

- Exercise 2: Principle Basic Image Processing

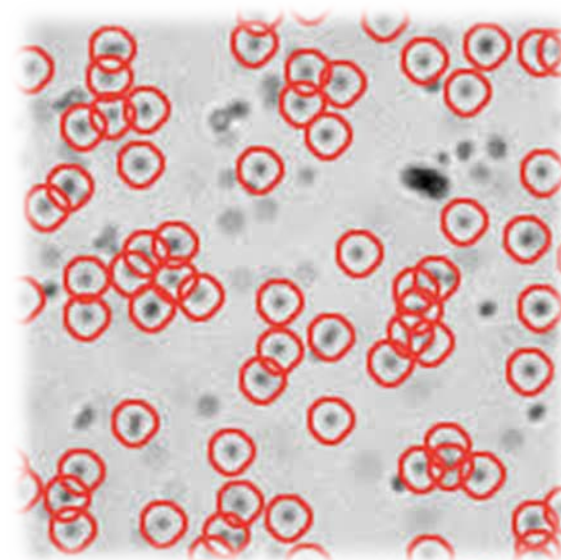


- Introduction to concept of computer vision using OpenCV Linux computation
- Practical exercise with defect detection (in partnership with ext company)

- Basic computer vision introduction
- Principle : demo using OpenCV Linux
- Topics to cover the entire flow of defect detection :
 - Image binarization
 - Image centering
 - Image filtering in 2D (sharpen/morphogy)
 - Image feature extraction (blob / corner / contour)
 - Image feature attributes (shape, position, number, color....)
 - Image masking
 -
 - To Higher level image classification



- Basic computer vision introduction
- Principle : demo using OpenCV Linux



High level

- Image learning
- Image classification
- Stereo vision

Mid Level

- Image segmentation, removal bgnd
- Main feature detection
- Corner detection

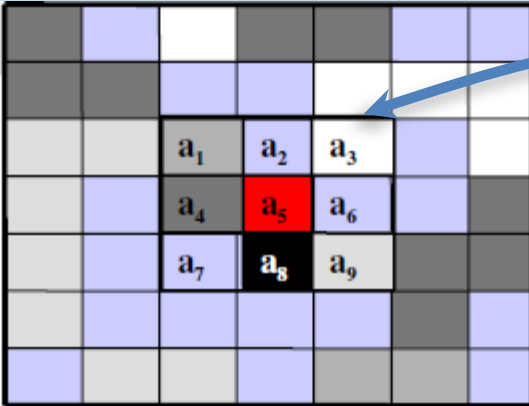
Low level

- Blob detection
- Kernel filter
- binarization

Image processing Treatment

Convolution filters introduction

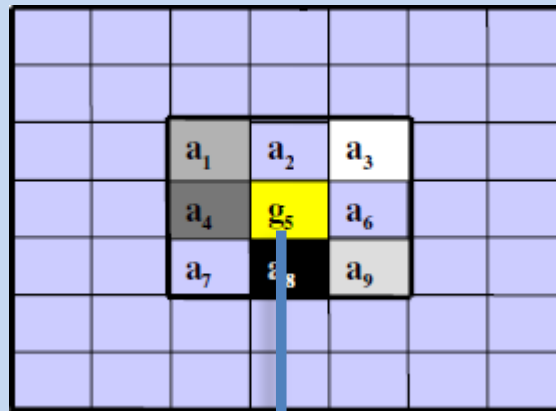
Input image



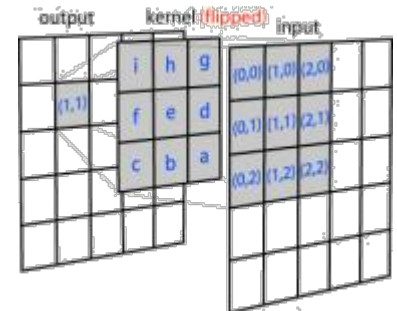
Kernel grid

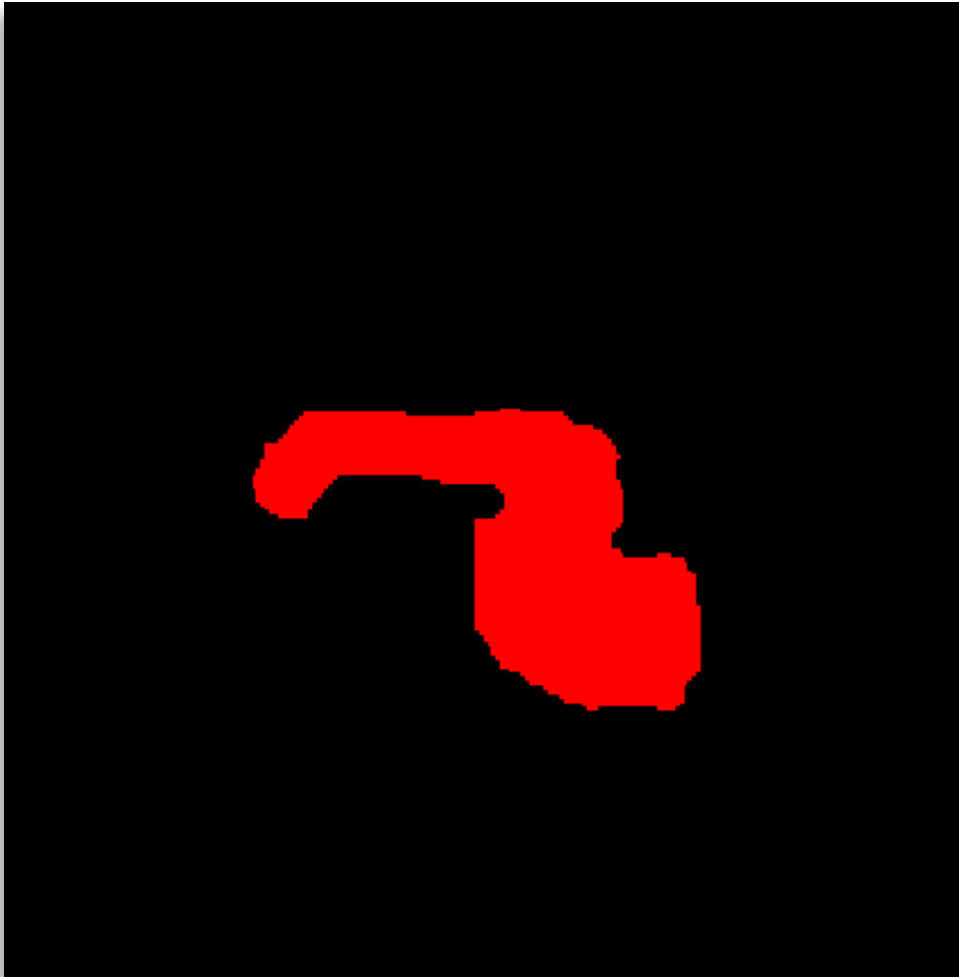
b_1	b_2	b_3
b_4	b_5	b_6
b_7	b_8	b_9

Output image

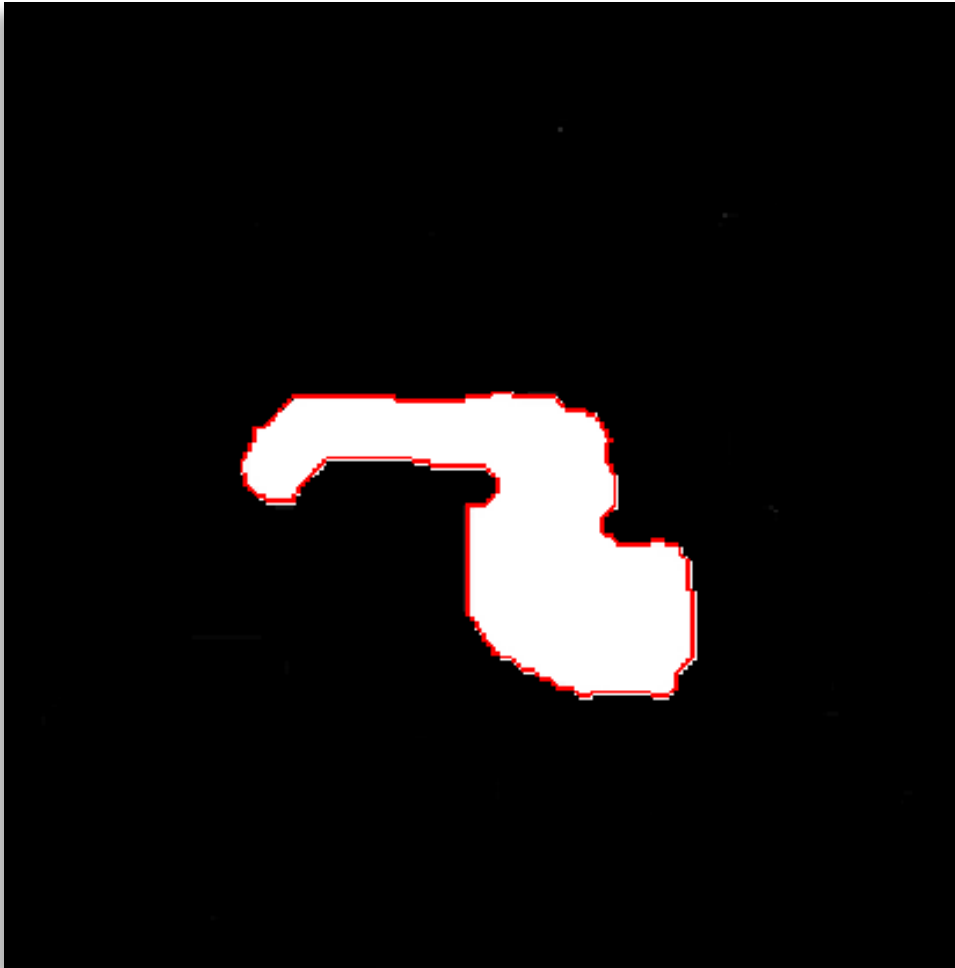


$$G_5 = (a_1 \times b_1) + (a_2 \times b_2) + \dots + (a_9 \times b_9)$$

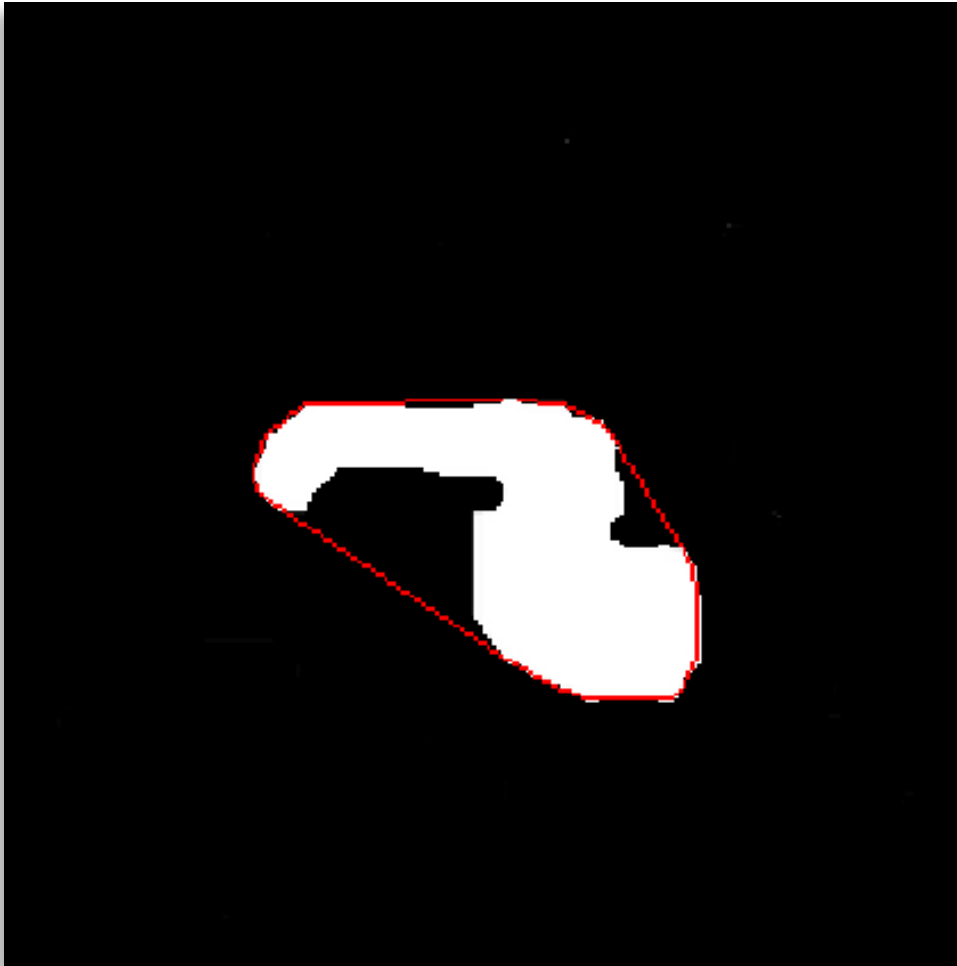




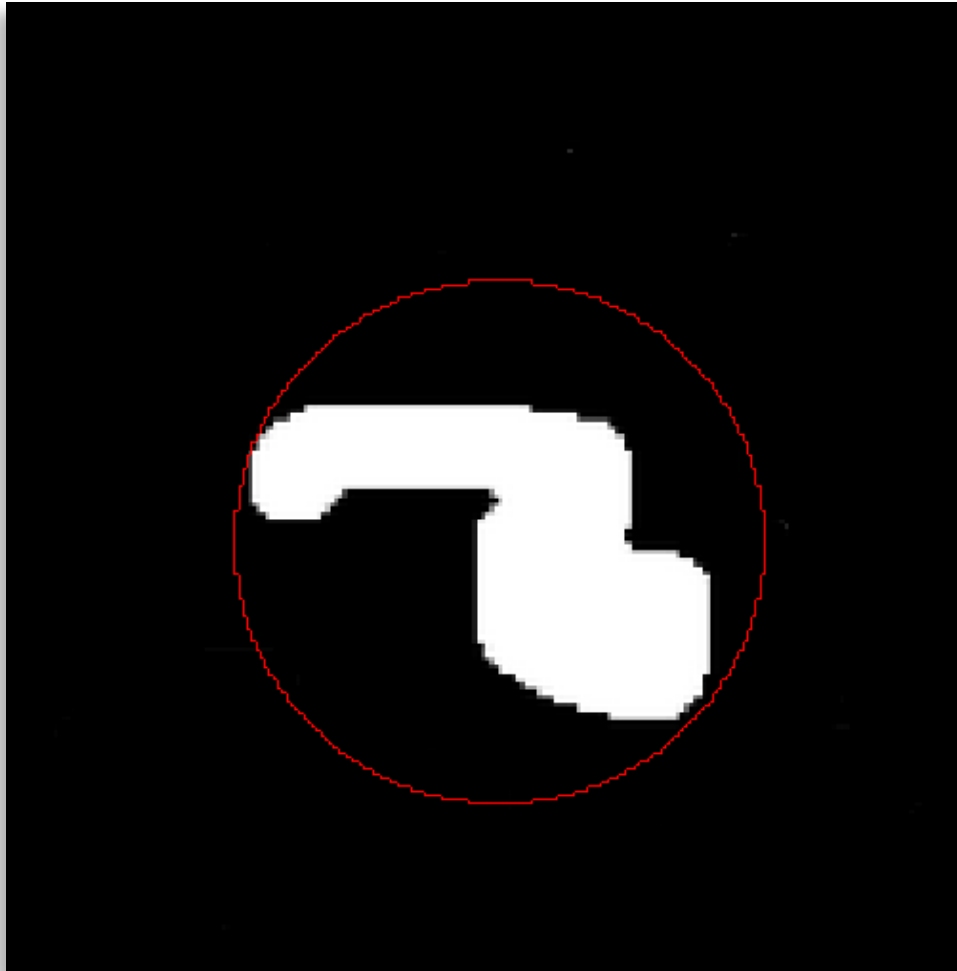
- ✓ **Area**
- ✓ Perimeter
- ✓ Convex hull
- ✓ Circularity
- ✓ Rectangularity
- ✓ Roughness/Compactness
- ✓ Width
- ✓ Height
- ✓ Length
- ✓ Principal/Secondary axis
- ✓ Principal axis angle
- ✓ Center of gravity
- ✓ ...



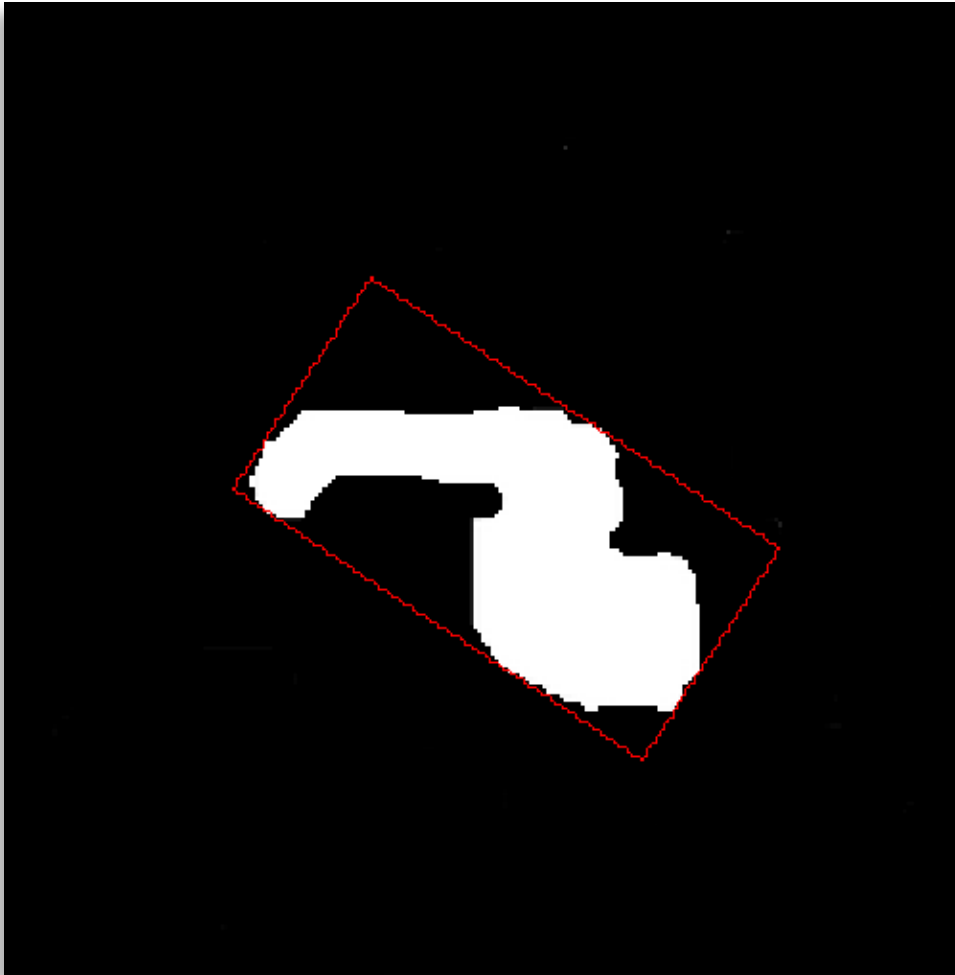
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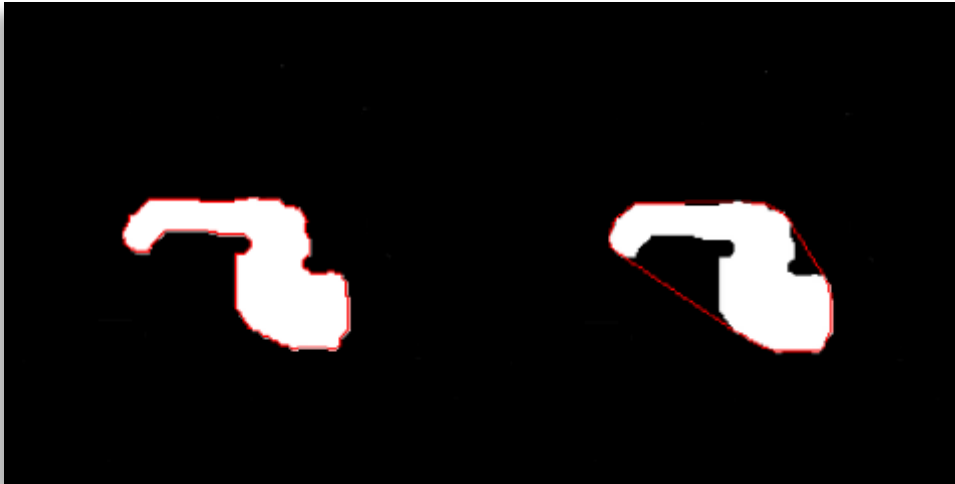
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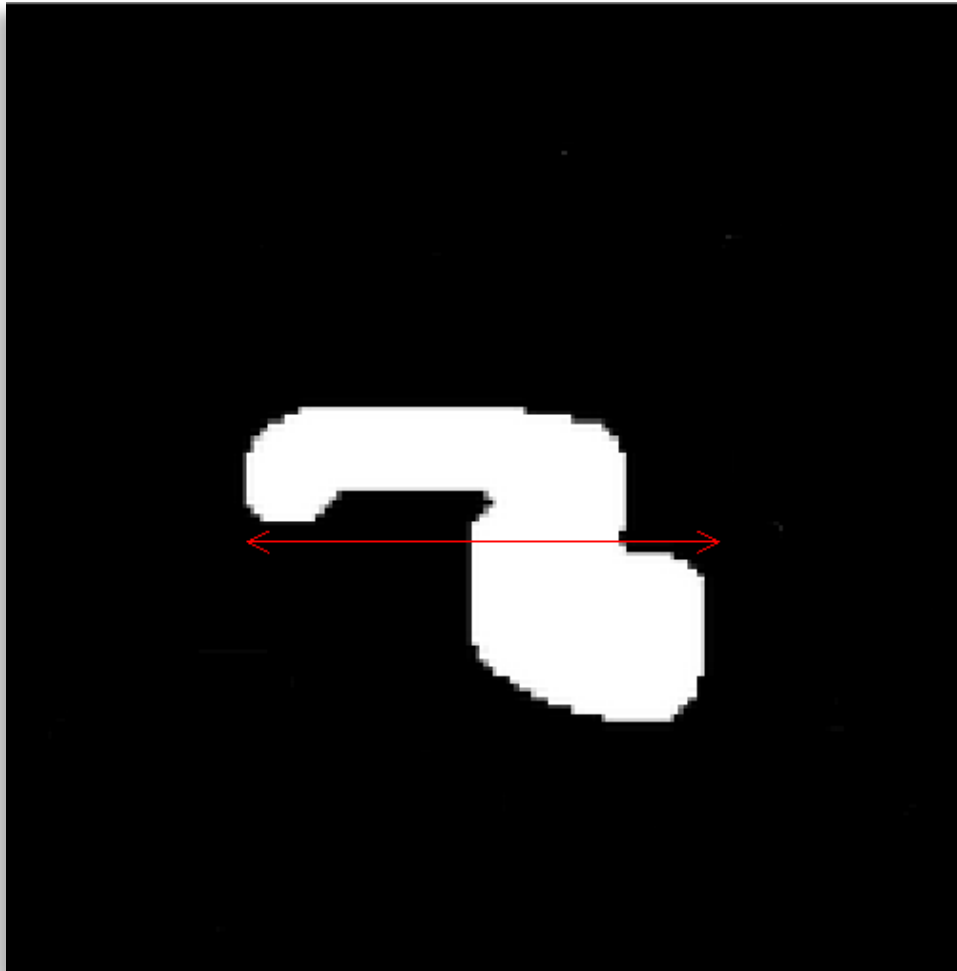
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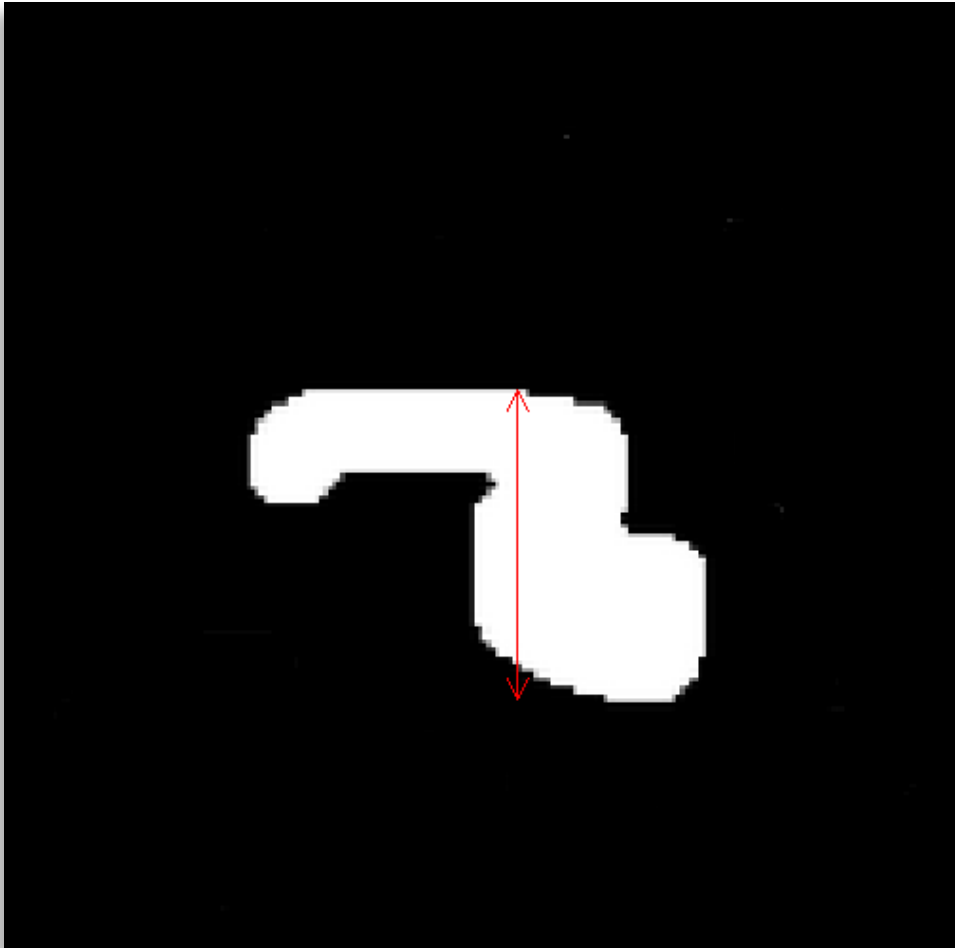
$$\text{Roughness} = \frac{\text{Perimeter}_{\text{Blob}}}{\text{Perimeter}_{\text{Convex}}}$$

$$\text{Compactness} = \frac{\text{Area}_{\text{Blob}}}{\text{Area}_{\text{Circle}}}$$

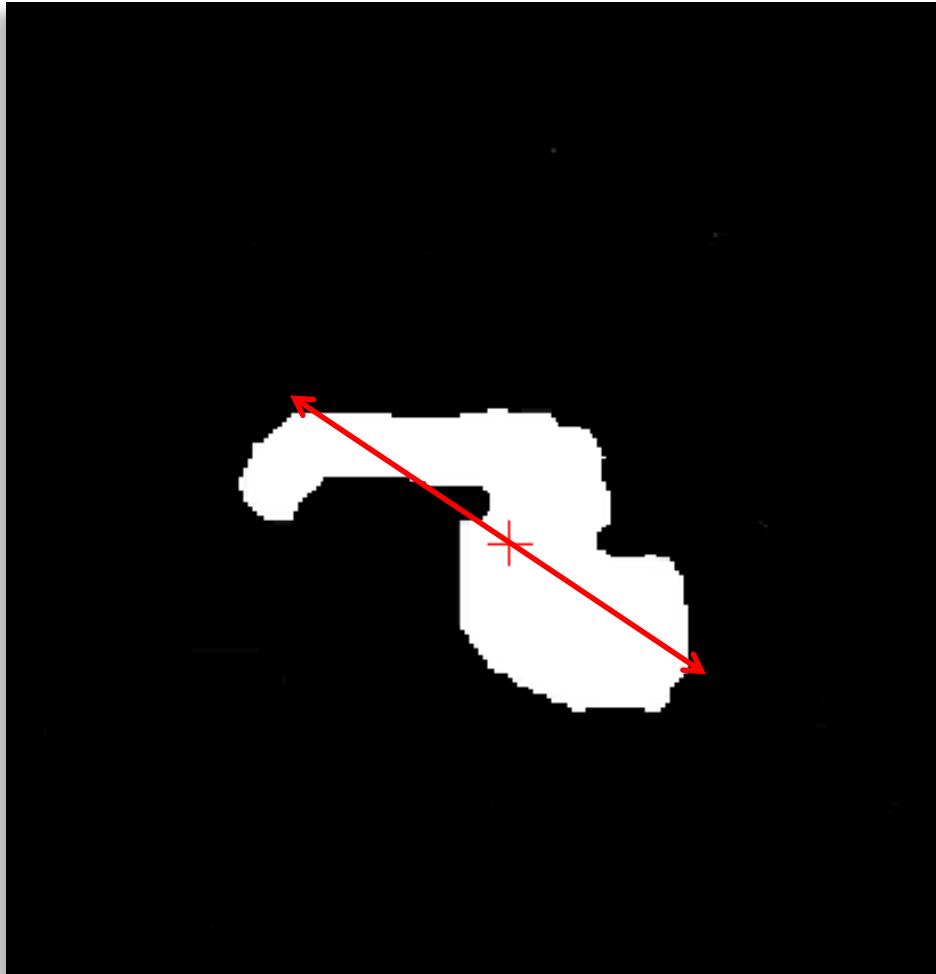
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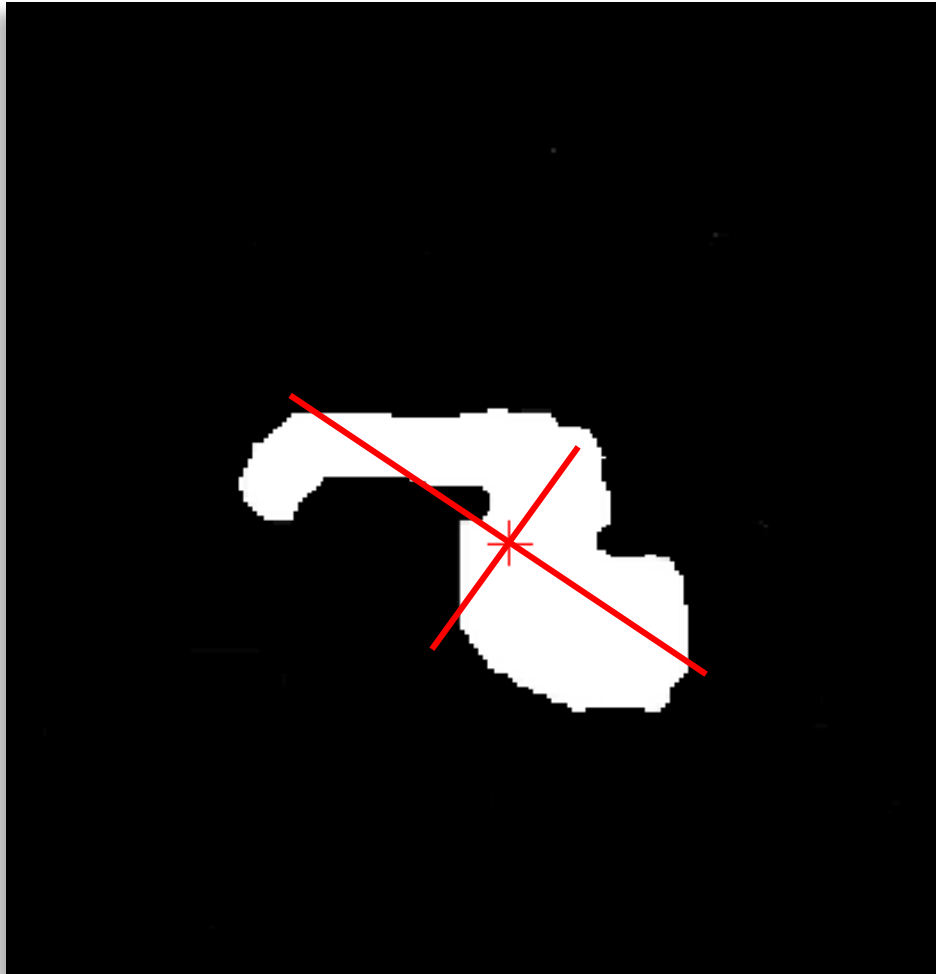
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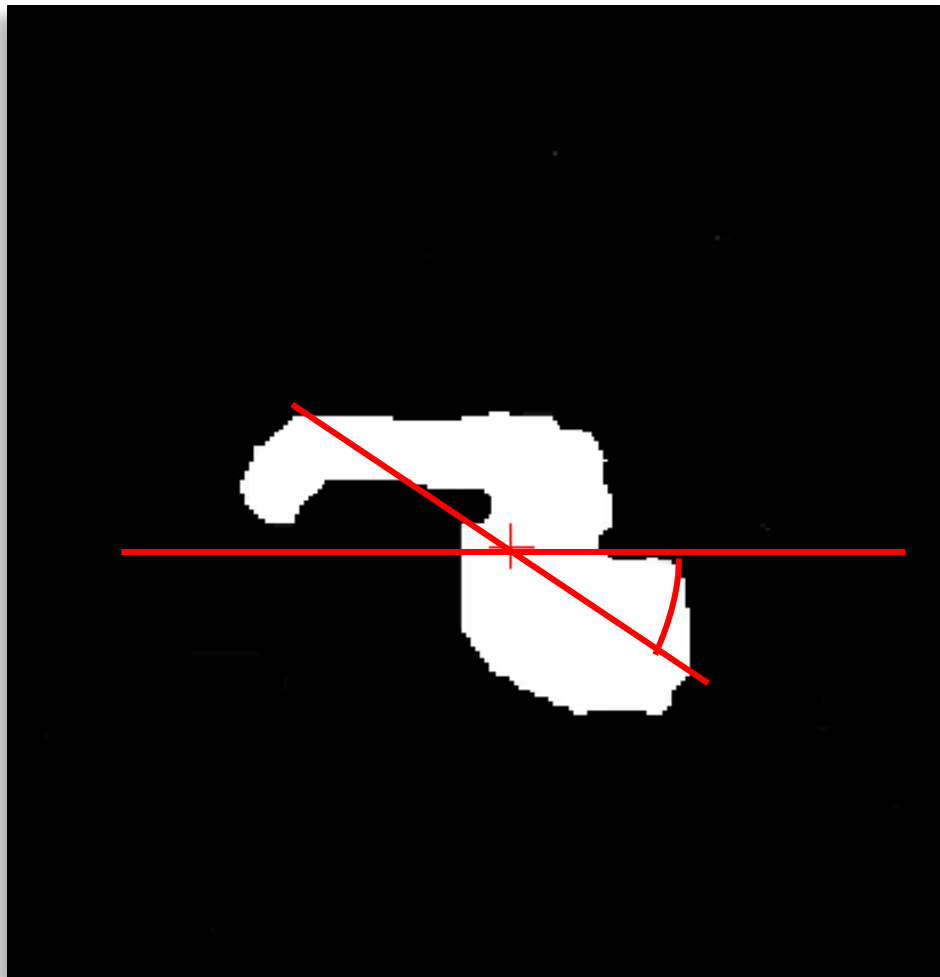
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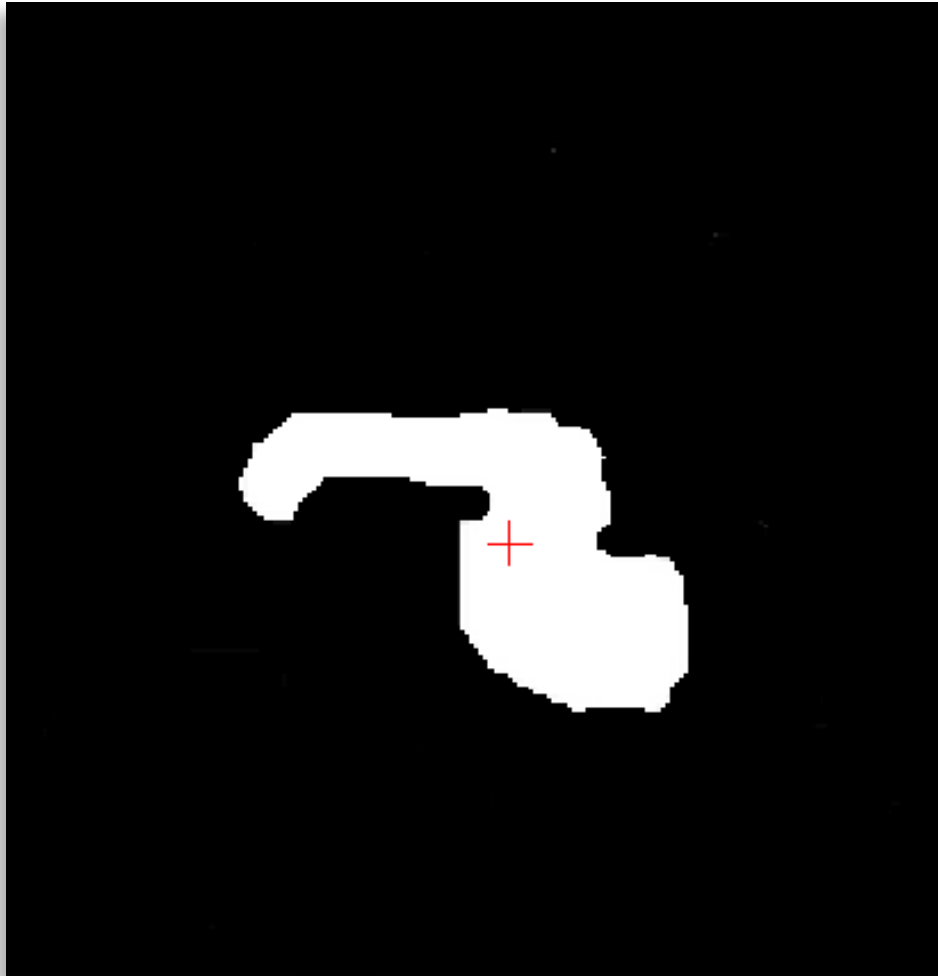
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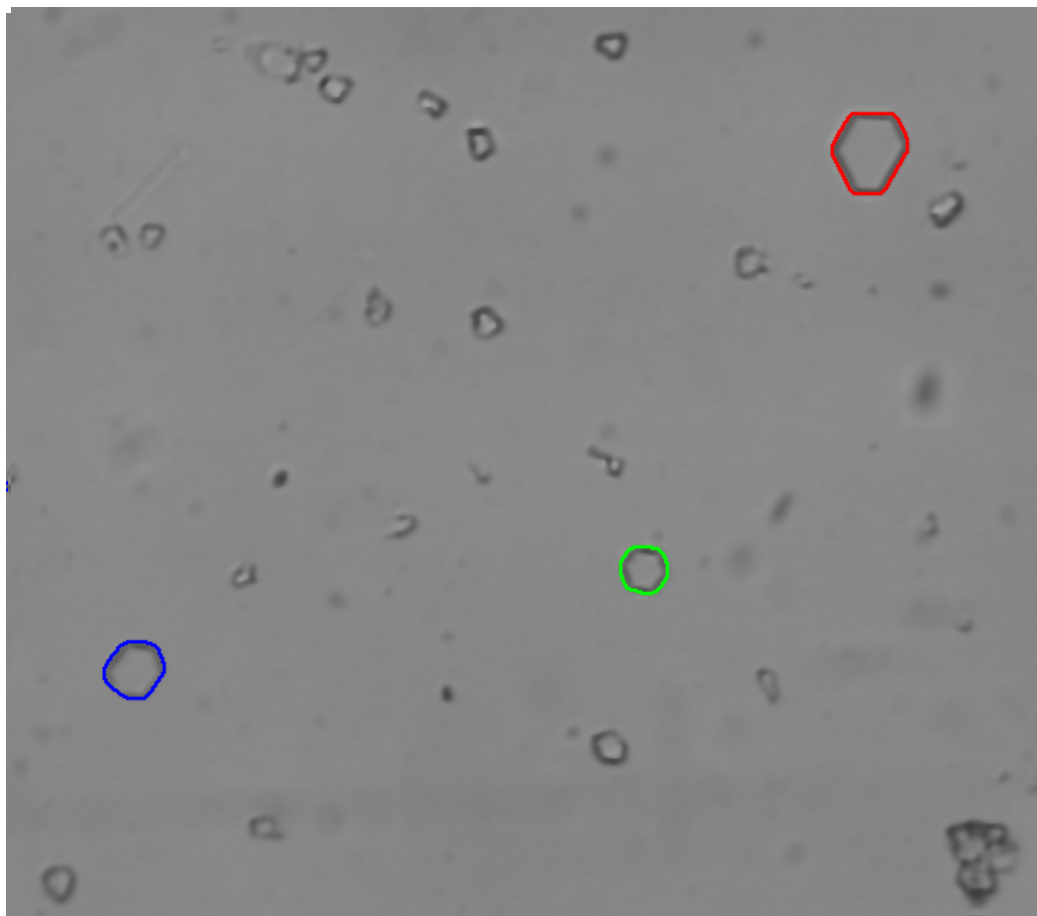
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Objective: locate hexagonal crystals in the image

Step 1: extract blobs without any restrictions

Step 2: filter blob with a criteria on area. Only blobs with an area in a given range are kept.

Step 3: filter blob with a criteria on entropy. Only blobs with an entropy in a given range are kept. Entropy measure consists in a statistical analysis of the gray level inside a blob.