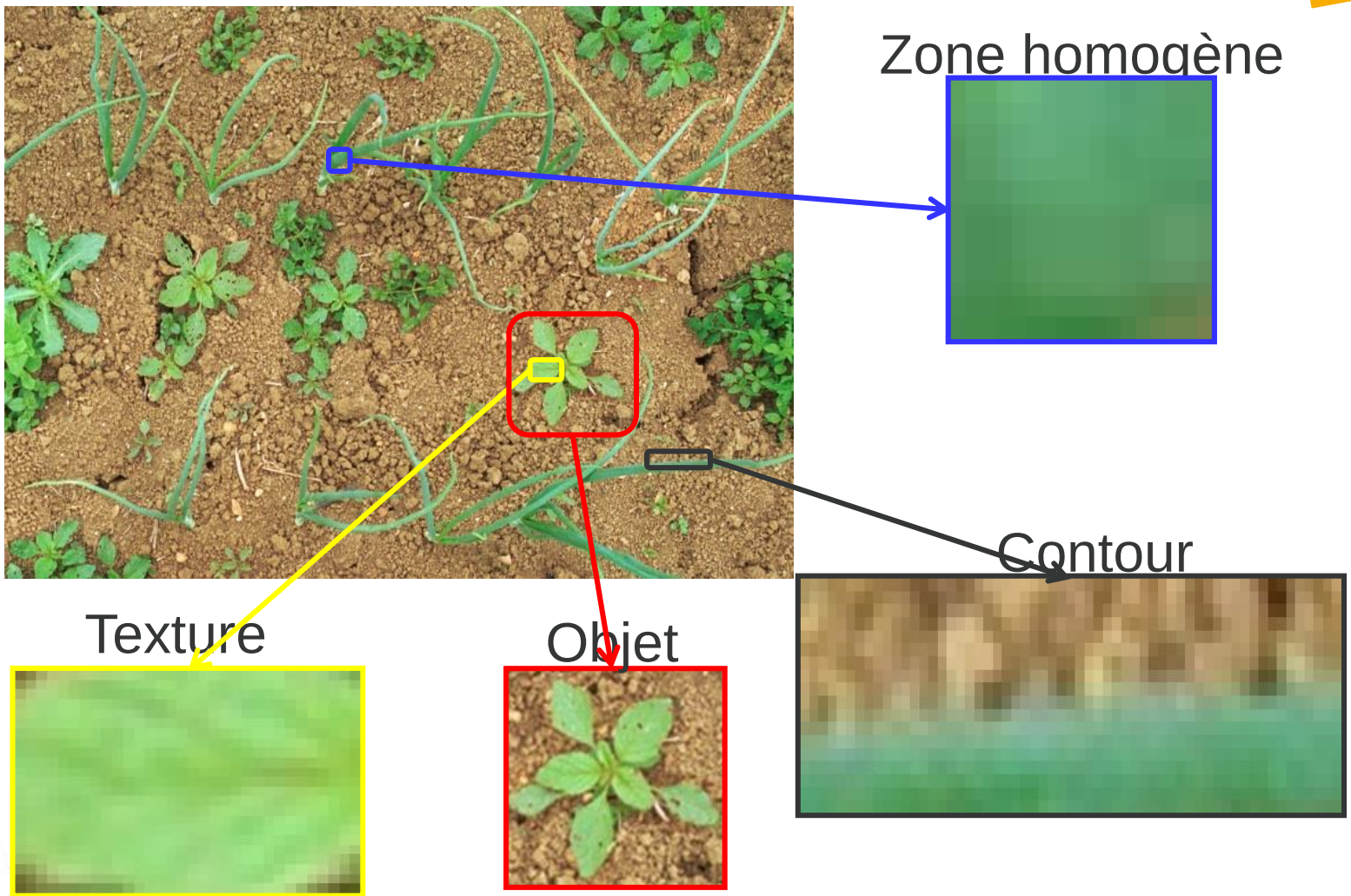
devient



donne



I - INTRODUCTION



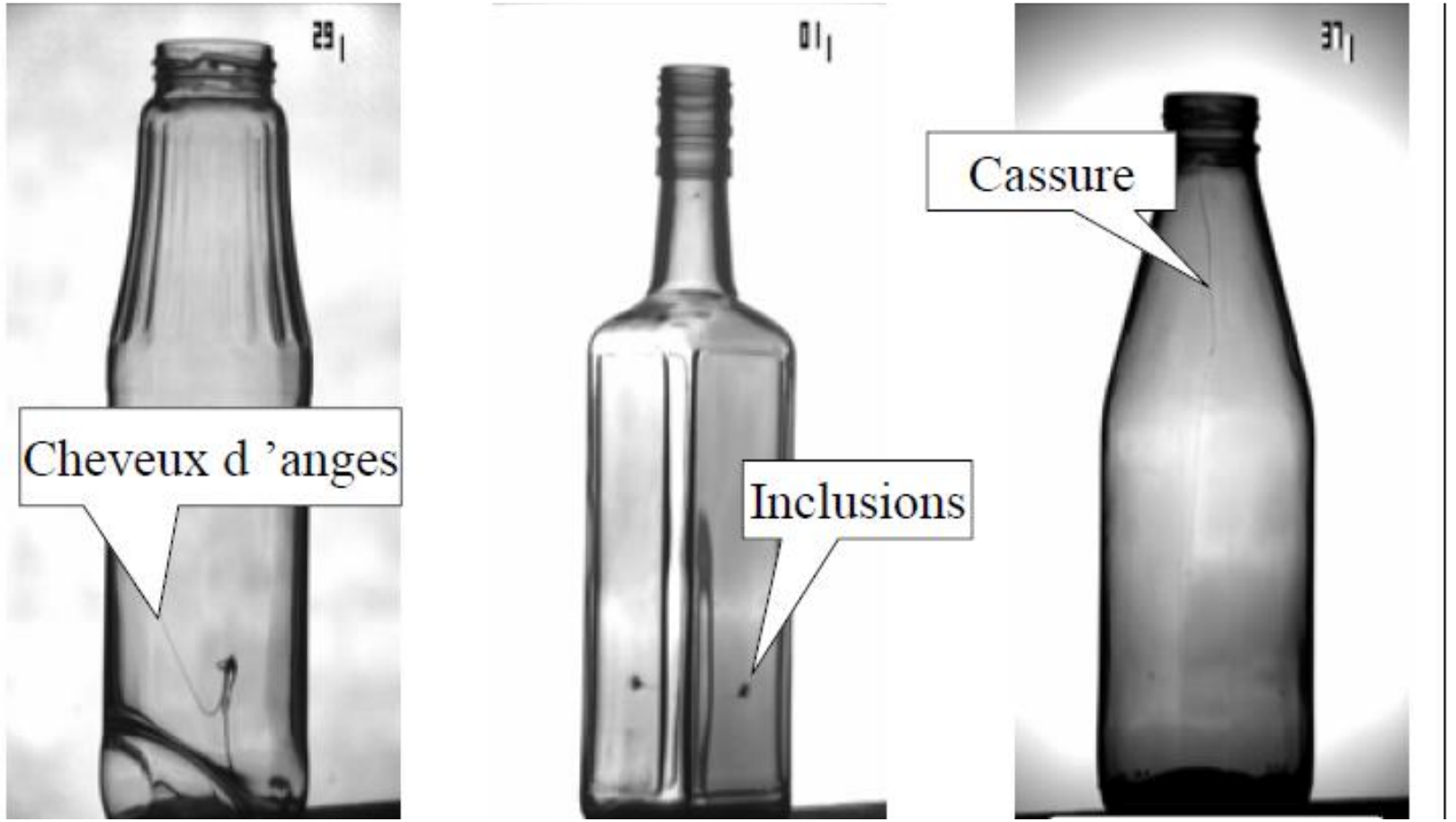
I - INTRODUCTION

APPLICATIONS

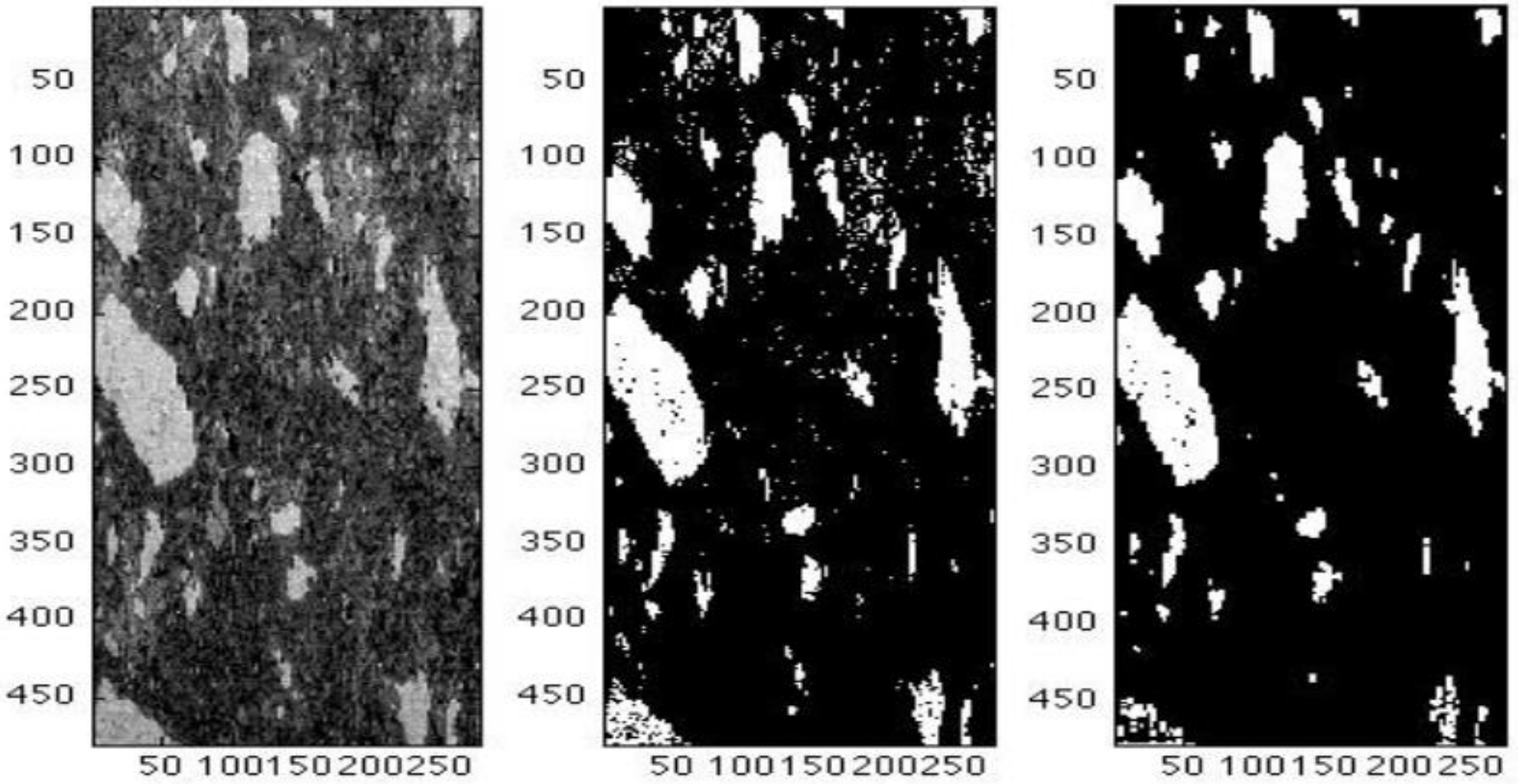
- Détection de Défauts
- Reconnaissance de Formes
- Comptage d 'objets
- Analyse de Mouvements
- Réalité virtuelle, Synthèse d 'Image
- Compression et Transmission d 'Images
- Imagerie aérienne et spatiale

I - INTRODUCTION

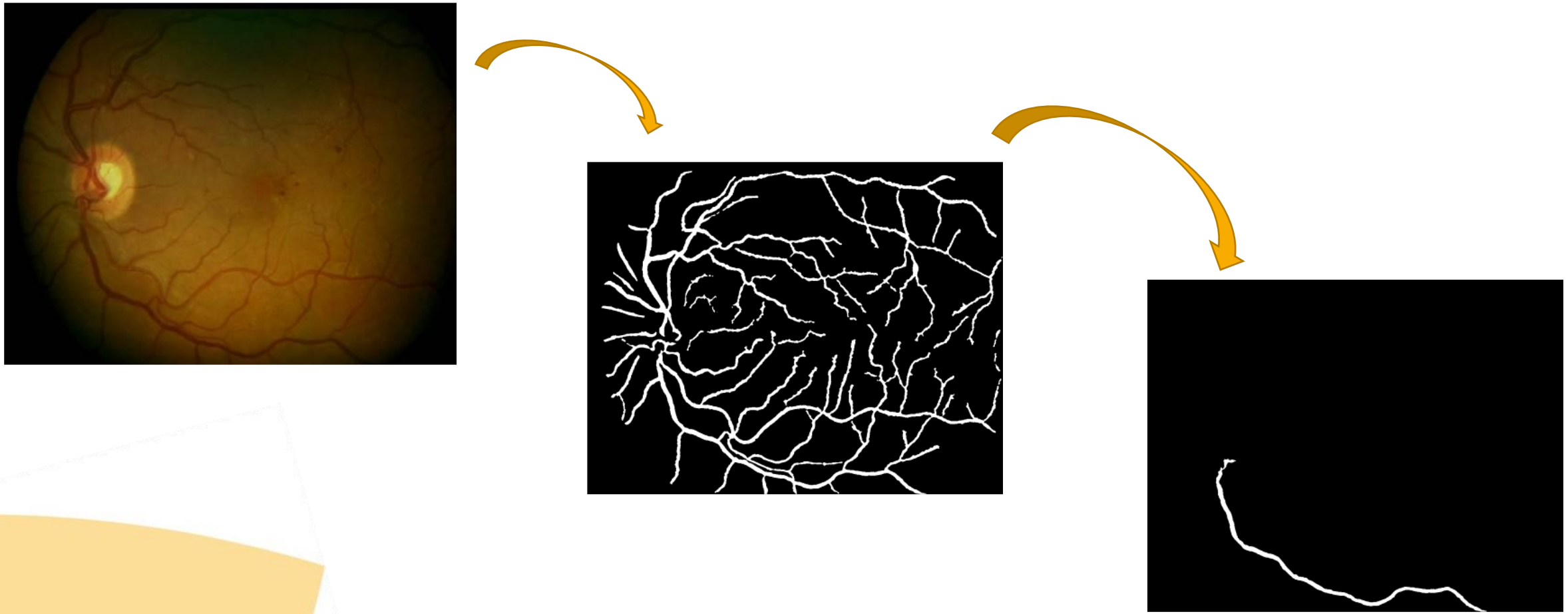
Détection de défauts sur des bouteilles



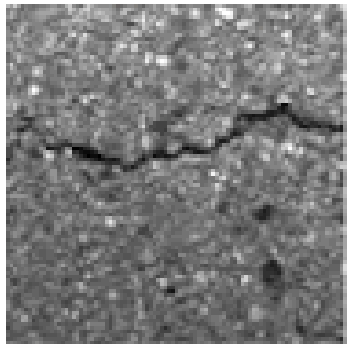
I - INTRODUCTION

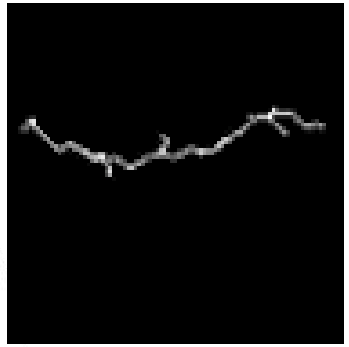


I - INTRODUCTION



I - INTRODUCTION





Détection de défauts

Automatisation de production

Détection de position

Tri sélectif

I - INTRODUCTION

Sécurité - Surveillance

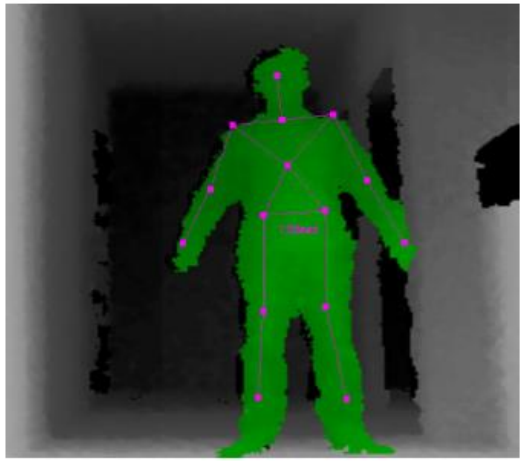
Détection de Personnes

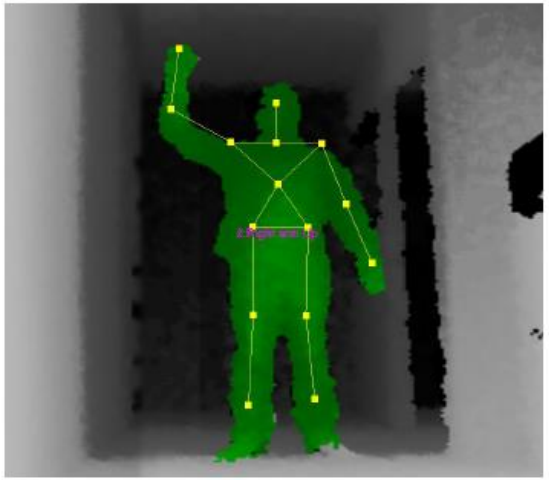
Tracking

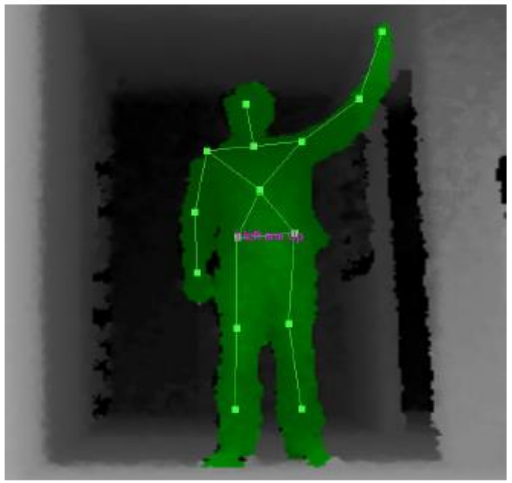
Détection d'évènements

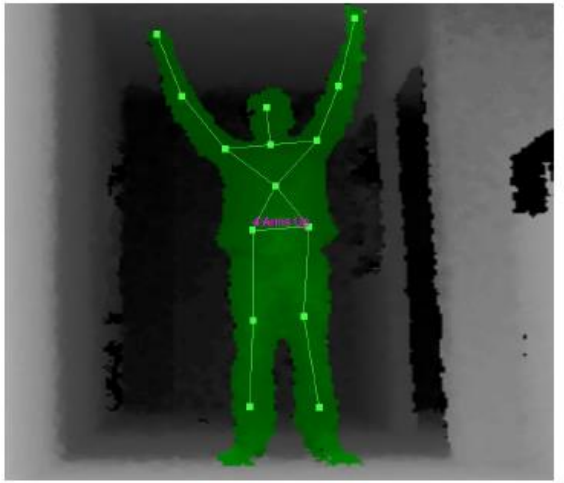
I - INTRODUCTION

IHM

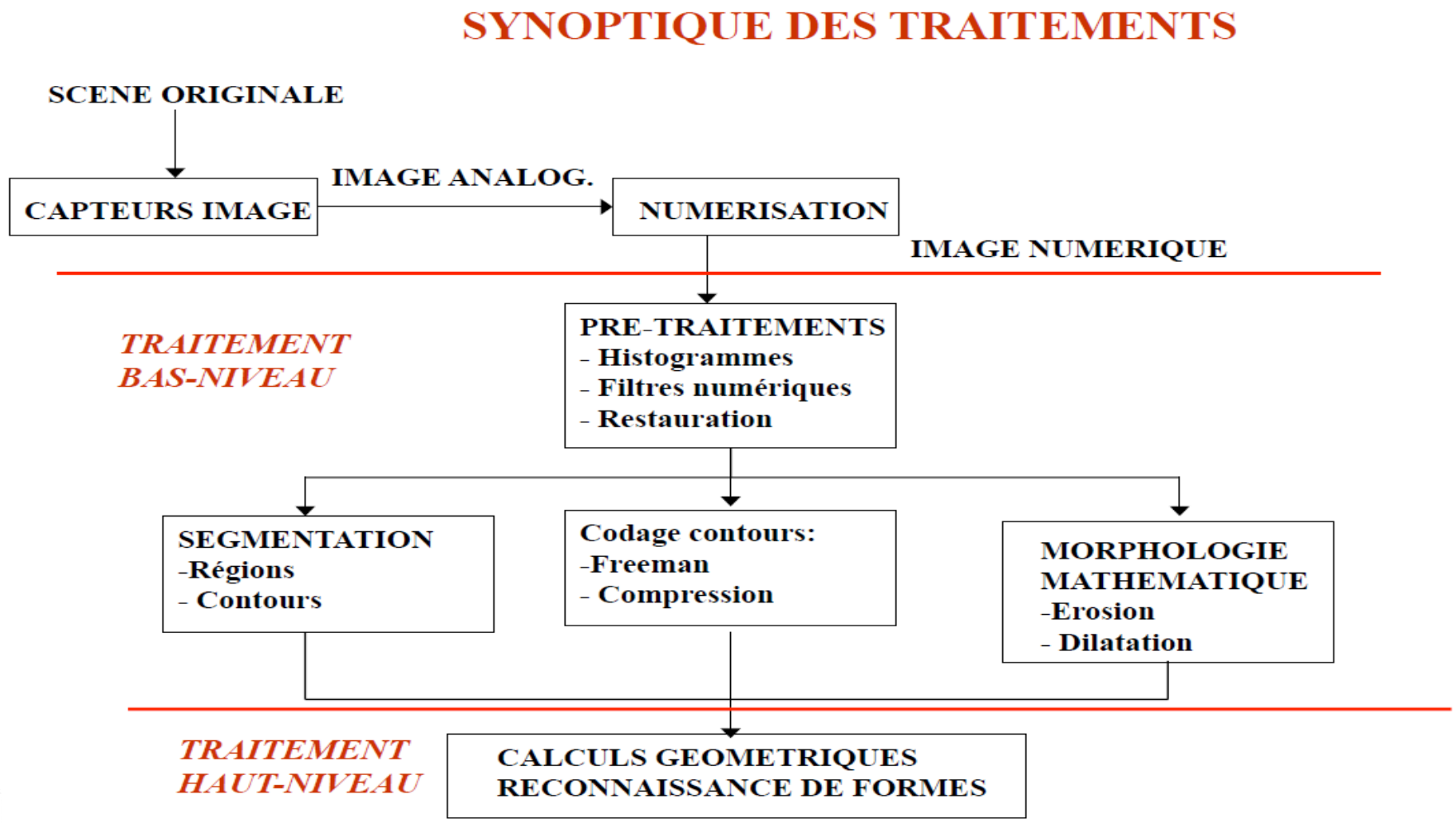








I - INTRODUCTION



0 - Préambule

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II - DEFINITIONS

Œil Humain ou Œil Artificiel?

•Résolution spatiale : Œil Humain > Œil Artificiel

- Œil Humain:

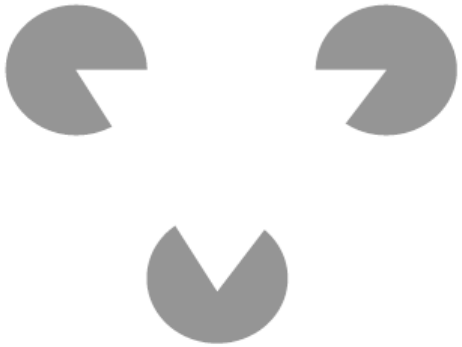
* Cônes rétiniens sensibles couleur ~ 1 million pixels couleur
* Bâtonnets rétiniens sensibles contraste >50 millions pixels N/B

- Œil Artificiel (Capteur Image):

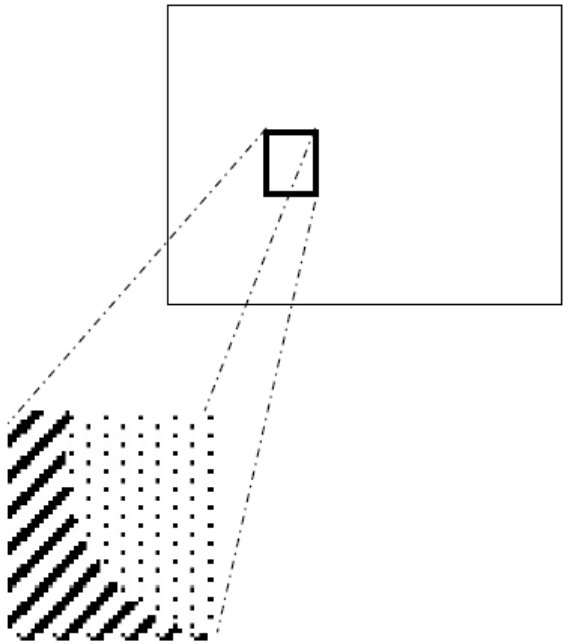
* ImageN/B courante: 1024x1024 pixels ~ 1 million pixels N/B
* Image N/B Haute-définition: 4096x4096 pixels ~ 16 millions pixels N/B

II - DEFINITIONS

Avantages and limits of computer visions vs **human vision**



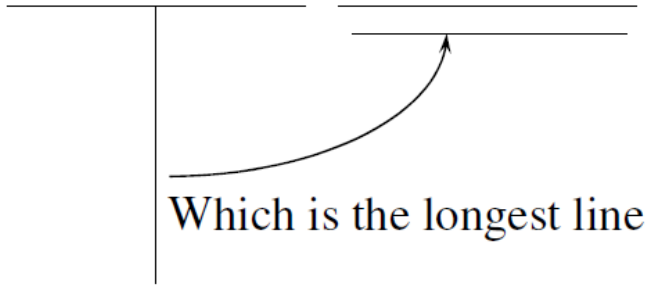
A triangle ?



Where is the limit of the circle?

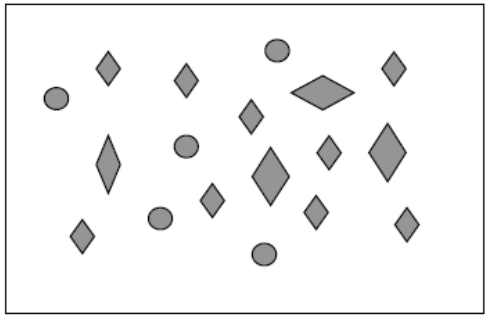
II - DEFINITIONS

Avantages and limits of
computer vision vs human vision



Which is the longest line ?

Which is the darkest one?

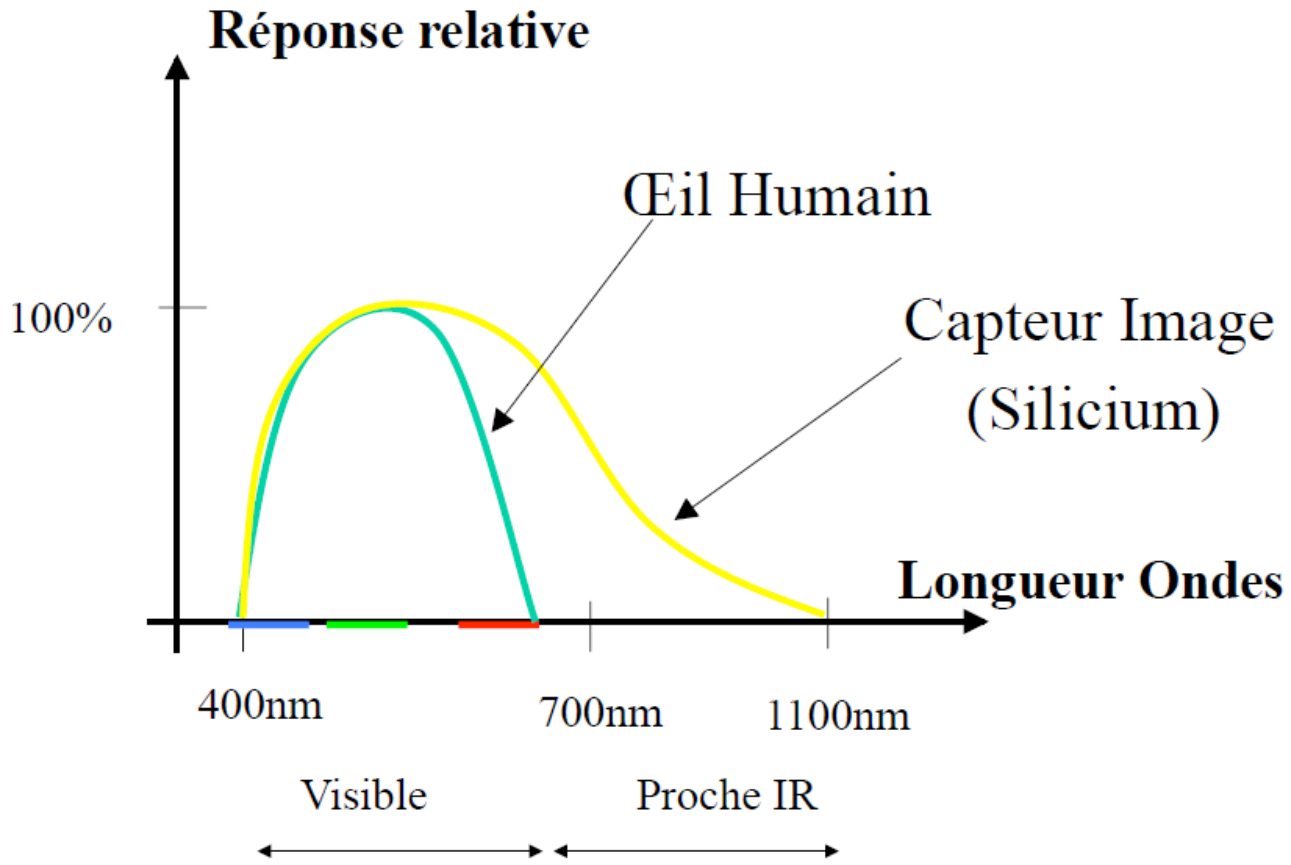


How many circles?

Be aware of what you think you see !

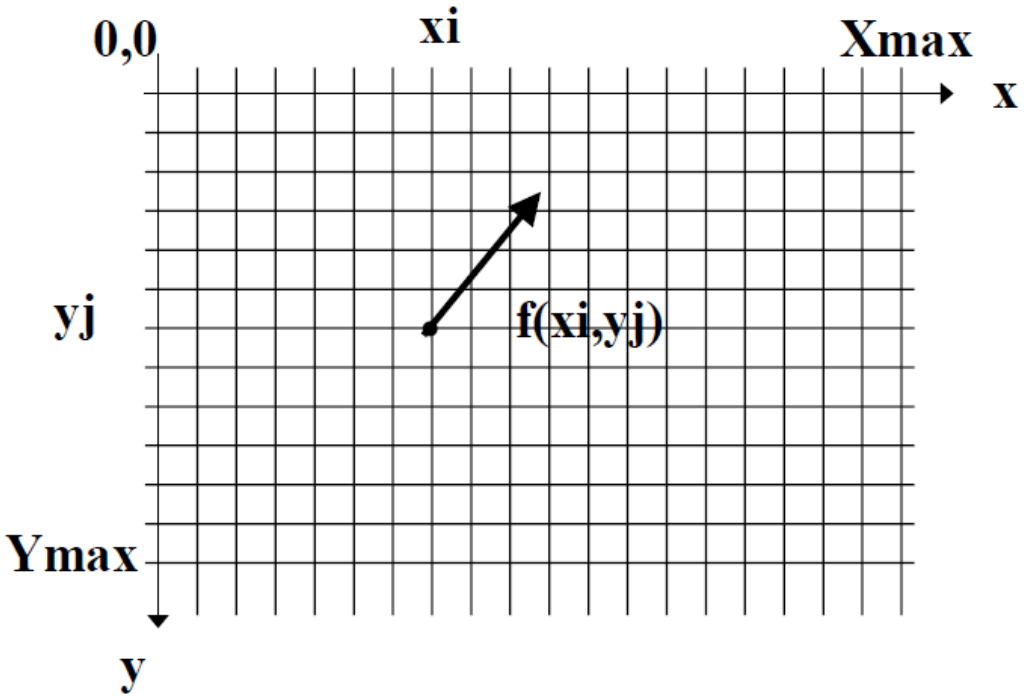
II - DEFINITIONS

•Réponse spectrale: Œil Humain < Œil Artificiel



II - DEFINITIONS

Représentation d'une image numérique



f(xi,yj): Niveau gris pixel aux coordonnées (xi,yj)
f(xi,yj) entre 0 and 255
Si f(xi,yj)=0 alors Pixel Noir
Si f(xi,yj)=255 alors Pixel Blanc

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III – PRE-TRAITEMENT DES IMAGES

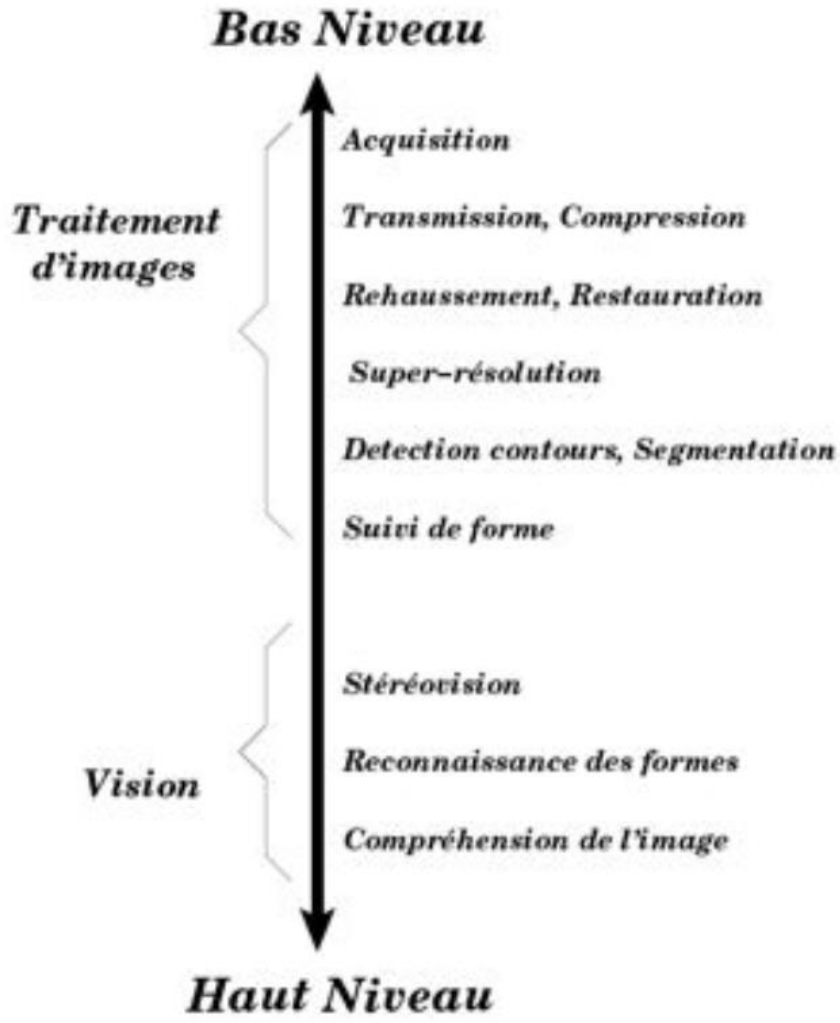
III-1 Histogrammes

III-2 Egalisation d 'Histogrammes

III-3 Filtres numériques dans le domaine spatial

III-4 Filtres numériques dans le domaine fréquentiel

III – PRE-TRAITEMENT DES IMAGES



III – PRE-TRAITEMENT DES IMAGES

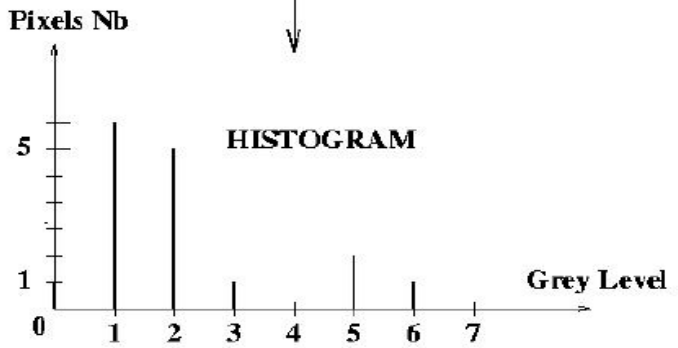
III – 1 Histogramme

Image 4x4 Pixels

1	1	2	1
3	5	0	5
2	2	1	6
2	2	1	1

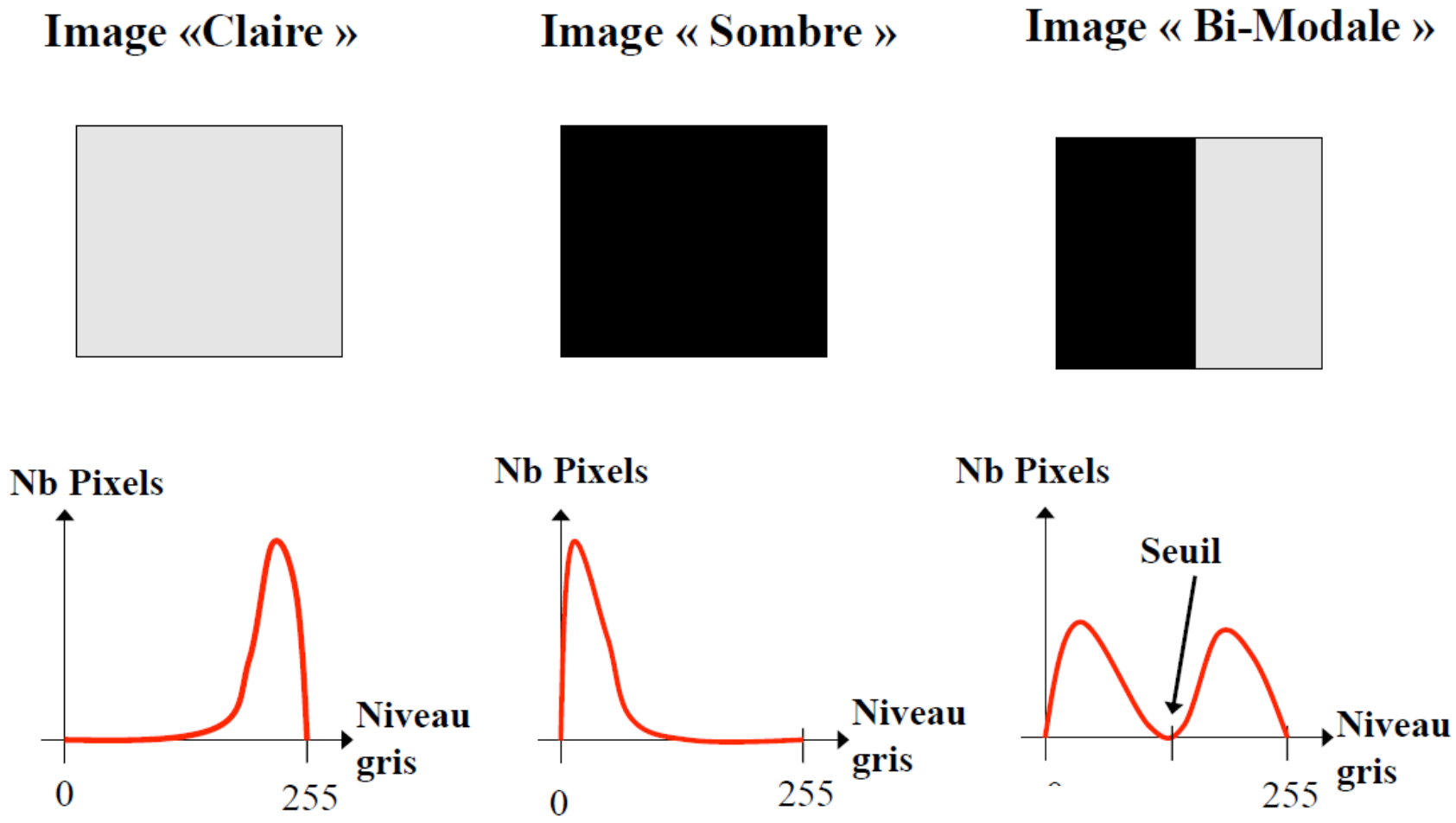
(Grey Levels between 0 and 7)

Grey Level	0	1	2	3	4	5	6	7
Pixels Nb	1	6	5	1	0	2	1	0

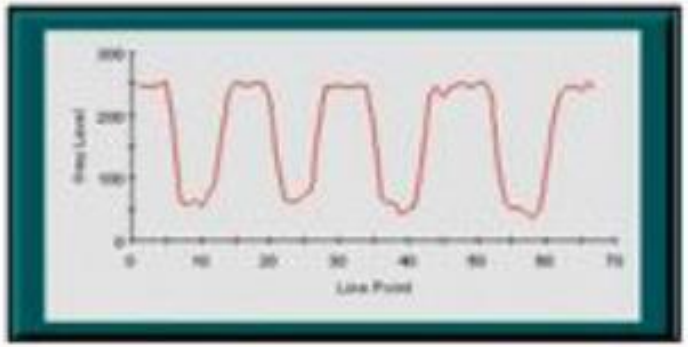


III – PRE-TRAITEMENT DES IMAGES

Différents types d'histogrammes

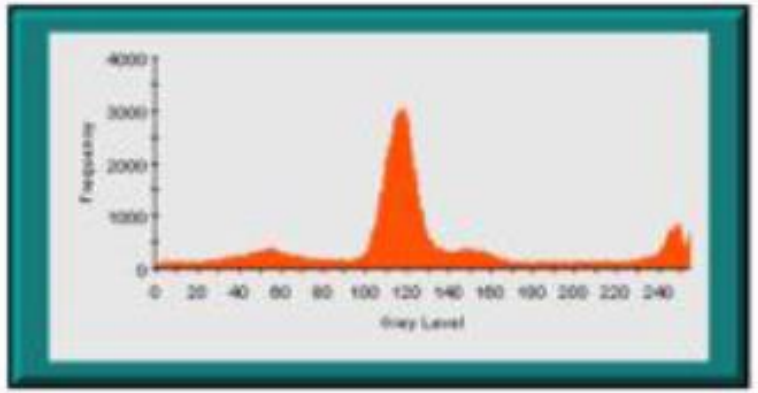


III – PRE-TRAITEMENT DES IMAGES



1 ligne

Image entière



III – PRE-TRAITEMENT DES IMAGES

Algorithme de l'histogramme

Image of 512x512 Pixels coded on 8 bits (256 K Bytes)

(2^8 = 256 Grey Levels)

```
For Grey= 0 TO 255
  N_Pixels(Grey)=0        --> Table N_Pixels = 0
End Grey

 For Y= 0 to 511     --> Image Scanning
   For X= 0 to 511
     Grey=f(X,Y)
      N_Pixels(Grey)=N_Pixels(Grey) + 1
   End X
End Y
```

Total Computations:

- 256 K Reading

- 256 K Additions

- 256 K Writing