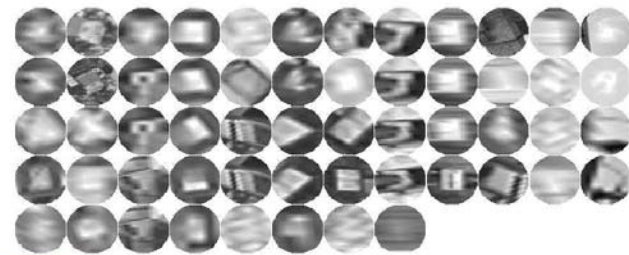
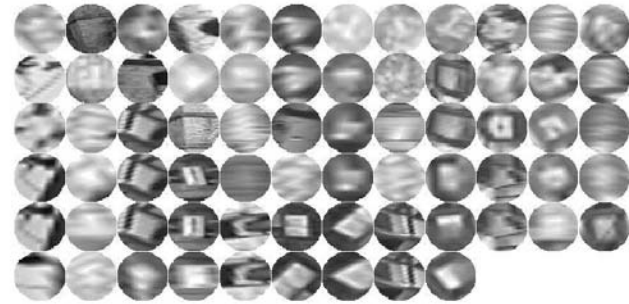


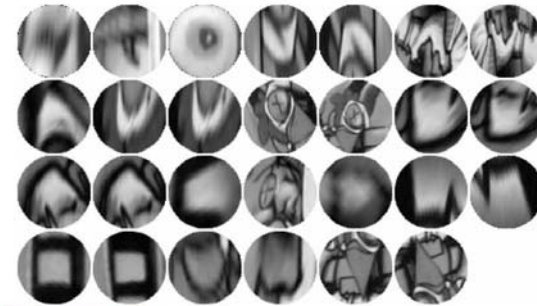
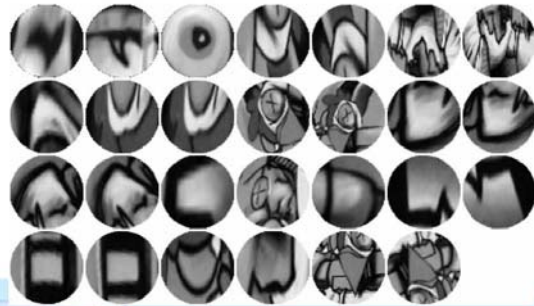
# MSER Operator: Maximally Stable Extremal Regions

- 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.

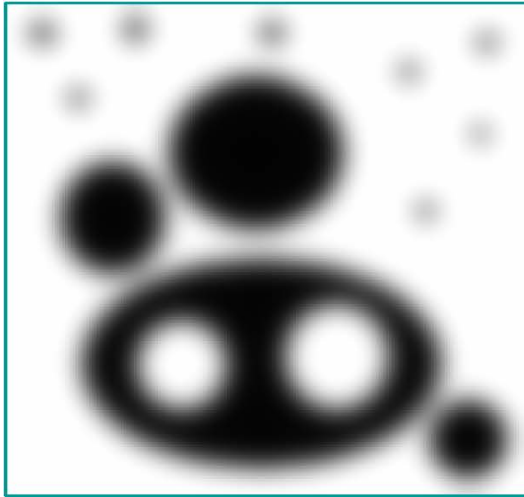
# Examples of MSER Regions



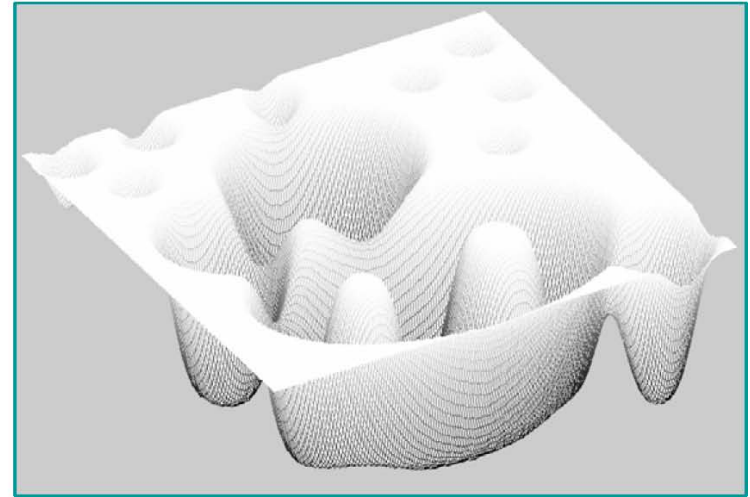
# Another Example



# MSER Construction (1)

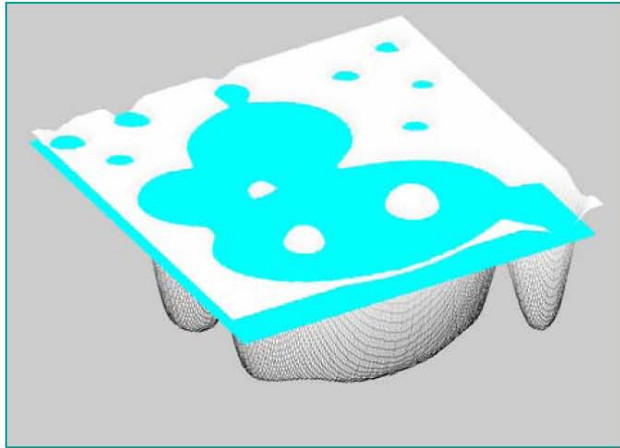


intensity image

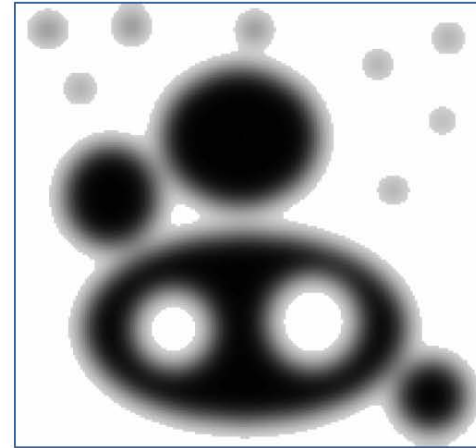


shown as a surface function

# MSER Construction (2)



Threshold simulation



*Extremal Regions (represented by their original lumiance values)*

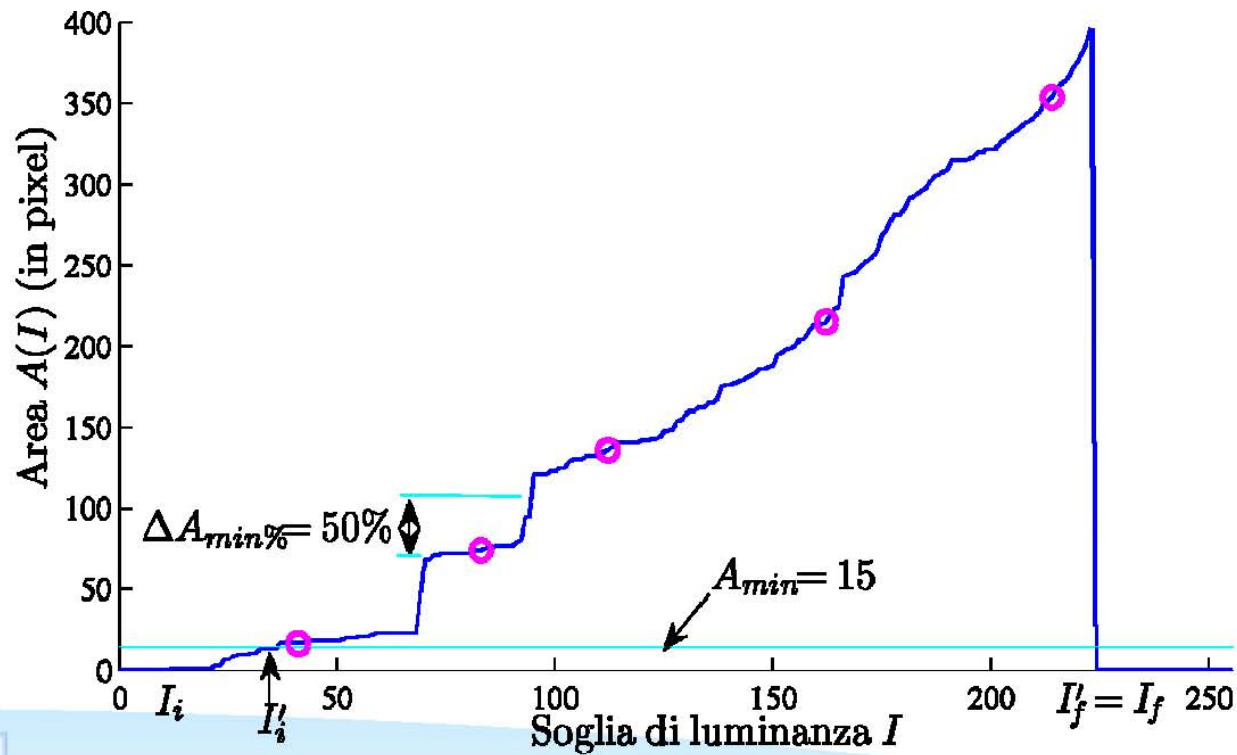


For each region, and for each threshold value, the region area is saved.

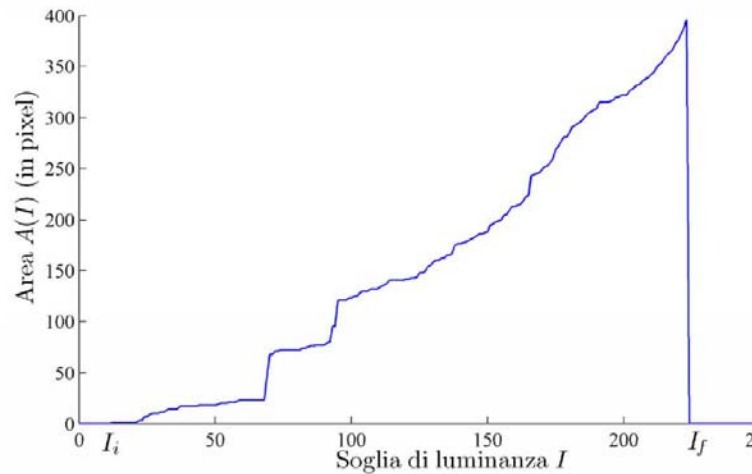
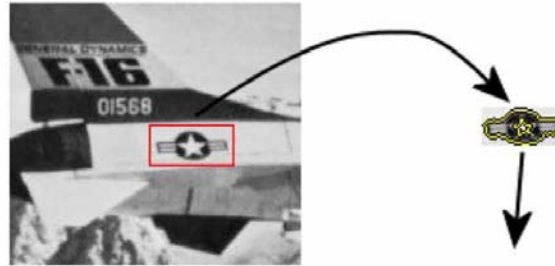
# MSER Computation (3)

- For each threshold, compute the connected binary regions.
- Compute a function, such as 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



# Regions detected at different thresholds have different areas





# Normalization



MSER regions



Ellipse Fitting



Ellipse Dilation

# Affine transformation from ellipses to circular regions plus intensity normalization

