



COMPUTER VISION

Júlia Garcia Torné and Josep Maria Rocafort

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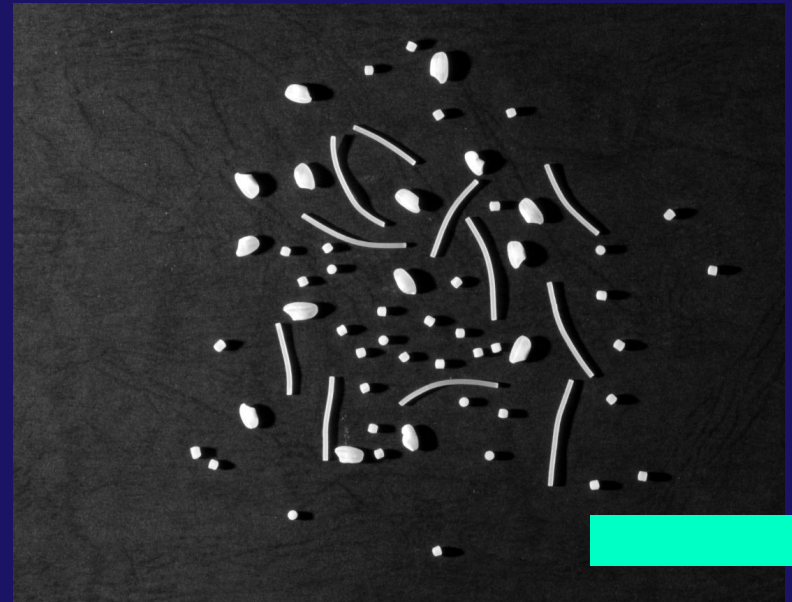
04

Proposed
solution

Notebooks with partial outputs available at:
github.com/juliagartor/Project-Computer-Vision

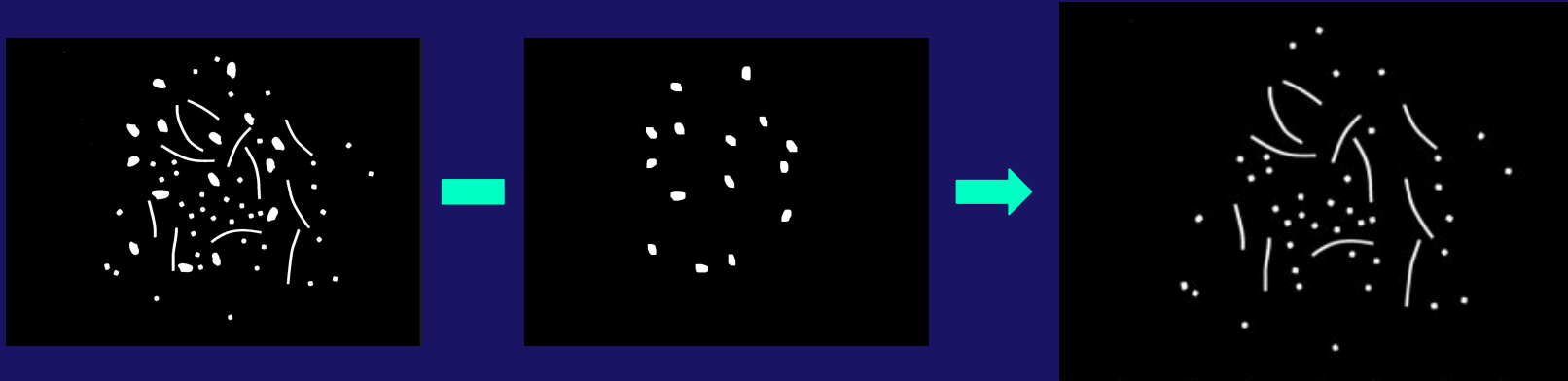
FIRST TASK

1. Count the number the number of element of each kind.
2. Provide separate images for each of them.



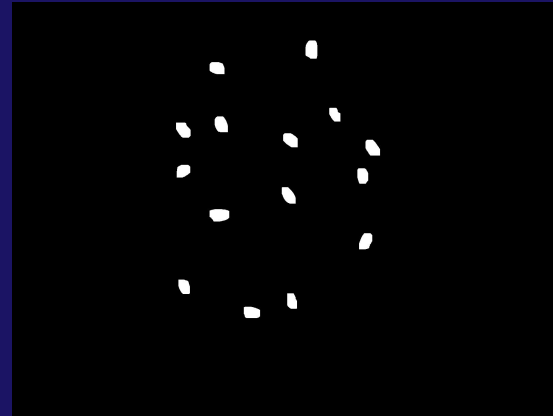
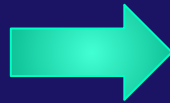
3. Simplify the problem:

- Compute a **subtraction** operation to get rid of pasta elements.



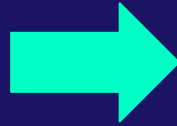
Algorithm Steps

1. Convert Grayscale Image to **Binary Image**.
2. Obtain pasta image:
 - **Erosion**: Get rid of useless elements (Spaghetti and Grains).
 - **Dilation**: Recover original pasta size.



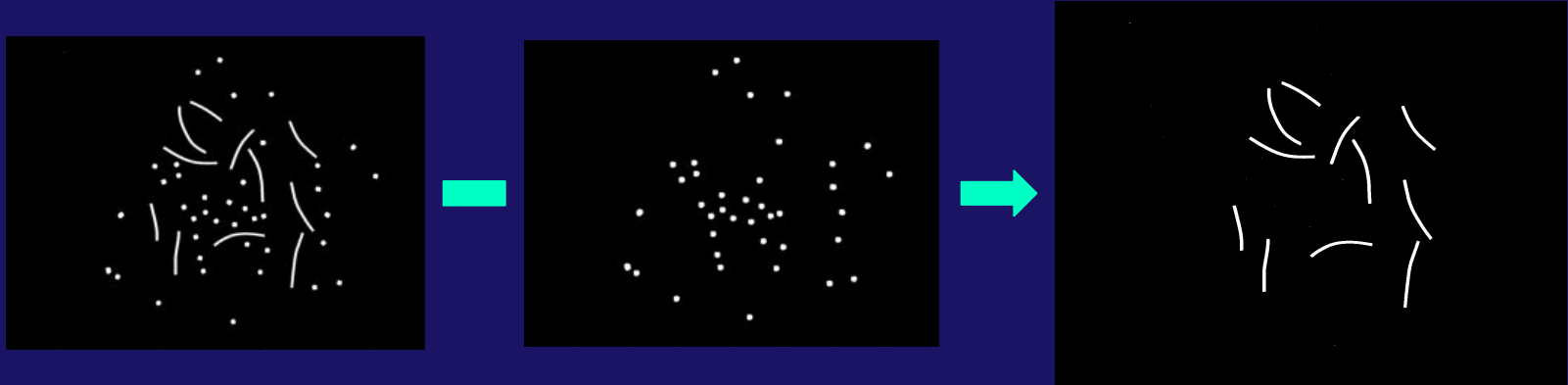
4. Obtain Grain image:

- **Erosion**: Get rid of useless elements (Spaghetti).
- **Dilation**: Recover original grain size.



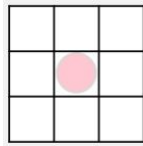
3. Obtain Spaghetti image:

- Compute a **subtraction** operation to get rid of Grains elements.



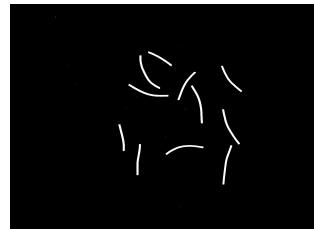
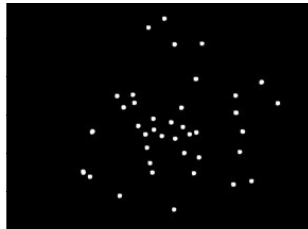
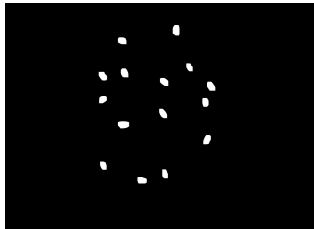
Counting the number of elements: Blob Detection in Binary Images

1. **Connected component analysis** algorithm.



8-Connectivity
→ Detect all
different elements.

2. **Area thresholding.**
→ Dismiss noise.

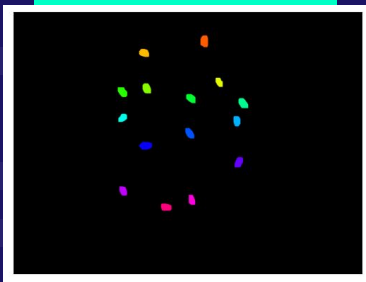


RESULTS

Pasta

Elements in image:

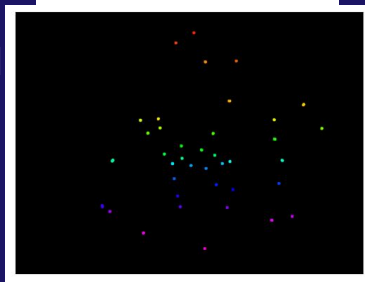
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Grains

Elements in image:

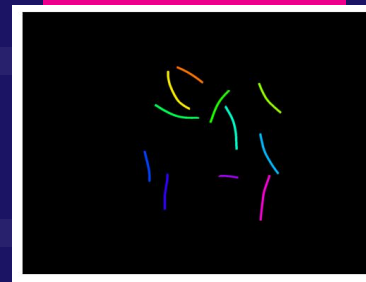
39



Spaghetti

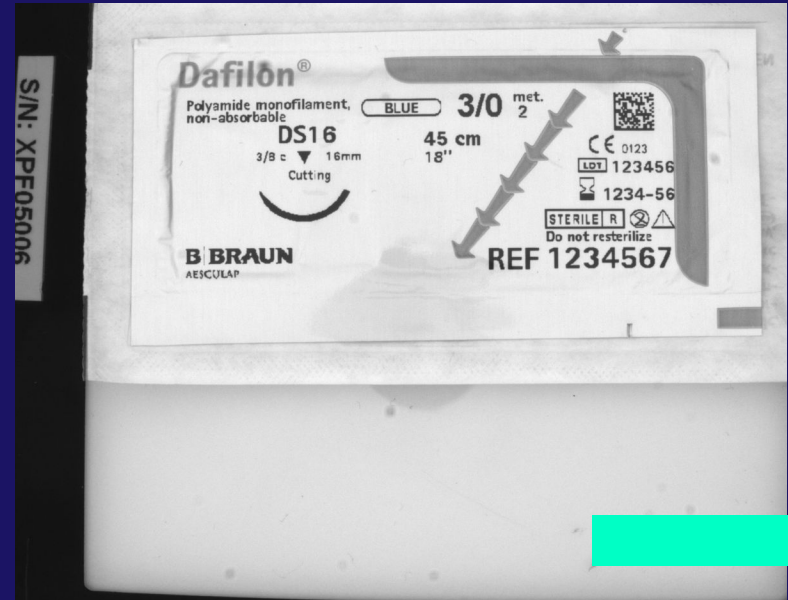
Elements in image:

11



SECOND TASK

1. Provide the reference number that appears on the image.



Algorithm Steps

1. **Resize** image.
2. Find REF coordinates on input image: Pixel-wise template matching.
3. Localize numbers coordinates.

REF



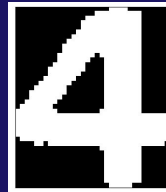
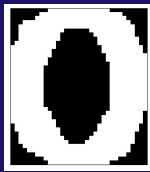
3. **Cropping ref. numbers:** hard-coded pixel window.

-> We assume that input images scale and rotation is constant.



4. **Converting to binary, separating numbers into image per digit and cropping borders.**

-> Row and column wise scan.



5. Apply the **same processing** as (4) for all **templates**.

6. **"Correlation indicator"** mean of pixel-wise matches for evaluated digit and template.

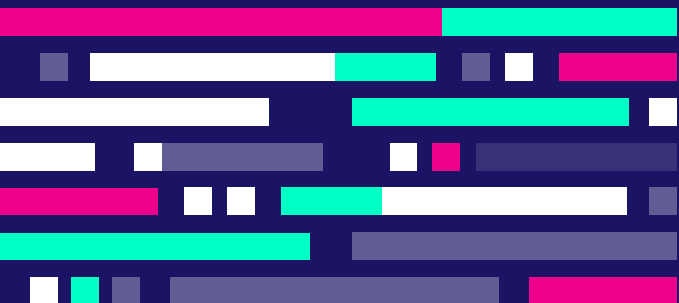
- > Calculate and apply borders to have shapes match
- > Max correlation is detected number

examples:

$$\mu(\text{1} \wedge \text{0}) = 0.4649350649350649 \quad \mu(\text{1} \wedge \text{1}) = 0.8835978835978836 \quad \mu(\text{1} \wedge \text{2}) = 0.5254515599343186$$

RESULTS

```
(chaos) josepsmachine@Joseps-MacBook-Air ref_num_problem % python ref_num_reader.py perfecta-test.bmp  
WELCOME THE REFERENCE NUMBER READER!  
REF: 0934552
```



Obtained number:

0934552

THANKS!

Do you have any questions?