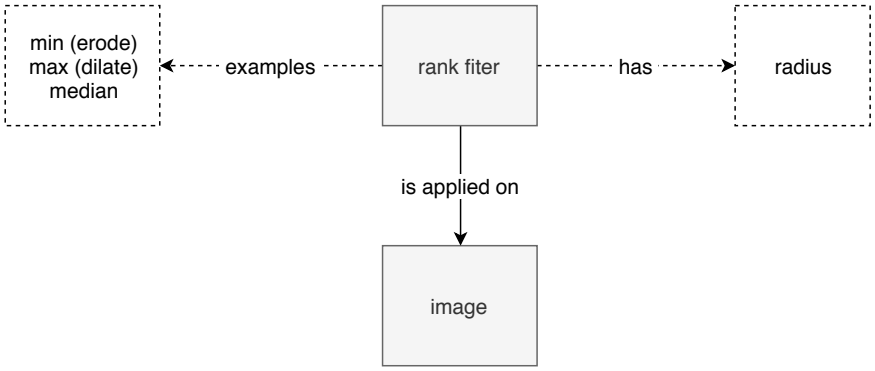
Rank Filters

Rank filters

- Rank filters are local filters based on sorting (ranking) pixel values.
- Rank filters work like this: (i) sort the pixel values in a certain neighborhood around a central pixel, (ii) pick one value (x) based on its position (rank) in this sorted list of values, (iii) replace the central pixel by x.
- Rank filters are very useful both for gray scale and binary images.



Activities

- Understand how min, max and median rank filters work conceptually (=> whiteboard session)
- Explore applying rank filters to binary images
- Explore applying rank filters to grayscale images
- Discuss the different names of rank filters (minimum, erosion, ...)

Rank filter sequences (morphological filtering)

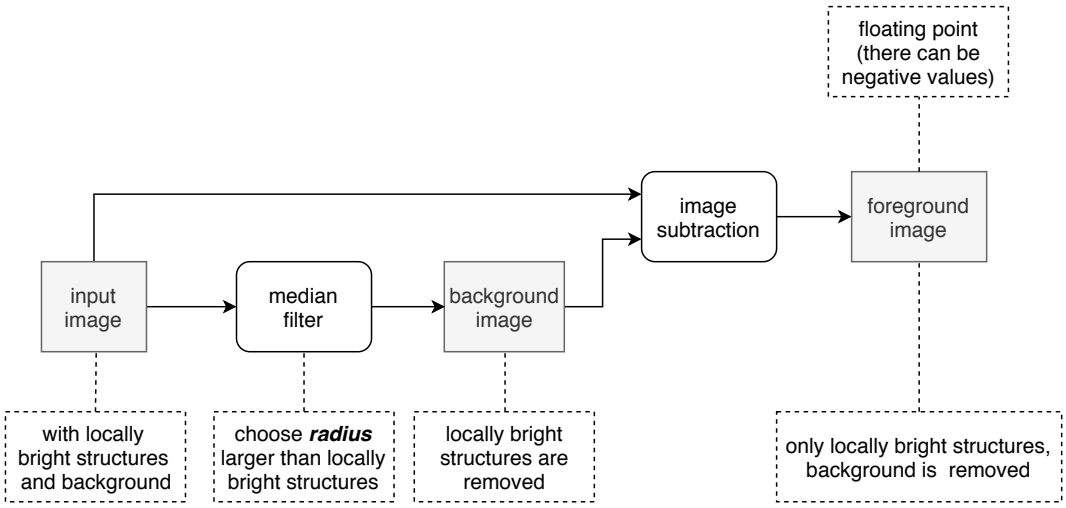
- Applying rank filters in all kind of sequences is very useful in image analysis.
- This important image analysis field is also called morphological filtering.
- Morphological filtering can be applied both to binary and grayscale images.

Activities

- Explore the effect of above rank filter sequences on some images

Local background subtraction using a median filter

- Biological images very often have "background" that is not constant across the image.
- For example, it often is the case that one wants to quantify protein localised to small dot-like (locally bright) structures in the prescence of diffuse protein.
- Subtracting a median filtered image with a radius larger than the radii of the objects of interest is a very good and popular method for removing uneven background.
- This works well also in the presence of noise.
- It is not perfect at corners of background structures.

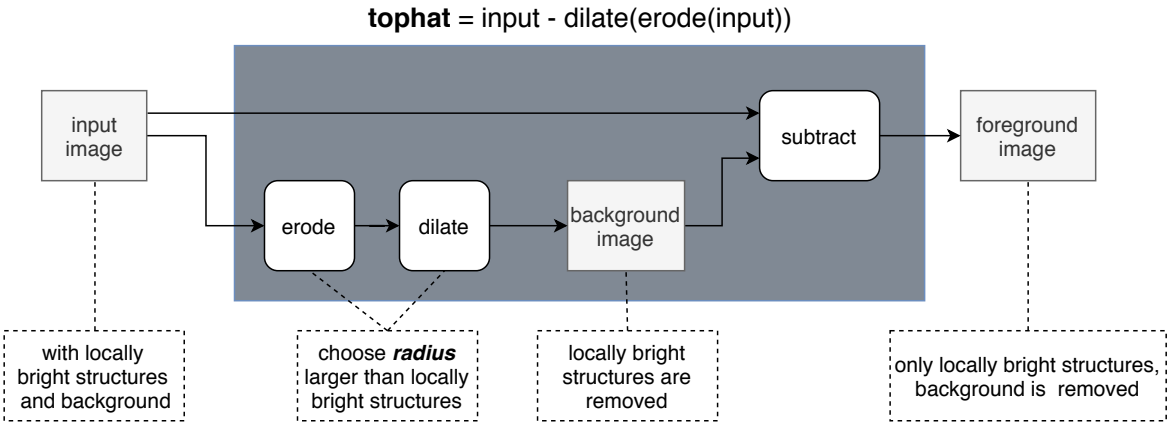


Activities

- Peform above workflow on a example, exploring different radii for the median filter.
- Observe that this approach does not work perfectly at the corners of background structures.

Local background subtraction using a tophat filter

- Biological images very often have "background" that is not constant across the image.
- For example, it often is the case that one wants to quantify protein localised to small dot-like (locally bright) structures in the prescence of diffuse protein.
- Subtracting a morphological opening (i.e. performing a tophat filter) with a radius larger than the radii of the objects of interest is a very good and popular method for removing uneven background.
- In the prescence of noise it leads to non-zero background (=> incorrect intensity quantification).
- It typically works rather well also at corners in the background.



Activities

- Peform above workflow on a example, exploring different radii for the median filter.
- Observe that this approach works rather well at the corners of background structures.