SHERPA: A straightforward way to suitable settings

When it comes to finding settings suitable for your data and investigation, a simple procedure will help:

1. Load your templates. If you don't already have templates specific to your data, using those templates delivered with SHERPA is a good starting point.

2. Load your image data. In the beginning it is recommended to start with a decent amount of typical samples (some dozens to a couple of hundreds).

3. Select segmentation procedures "Otsu's Thresholding", "Histogram Equalization + Otsu", "Canny Edge Detector" and "Adaptive Thresholding".

4. Decide if you are interested in convex (valve) shapes only. If so, enable "Force Convexity", otherwise enable neither "Use Convexity" nor "Force Convexity".

5. Use default values for contour validation, rating and ranking. You might need to adjust the validation settings for area and perimeter (red area) according to the minimum object size you are expecting, otherwise objects being too small will be ignored.

6. Start contour analysis.

7. Sort the results by "Best EFDIs Match" in ascending order.

8. Display the shape visualization window (see manual, Chap. 4.2.1) by clicking the "Show" button for the topmost (= lowest EFDIs matching) result. Here make sure "Show Contour" is checked and click onto "Show Template" to additionally display the best matching template.

9. Scroll through the results list by clicking onto "Next Contour", and for contours which are segmented well (i.e. red area really coincides with the object area), check if you feel comfortable with the assigned template. If their shapes don't match, you need to add the current contour to your template library (see manual, Chap. 4.2.1, paragraph about "saving a shape as template file"). It is advisable to manually refine and smooth the shape using the "Rework Contour" functions before doing so (see manual, Chap. 4.2.2).

10. When you are finished with checking, reload the templates (now also containing your new templates) and start over at step 6. Repeat this procedure several times until you are satisfied with the matching between objects and templates.

11. Now adjust settings for each rating / ranking indicator, starting with the indicator "Best EFDIs Match".

12. Sort the results list according to the indicator you selected at the previous step. Set the sorting order (by clicking once or twice onto the column header) depending on whether a low or a high value indicates a good measure, so that the best results for an indicator are listed topmost.

13. Display the shape visualization by clicking the "Show" button for the topmost data row.

14. Scroll through the results list by clicking “Next Contour” (or turning the mouse wheel within the window’s lower button area) until you find the detected shape unsatisfying. A good value for a corresponding threshold of the indicator will be around the value shown for the result you find unsatisfying. Sometimes outliers might distort the choice, so please inspect a few more results until you are sure you reached an acceptable limit.

15. Set the value for the selected indicator to the new threshold.

16. Select another indicator and repeat from step 12. Indicators to be checked are:
    - Best EFDIs Match
    - Hu Match for EFDIs Template
    - Standard Deviation
    - Width / Height Ratio
    - Contour Smoothness
    - Formfactor
    - CDF, PCAF and CHMDF (only for convex shapes)
    - CDF Match, PCAF Match and Compactness Match (if you are not using “Force Convexity”).

17. Restart “Analyze Contours”, sort by “Ranking Index” in ascending order, and recheck if you are satisfied with the results. Usually a ranking of zero indicates really excellent results and a ranking of one stands for good results. Results of ranking two to three contain good and bad results mixed, whilst worse rankings mostly contain undesired results. If you choose to “Use / Force Convexity”, ranking might be messed up by convex templates matched to concave shapes. In this case, you are either missing adequate templates or you should analyze your data without using or forcing convexity.

18. Don’t forget to click “Save Settings” when you are finished with tuning values, otherwise your customized thresholds will be lost after restarting SHERPA! You can use multiple settings profiles customized to images coming from different sources or for different sets of taxa, see manual, Chap. 4.4.

The process of optimizing settings might look complicated and time-consuming at first glance, but it is pretty simple to accomplish and usually you only have to do so when you start analyzing a new type of data.

To check for redundant templates, you can run a shape analysis using the same files as templates and also as image data. In this case, not the best match will be shown (which would be the template matched to itself), but the second best, which is the template with the most similar shape. If the matching value is very close to zero, the template data might be redundant. For reliable results please disable contour optimization, use only Otsu’s thresholding without Gaussian or median filtering for segmentation and sort the results list by column “Best EFDIs Match”.