USER MANUAL

RYAN NAIDOO

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LIST OF FIGURES

1 PARAMETER ESTIMATION FOR CHAN-VESE SEGMENTATION FOR FLUORESCENCE MICROSCOPY GUI

1. When the application is executed, the interface will like the figure below

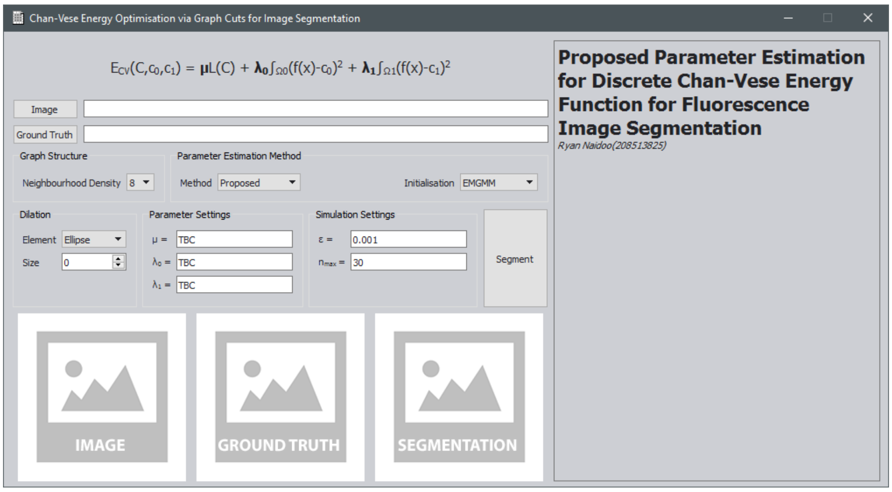

Figure 1: On startup.

2. Load in an image by clicking on the button labelled "Image" an image explorer dialogue will open as shown in the figure below. Then navigate to the desired image.

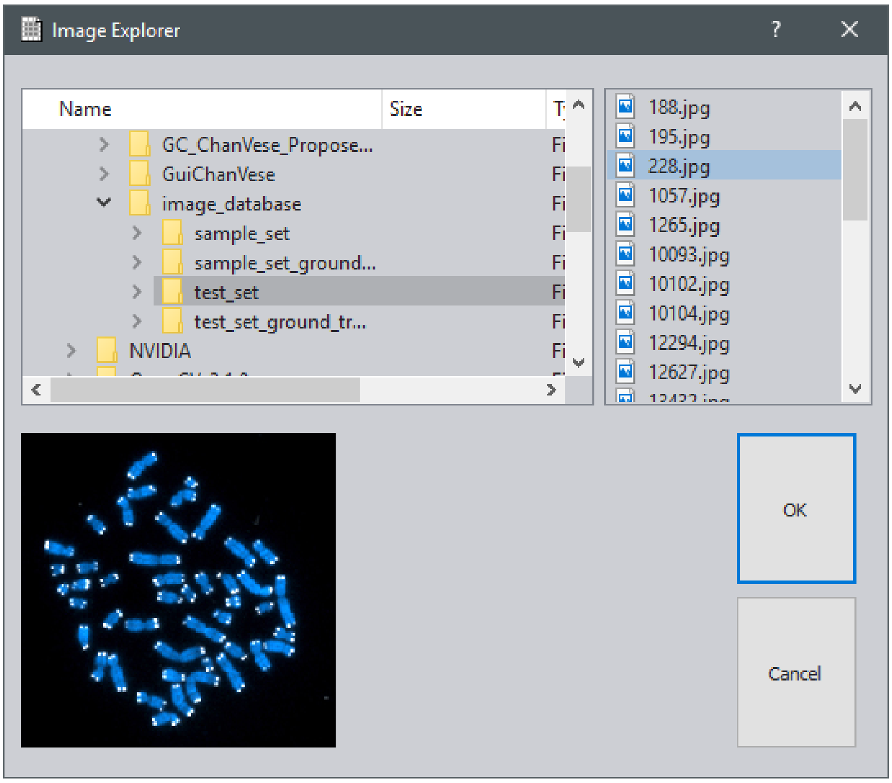

Figure 2: Image explorer to load an image.

3. When an image has been succesfully loaded it will appear in its designate slot as shown in the figure below.

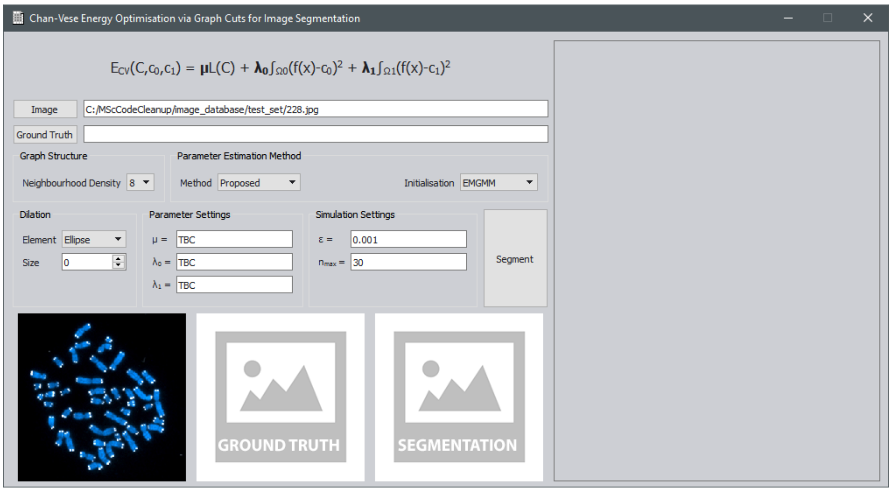

Figure 3: Sucessfully loaded image.

4. *Optional* Load a ground truth image by clicking on the button labelled "Ground Truth", an image explorer dialogue will open as shown in the figure below. Then navigate to the desired image.

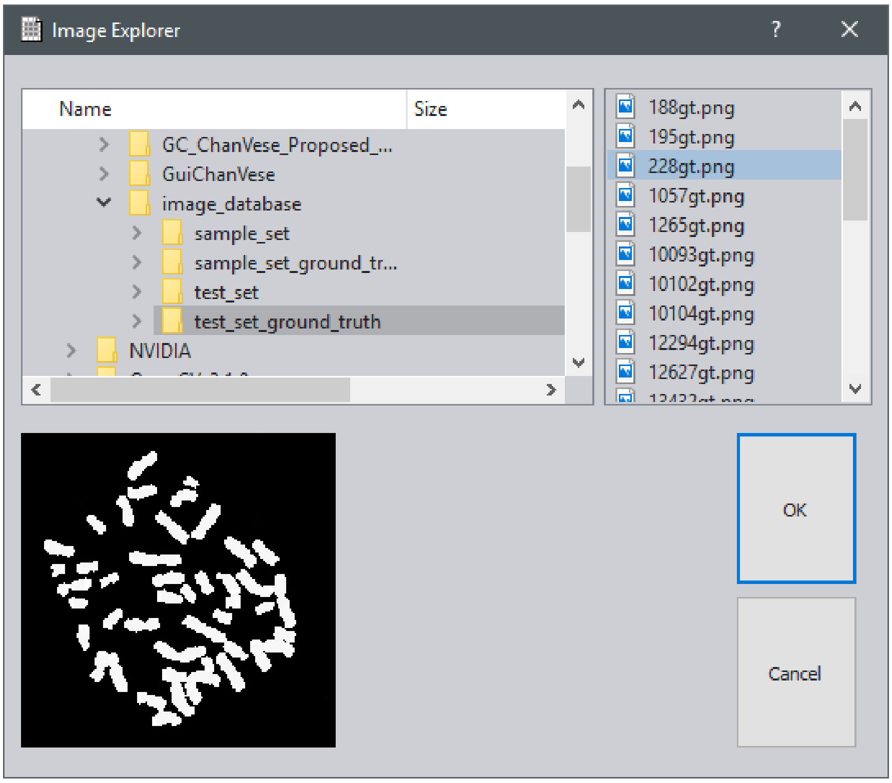

Figure 4: Image explorer to load a ground truth image.

5. When a ground truth image has been succesfully loaded it will appear in its designate slot as shown in the figure below.

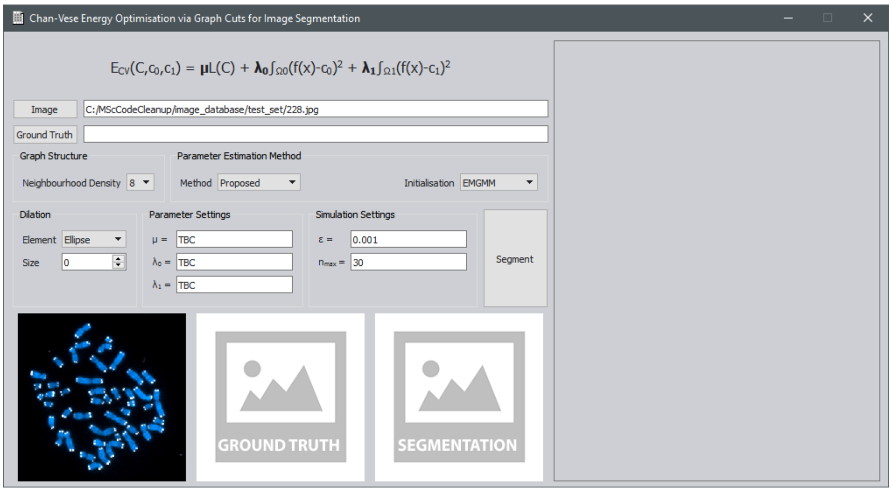

Figure 5: Sucessfully loaded image.

6. Set the segmentation parameters. All list parameters are shown in the figure below.
    - *Neighbourhood Density* is the connectivity density of the graph to be built. The only options are 4-connected and 8-connected (default).
    - *Method* determines the type of parameter estimation method to use. The options are the parameter settings by El-Zehiry *et. al* and Masaka *et. al*, the proposed parameter estimation method (default) and manual tuning to allow for user-defined parameter settings.
    - *Initialisation* is the initial curve/mask which is iteratively deformed until convergence. The options are a centred circle, and curves/masks generated by Otsu binarizartion, K-means clustering ($k = 2$) and EMGMM (Expectation Maximisation Gaussian Mixture Modelling with k=2) (default).
    - *Element* is the dilation element to be used on the initial curve/mask. The options are Rectangle, Cross, and Ellipse.
    - *Size* denotes the size of the dilation element in pixels. By default, no dilation is applied.
    - *Energy function parameters,* μ, λ_0 *and* λ_1, are automatically calculated and shown in the designated text boxes. If "Manual" method is chosen then these can be edited by the user.
    - *Simulation Settings* cover the extra settings for segmentation. The convergence criterion is shown as ϵ which is set to 0.001 by default, and the maximum number of iterations is shown as n_{max} which is set to 30 by default.

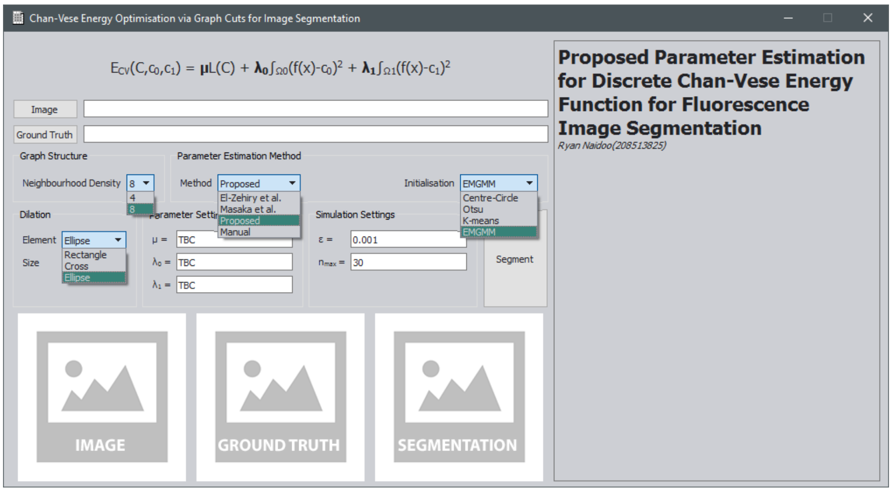

Figure 6: All list parameters exposed.

7. Click the "Segment" button to start segmenting with the chosen parameters. A summary will appear on the segmentation results box as shown in the figure below.

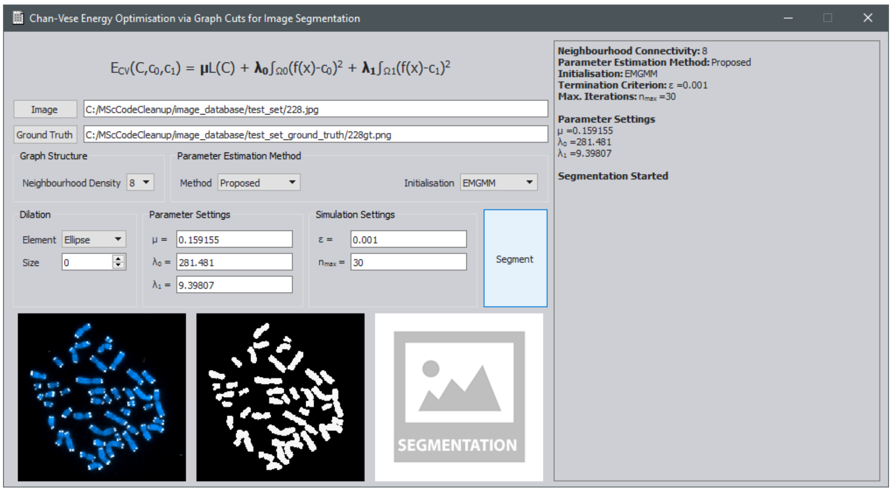

Figure 7: Initial segmentation summary.

8. When the segmentation is complete, the segmentation image result will appear in its designated slot and the binary classification statistics, if a ground truth image is available, will be shown in the segmentation results box as shown in the figure below.

Note

The GUI version is buggy and impacts the segmentation process which sometimes produces inaccurate results.

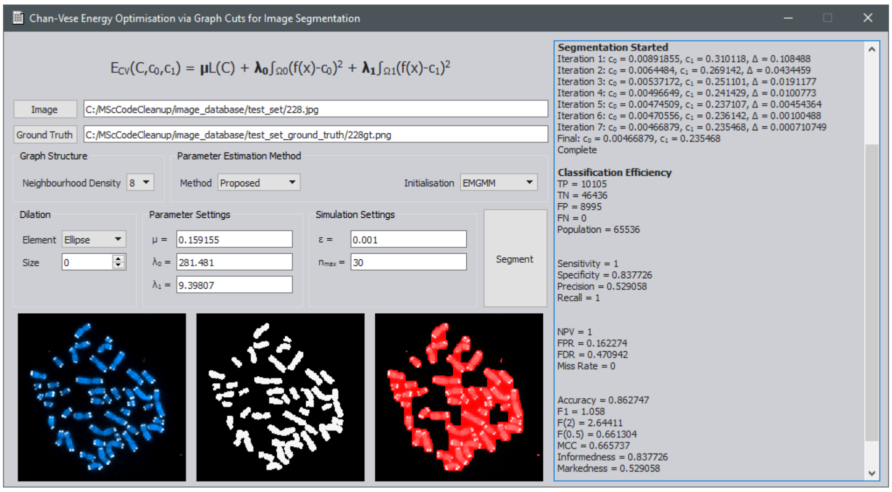

Figure 8: Final segmentation results.

2 PARAMETER ESTIMATION FOR CHAN-VESE SEGMENTATION FOR FLUORESCENCE MICROSCOPY CLI

1. Load in an image by giving the direct path.

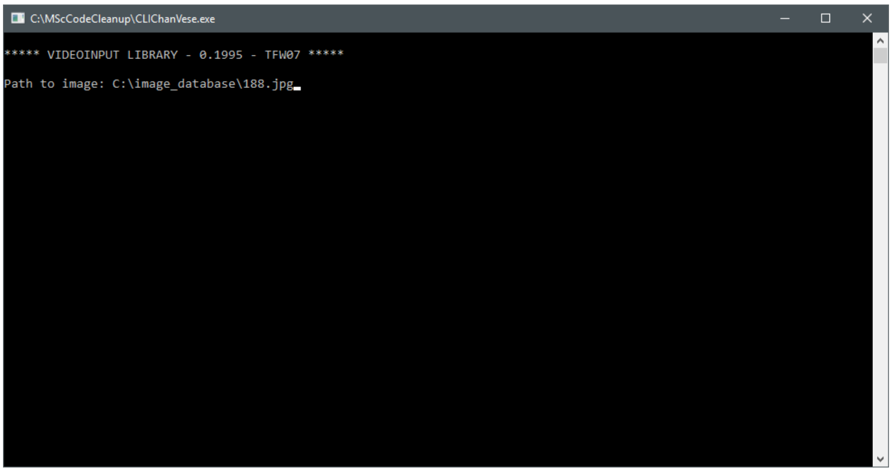

Figure 9: Load image.

2. The initial mask/curve to deform is set by typing in on of the following: default, otsu, kmeans, emgmm.

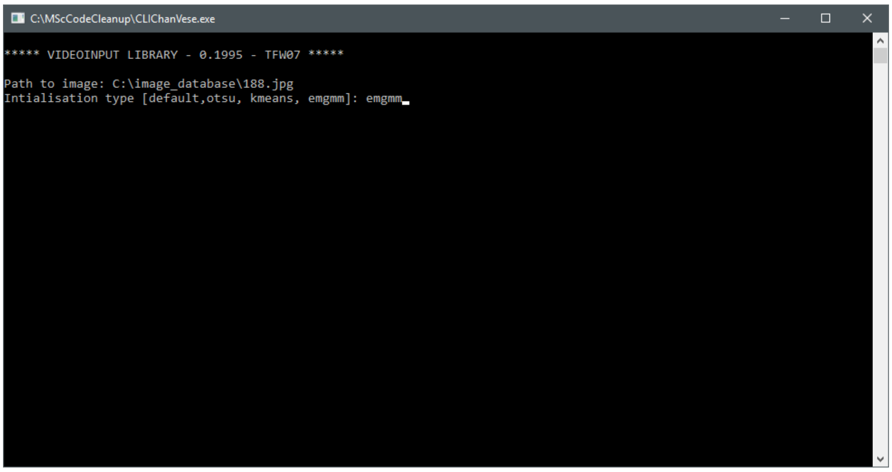

Figure 10: Set initialisation method.

3. Set the dilation size. Enter a number between 0(no dilation)-10.

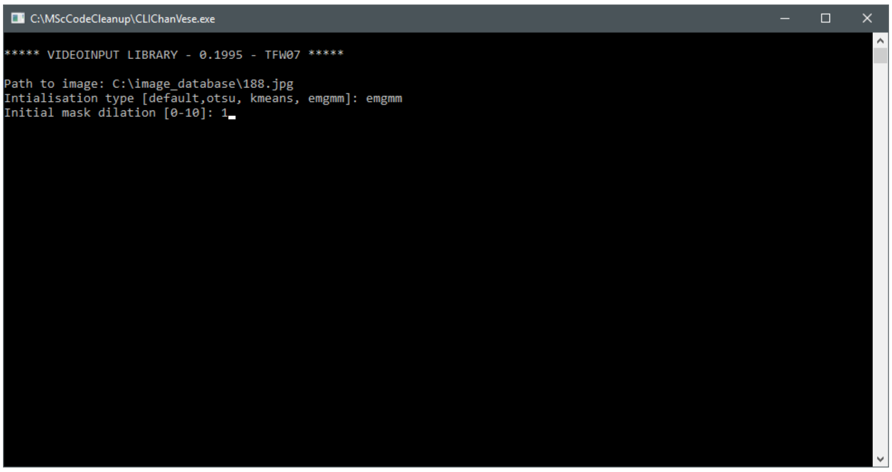

Figure 11: Set mask dilation size.

4. Set the parameter estimation method by typing in one of the following: `proposed`, `el-zehiry`, `masaka`

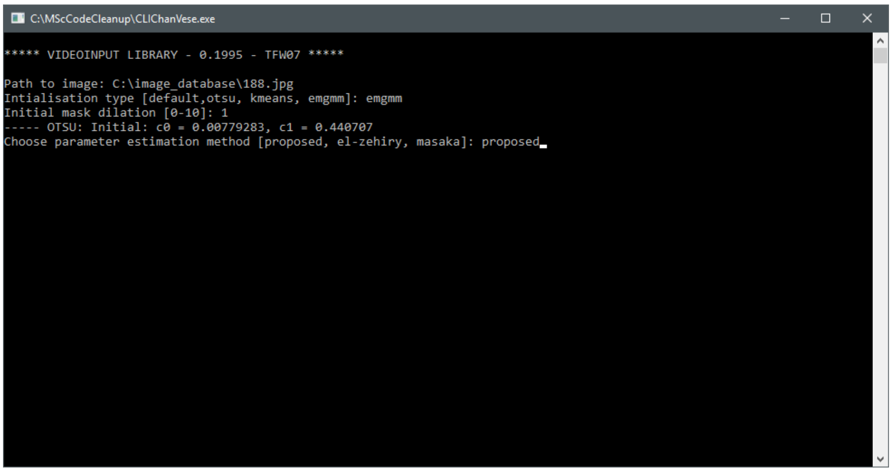

Figure 12: Set parameter estimation method.

5. Set the output type. The options are `mask` or `contour`.

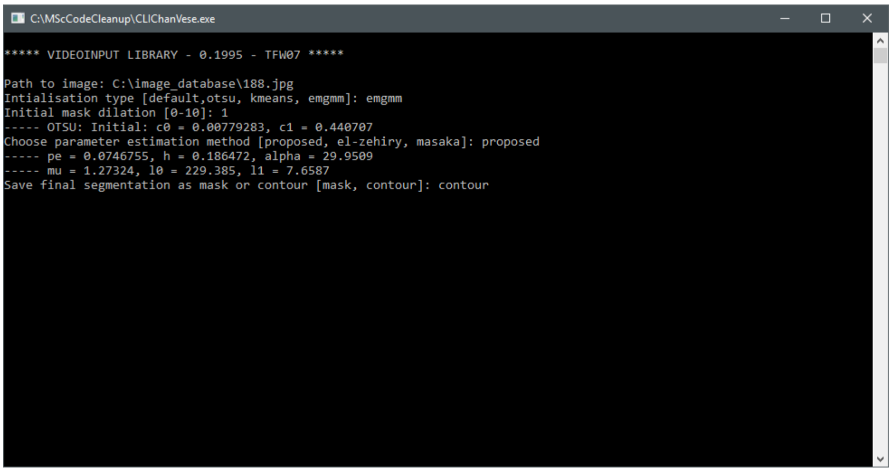

Figure 13: Set final segmentation output style.

6. If the parameters are correct then the segmentation will start successfully as shown in the figure below.

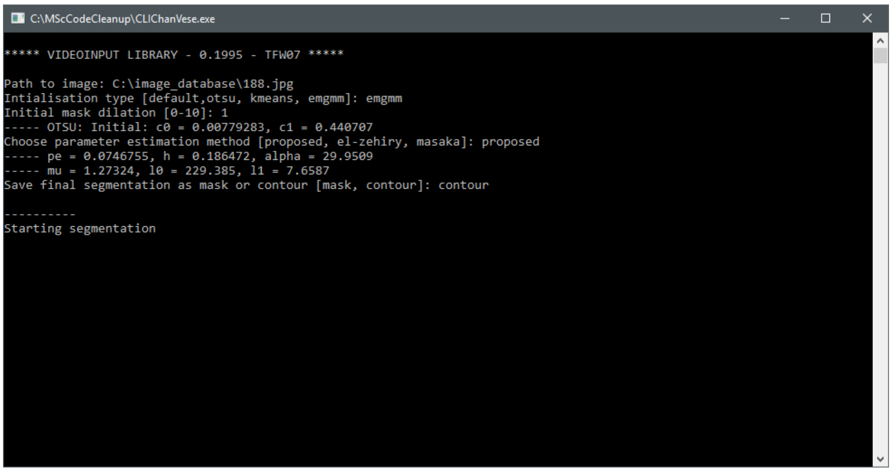

Figure 14: Segmentation initialised.

7. When the segmentation is complete, the results will appear in its own window as shown in the figure below.

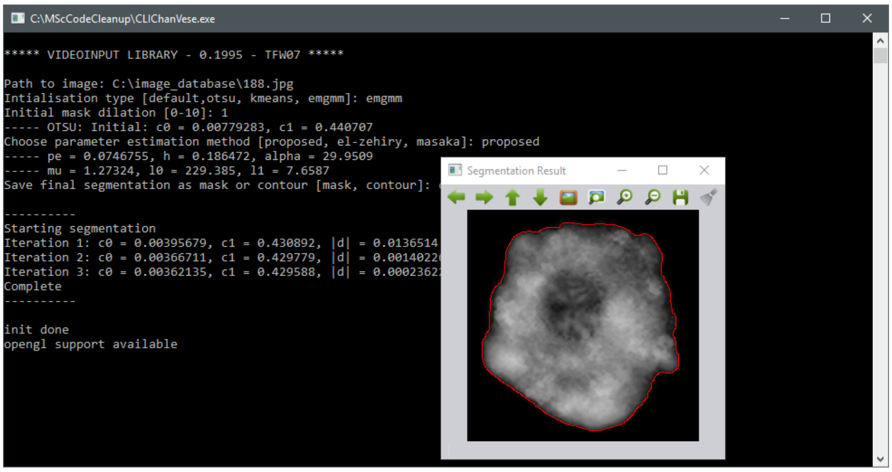

Figure 15: Segmentation output.

3 INTERACTIVE SEGMENTATION CLI

1. Load in an image by giving the direct path as shown in the figure below.

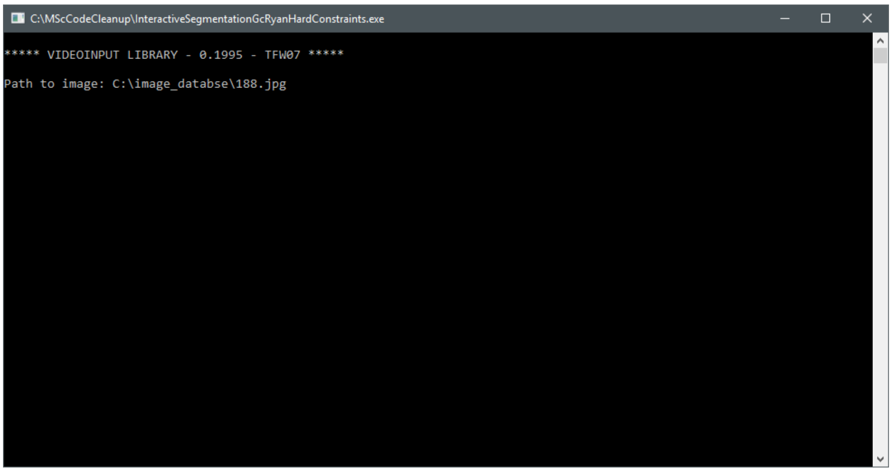

Figure 16: Load in an image.

2. Load in a seed by giving the direct path or type "x" for no seed as shown in the figure below.

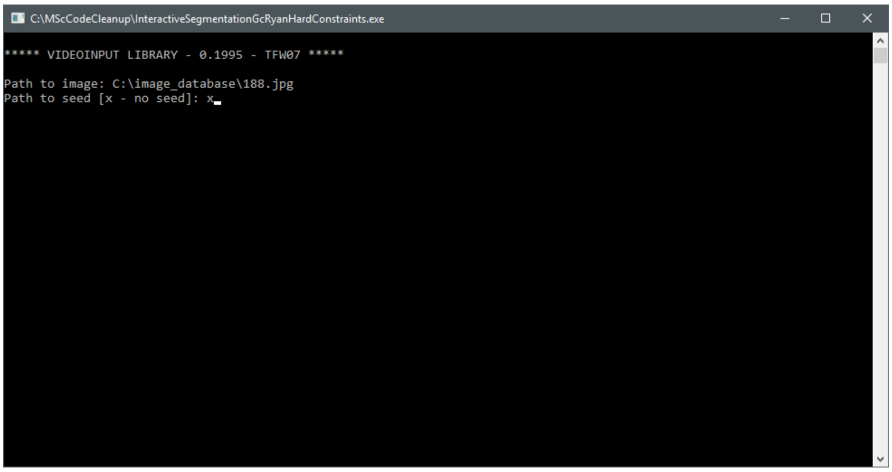

Figure 17: Load in an iamge.

3. Type "y" to enable or "n" to disable real time probability distribution update as shown in the figure below.

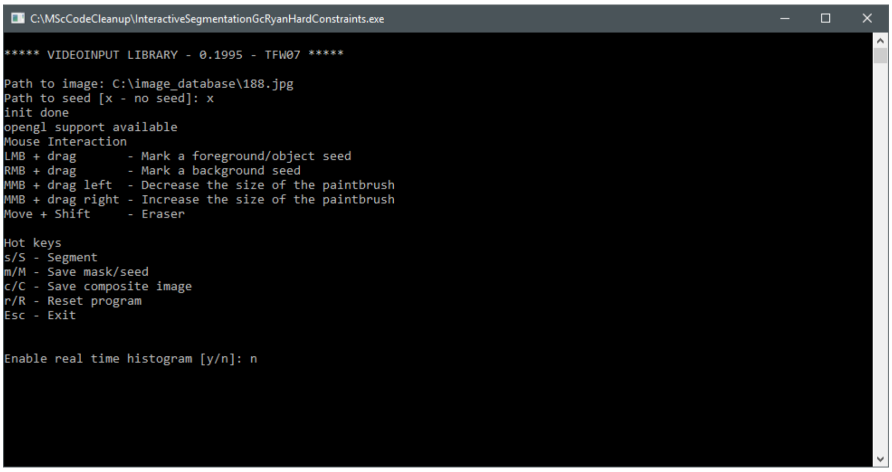

Figure 18: Load in a seed.

4. Mark object seed by left-click and dragging over the object.

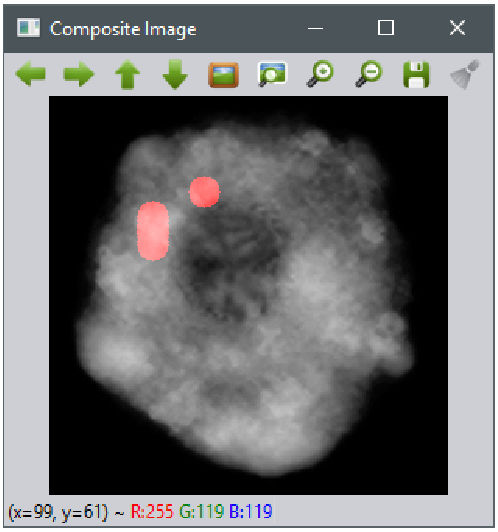

Figure 19: Mark object.

5. Mark background seed by right-click and dragging over the object.

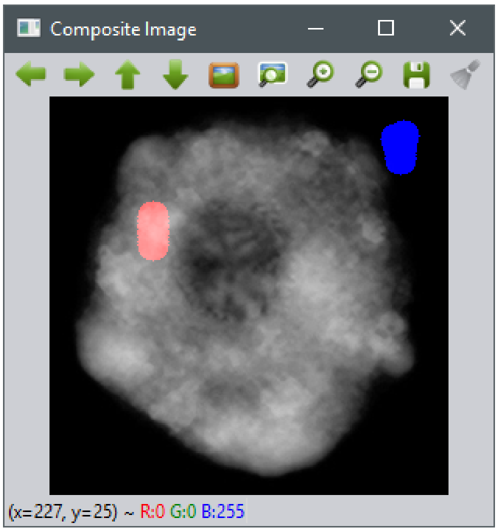

Figure 20: Background object.

6. *Optional*. To save the seed, press "m" or "M".

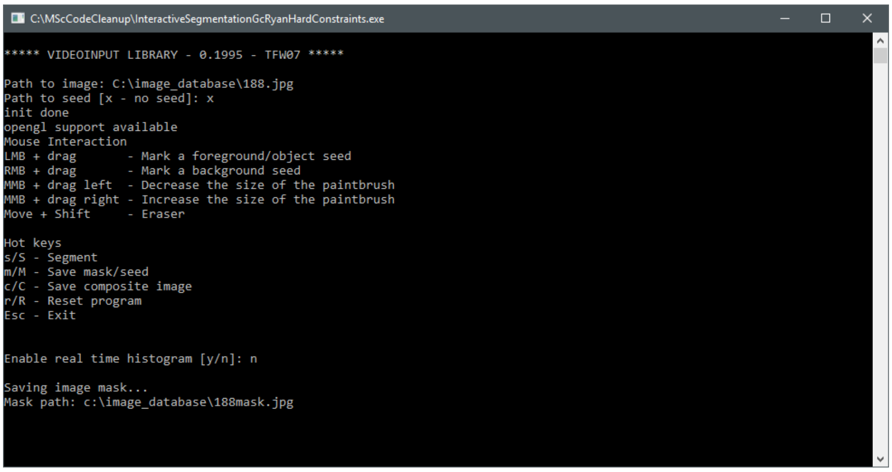

Figure 21: Save seed.

7. Start segmentation by typing "s" or "S" and enter.

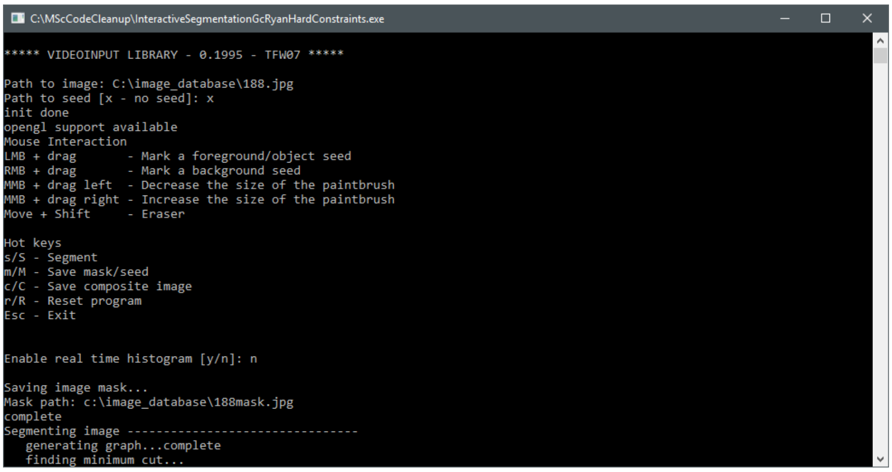

Figure 22: Start segmentation.

8. When the segmentation is complete the result will appear in the imge window as shown in the figure below. The final result can be save by pressing "c" or "C".

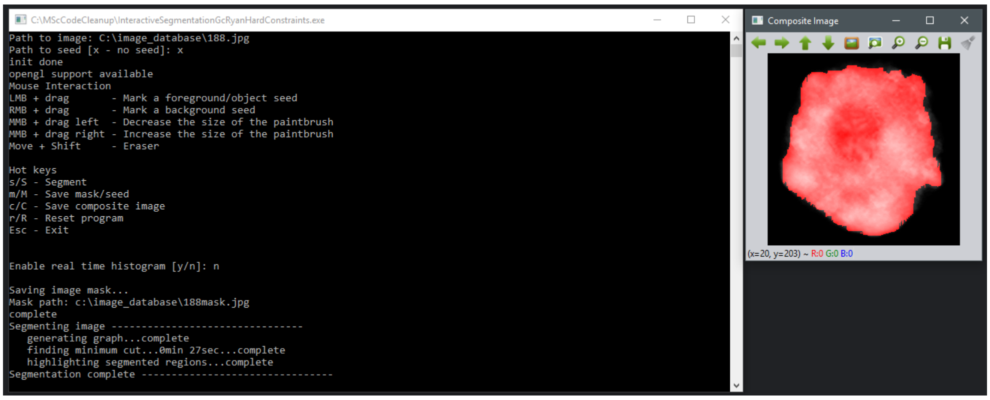

Figure 23: Segmentation complete.

Note
Additional functionality such as increasing or decreasing brush size, erasing seeds, and resetting the program are shown in the menu.

4 PREPROCESSING SCHEME

1. Total variation denoising is performed separately in PreprocessingScheme\main.m. This will prompt you to search for the desired image as shown in the figure below.

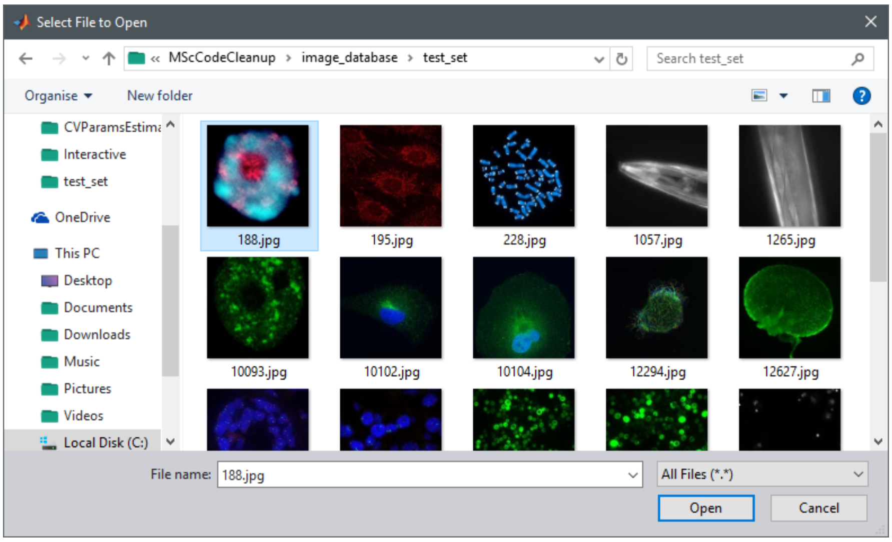

Figure 24: Load in an image.

2. The denoising effect by entering a value for gamma as shown in the figure below.

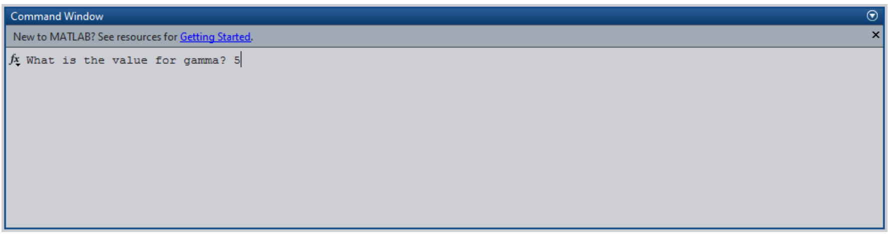

Figure 25: Set gamma.

3. Denoising is then performed on each channel in the image as shown below and combined into a single image. This image is save in the same directory as the input image and is named "tv.jpg".

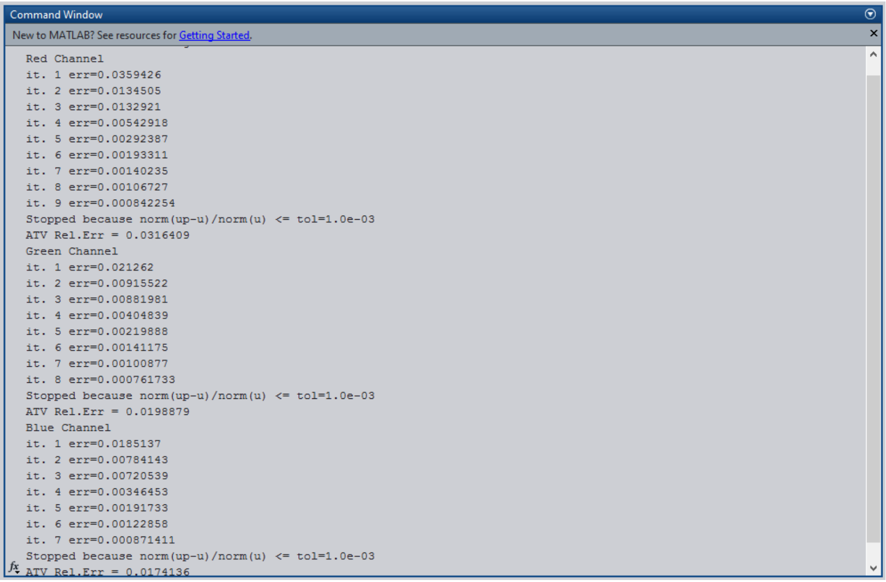

Figure 26: TV denoisong on each channel.

4. The remainder of the preprocessing scheme is performed using PreprocessingScheme\FMPreprocessingScheme.exe. Enter the path where the total variation denoised image is as shown in the figure below.

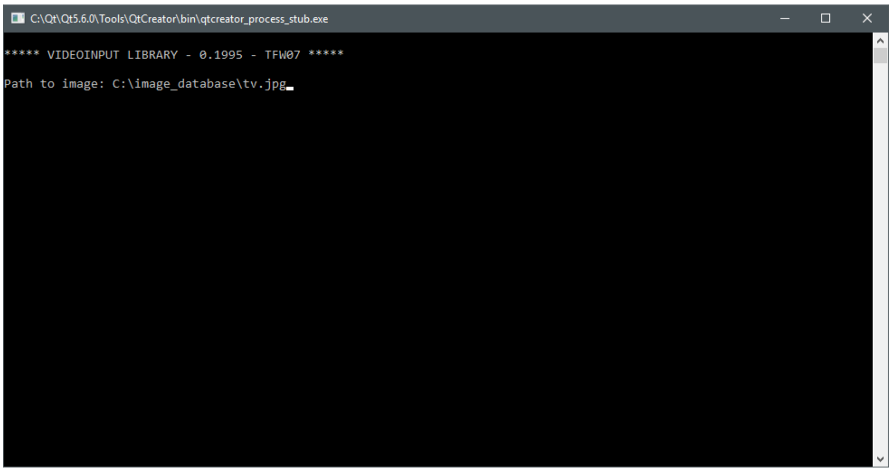

Figure 27: Background object.

5. Set the parameters for the remapping function as shown in the figure below.

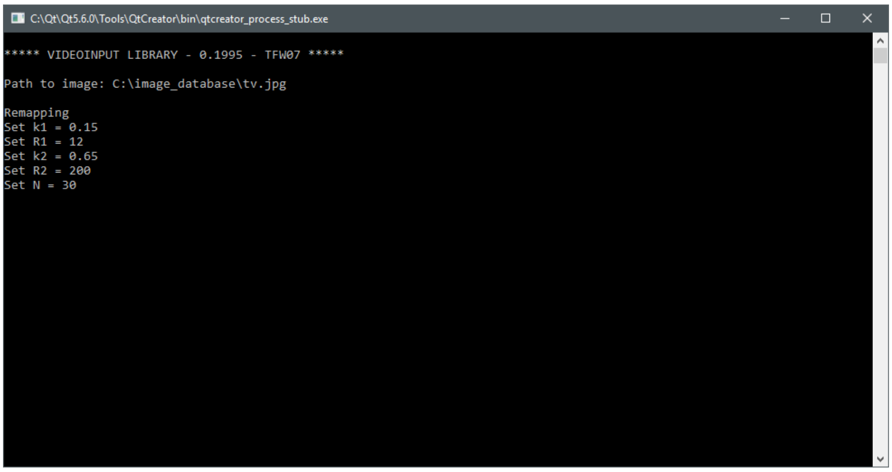

Figure 28: Remap function parameters.

6. Set the coherence enhancing diffusion parameter with optimised rotational invariance parameters as shown in the figure below.

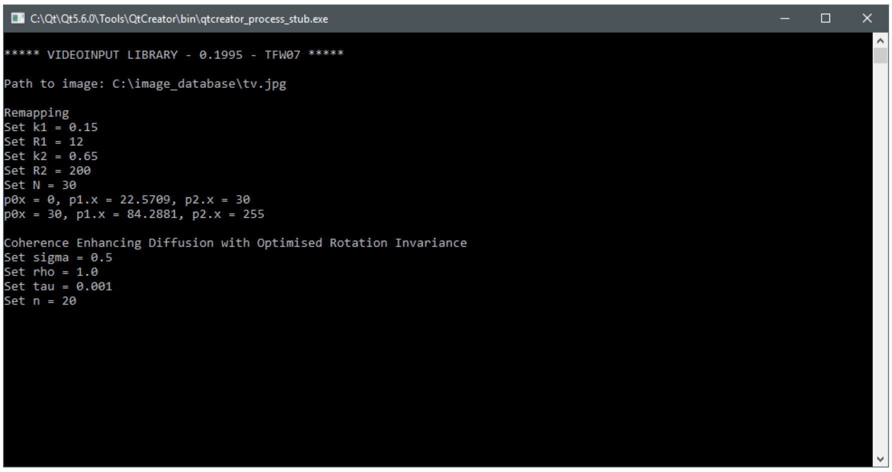

Figure 29: CEDORI parameters.

7. The final image will appear in its own window.

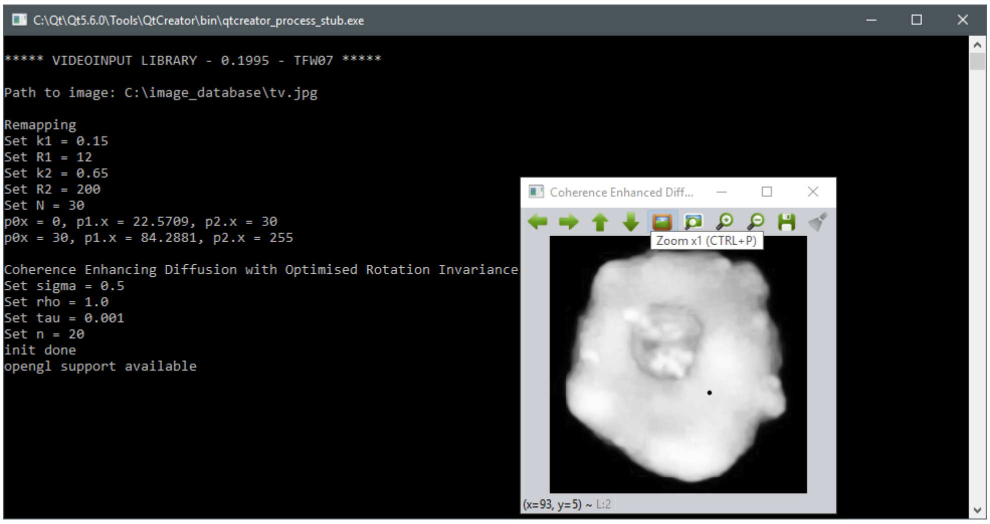

Figure 30: Image enhancement complete.