Practicum Computational Vision

Practicum 8: Top-down segmentation

This session will practice the top-down segmentation by active contour models, gradient vector flows and level sets.

8.1 Obtain image segmentation by active contour models

Run the file snake_demo.m and observe both examples: the segmentation of a heart in images using active contour models. Observe the influence of the different parameters: alpha, beta, lambda, kappa, maxstep, etc. An explanation of them can be found at the header of the file snake.m. Vary the values of the parameters and describe how they affect the model evolution. Which are the optimal values? Which are the critical values for each parameter? Add to the code the necessary lines in order to illustrate the different behavior of the active contour model when parameters are changed. Use the title command to visualize the performance of different parameters as Fig.1.

Explain what potential and external forces are used in order to segment the heart.

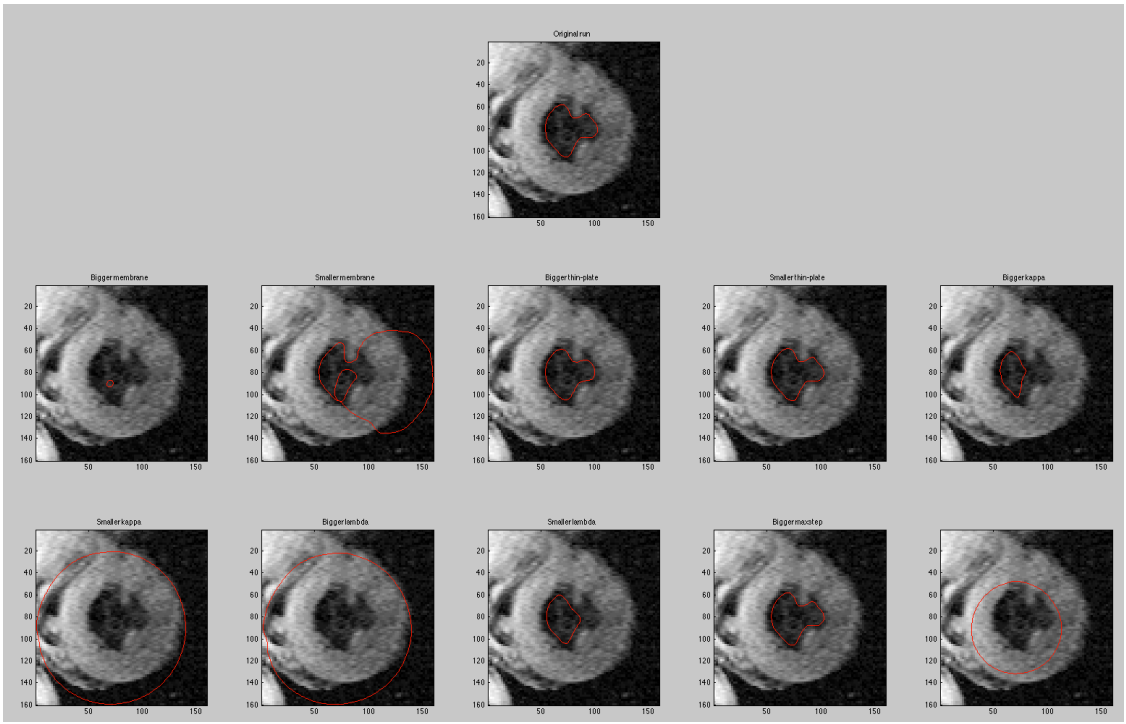

Fig.1 Visualizing the snake evolution using different parameters.

8.2 Obtain image segmentation by active contour models in noisy images

Apply the segmentation by active contour models to segment the bird.

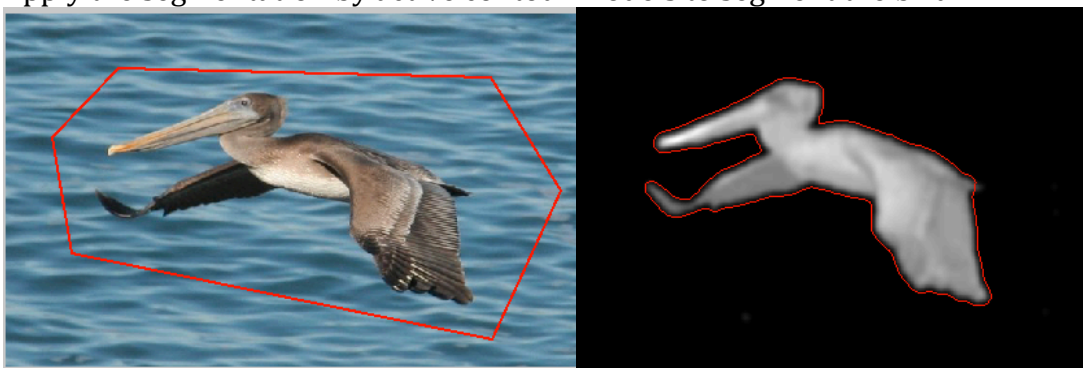

Fig.2 Segmentation of a bird by active contour models

Explore which are the most critical parameters for the segmentation.
Explain which potential and external forces are used.

Add different kinds of noise with different parameters on the image and segment the bird. To which extent the segmentation could manage the noise?! Which parameters you can use to compensate the noise?!
Note: Begin adding small amounts of noise.

8.3 Exploring the segmentation by level sets

Given the exercise levelsets_demo.m, explain:

a) what is the initial level set model?
b) What are the parameters of the level set and how do they affect the segmentation result?
c) What is the difference between the segmentation of the MRI brain in levelsets_demo.m and levelsets_demo3.m?

8.4 Application of the Segmentation by level sets for food analysis

Given the set of images, segment the ketchup part exploring the top-down segmentation techniques. Which technique and with which parameters work best? Illustrate it comparing to some of the alternatives (by model and parameters).
Comment the advantages and the limitations of the method.

Note: You can reduce the size of the image in order to accelerate the process e.g. by 4.

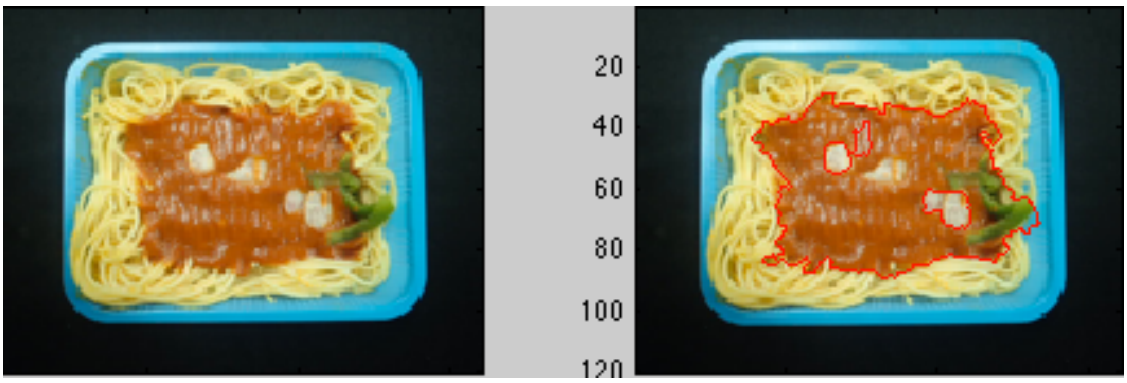

Fig. 3. Food segmentation

Practicum submission

You are requested to submit the exercises in this practicum with the exercises in the next session as a file "StudentName1+StudentName2_Lab7-8.zip" containing:

- A report entitled " Image segmentation" including the results of the problems posed in the lab 7 and 8 properly commented and all necessary images to fully understand your discussion. The report must provide answers for all questions.

-The matlab files with the implementation of the exercises.

Deadline: 6th of December, 23:55h by Campus Vitual.