

Pokročilé spracovanie obrazu - Morfológia II.

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13.11.2018

Granulometria

Opening with various SE

If we open a binary image with consecutively bigger structural elements we can retrieve information about the distribution of the object sizes.

Exercise

Open the image `granulometria.png` with consecutively bigger structural elements. Display a bar graph showing the relationship between the area of the opened image and the size of the SE.

Conditional dilation

Conditional dilation - definition

The image is thresholded with two different thresholds. We thus obtain two images: A for the higher threshold and B for the lower one. Conditional dilation with structural element SE is defined as: $(A \oplus SE) \cap B$.

Exercise

Test the conditional dilation for the image `bunky.png`.

Grayscale erosion and dilation

Dilation and erosion

For $f, h: \mathbb{R}^2 \rightarrow \mathbb{R}$ with finite support we define:

$$f \oplus h = \max\{f(x-r, y-s) + h(r, s) \mid (r, s) \in \text{supp}(h)\} \text{ and}$$
$$f \ominus h = \min\{f(x-r, y-s) - h(r, s) \mid (r, s) \in \text{supp}(h)\}$$

Matlab

Function names in Matlab are the same as function names for binary images.

Úloha

Test dilation, erosion, opening and closing on the image zatisie.pgm. Use closing and subsequent opening to smooth the image.

Morphological gradient

Morphological gradient

$$\text{grad}(I) = \frac{(I \oplus SE) - (I \ominus SE)}{2}$$

Morphological gradient - internal

$$\text{grad}(I) = I - (I \ominus SE)$$

Morphological gradient - external

$$\text{grad}(I) = (I \oplus SE) - I$$

Úloha

Otestujte detekciu hrán pomocou morfológického gradientu.

Top-hat and bottom-hat transformation

Top-hat transformation

Top-hat transformation is the difference of the original image and its opening. Bottom-hat transformation is the difference of the closing of an image and its original.

imtophat

`imtophat(I, SE)` - returns top-hat transformation of the image with structural element SE

imbothat

`imbothat(I, SE)` - returns bottom-hat transformation of the image with structural element SE

Adaptive segmentation

Segmenting on non-constant background

We can utilize the top-hat transformation to segment light objects on non-constant background. Bottom-hat can be used to segment dark objects.

Exercise

Segment the qr codes in qr.png and rice from rice.png (included in Matlab)

Contrast correction

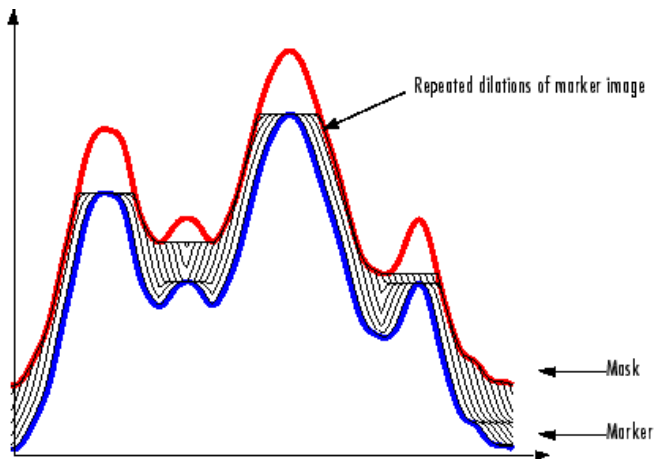
Increasing contrast

We can increase the image contrast by adding the top-hat transformation and subtracting the bottom-hat transformation from the original.

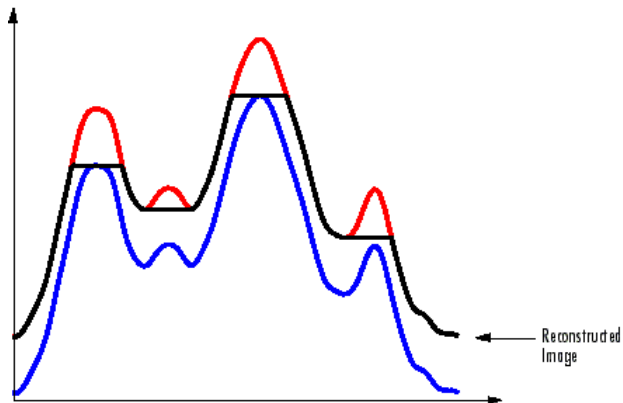
Exercise

Increase contrast in krajinka.png

Reconstruction



Reconstruction



Reconstruction

Filling a chosen object

We can use reconstruction to segment chosen objects in a binary image. To do this we choose a marker in a way which contains only the points that are in the object we want to segment.

`imreconstruct`

`imreconstruct(marker, mask)` - returns reconstruction of mask by the given marker.

Exercise

Use `ginput` and segment only the letter in `text.png` which gets clicked on by the user.