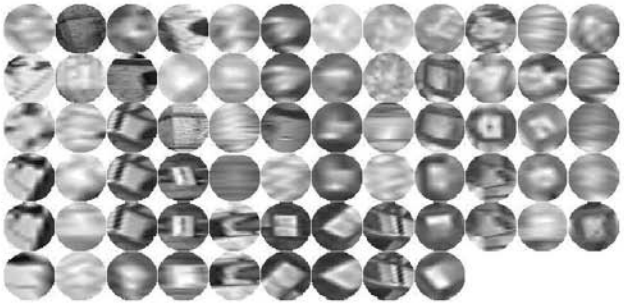
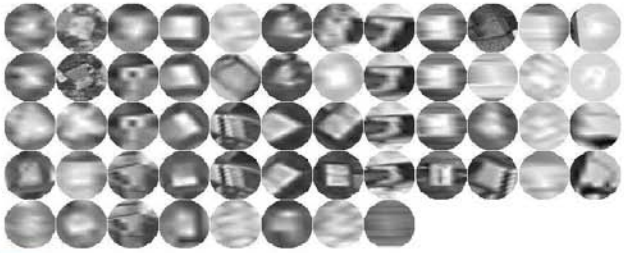
MSER Operator: Maximally Stable Extremal Regions

- MSER regions are connected areas characterized by almost uniform intensity, surrounded by contrasting background.
- They are constructed through a process of trying multiple thresholds.
- The selected regions are those that maintain unchanged shapes over a large set of thresholds.

Matas et al. 2001

Examples of MSER Regions





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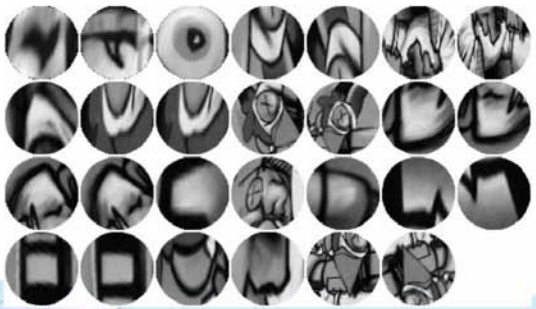
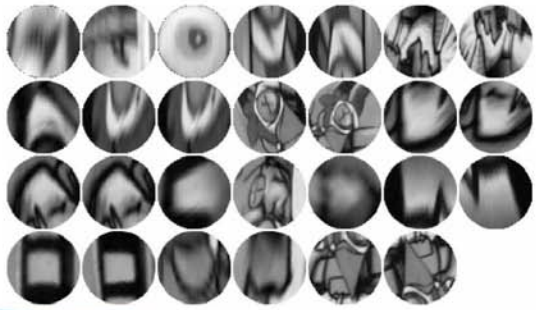
Another Example





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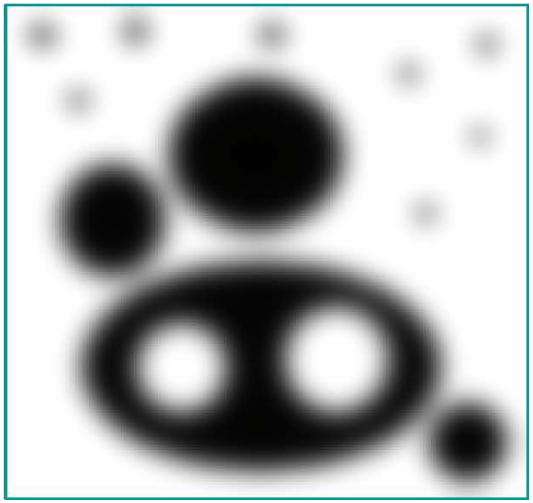
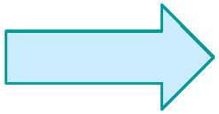
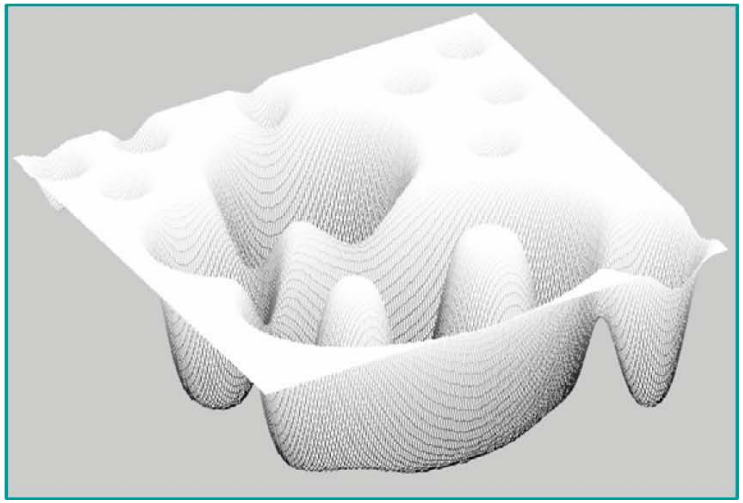
MSER Construction (1)





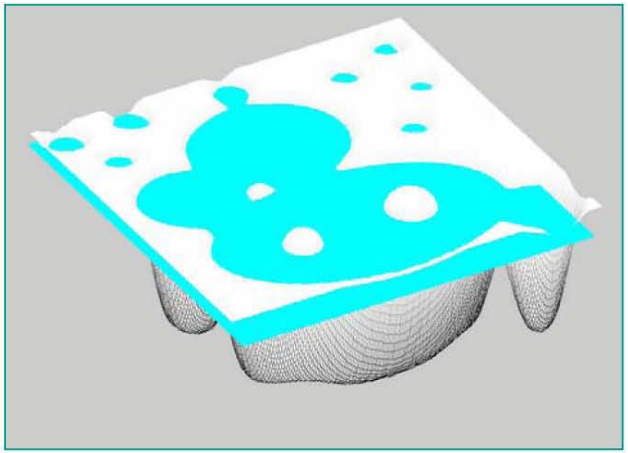


intensity image

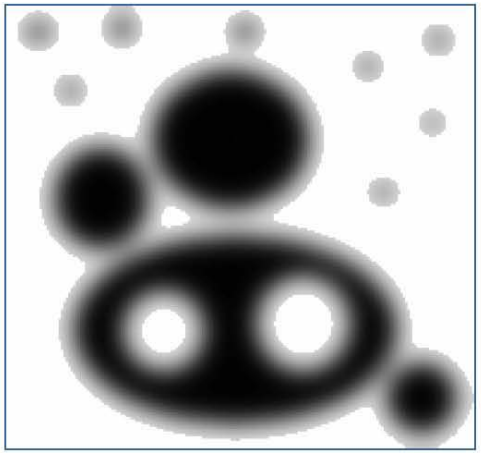
shown as a surface function

Watershed segmentation algorithms come from the concept of filling a basin with water to different levels.

MSER Construction (2)



Threshold simulation



Extremal Regions (represented by their original lumiance values)

For each region, and for each threshold value, the region area is saved.

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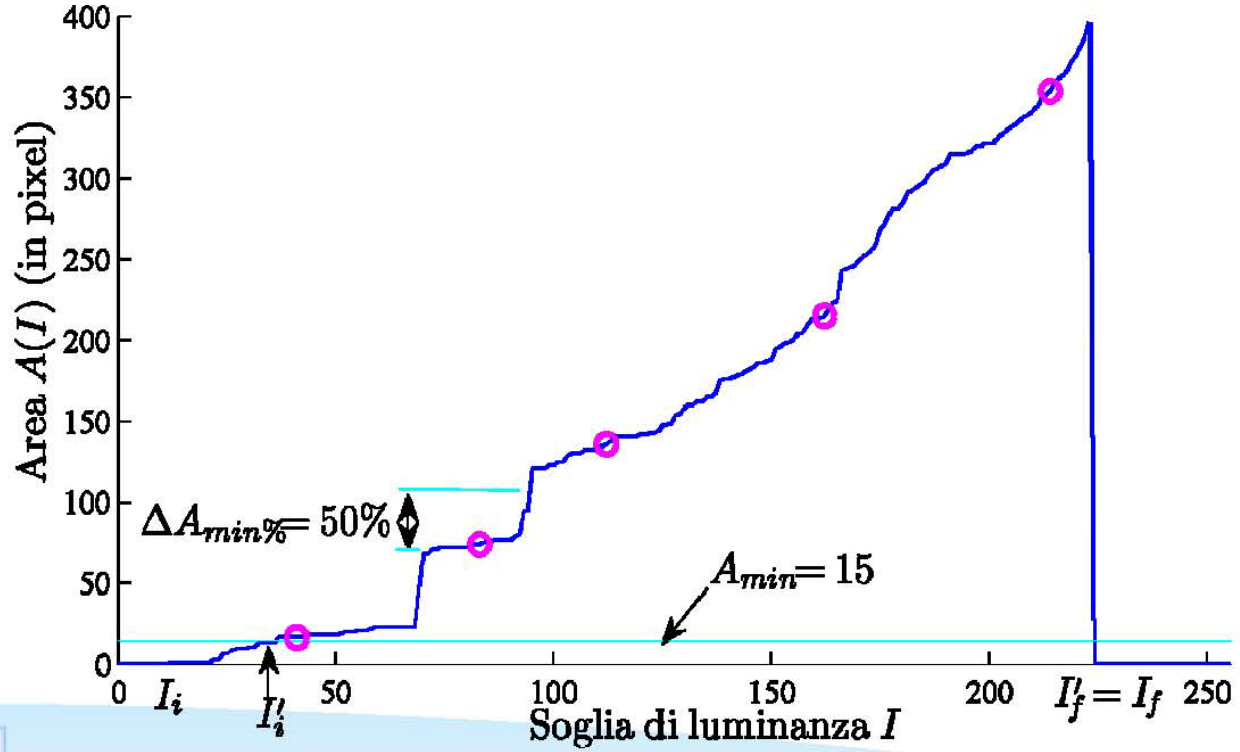
MSER Computation (3)

- For each threshold, compute the connected binary regions.
- Compute a function, area A(i), at each threshold value i.
- Analyze this function for each potential region to determine those that persist with similar function value over multiple thresholds.

Analysis of Area Function



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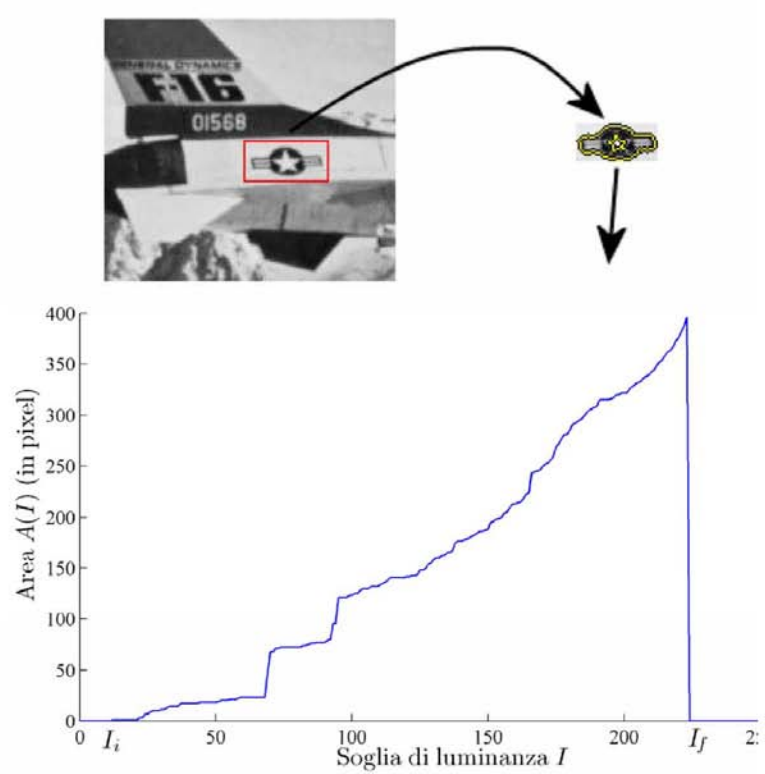
Regions detected at different thresholds have different areas



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Normalization

MSER regions

Ellipse Fitting

Ellipse Dilation

Affine transformation from ellipses to circular regions plus intensity normalization