Slicer 2.6 – EMSegmenter Tutorial using Non-Human Primate Data

1 Sample Case

1.1 Sample Case Files

- Subject Files:

    - PrimateSubj001_T1 - T1 image (256 × 256 in plane resolution, 124 slices, 0.496 × 0.496 × 0.5 mm^3 voxels)
    - PrimateSubj001_T1 - Subject T2 registered to T1 image

- Atlas Files (registered to T1):

    - PrimateSubj001_CSF - probabilistic atlas of CSF
    - PrimateSubj001_GM - probabilistic atlas of GM
    - PrimateSubj001_WM - probabilistic atlas of WM

- Label Maps (registered to T1):

    - PrimateSubj001_ECC - probabilistic atlas of CSF

- XML Files:

    - PrimateSubj001_scene01_images.xml - scene containing all the images
    - PrimateSubj001_scene01.xml - scene file with all the images and settings for GM, WM, and CSF segmentation

- Results:

    - PrimateSubj001_scene01_Seg

1.2 Atlas

The probabilistic atlas for this tutorial was created from an average of 15 subjects that were segmented using EMSegmenter in Slicer 2.6.

1.3 ECC

The ECC label map was generated by inverting the ICC label map. The ICC was automatically generated from the subjects T2 image and then manually corrected by an expert user.

2 Gray Matter, White Matter and CSF Segmentation

2.1 Files Used

- Subject Files:

    - PrimateSubj001_T1 - T1 image

- PrimateSubj001_T1 - Subject T2 registered to T1 image

- Atlas Files:
  - PrimateSubj001_CSF
  - PrimateSubj001_GM
  - PrimateSubj001_WM

- Label Maps:
  - PrimateSubj001_ECC - probabilistic atlas of CSF

2.2   Loading Subject and Atlas Images

The input channels and the atlas is input into Slicer. The images can be loaded automatically by loading the scene PrimateSubj001_scene01_images.xml or the images can be loaded manually (as described earlier).
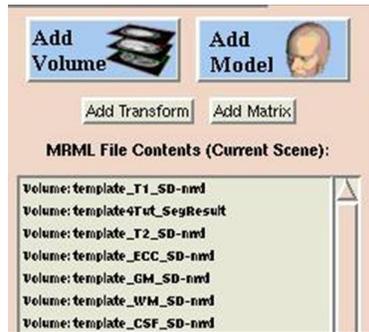

Figure 1: Contents of the Current Scene window after loading the images

2.3   Setting the EMSegment Parameters

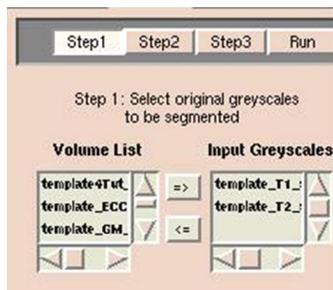### 2.3.1   Adding Input Channels (EM -¿ Step1 Tab)

Figure 2: Adding T1 and T2 as input channels.

2.4   Setting Up the Class Hierarchy (Class Tab)

2.4.1   ECC Class

For ECC class, set the following parameters

Mean: 3.8296, 2.3139

Covariance: 0.4753, 0.1581
0.1581, 0.1682
Prob: 0.4
Prob Atlas: PrimateSubj001_ECC
Color/Label: Black=0
Prob Data Weight: 1
Input Channel Weight: 0.01, 0.01
Note: The first channel (channel 0) is the T1, the second (channel 1) is the T2.
Note: To exclude (set to label 0) all of the ECC, we want to put maximum weight on the ECC label map and little weight on the input channels (0 weight will give an error, thus we set it to 0.01).
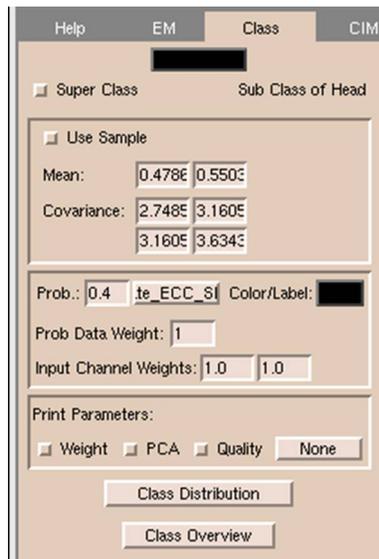

Figure 3: Parameters for the ECC Subclass

2.4.2   GM Subclass

For GM class, set the following parameters

Mean: 3.8296, 2.3139
Covariance: 0.4753, 0.1581
0.1581, 0.1682
Prob: 0.4
Prob Atlas: PrimateSubj001_GM
Color/Label: Red=4
Prob Data Weight: 0.7
Input Channel Weight: 1.0, 1.0

2.4.3   WM Subclass

For WM class, set the following parameters

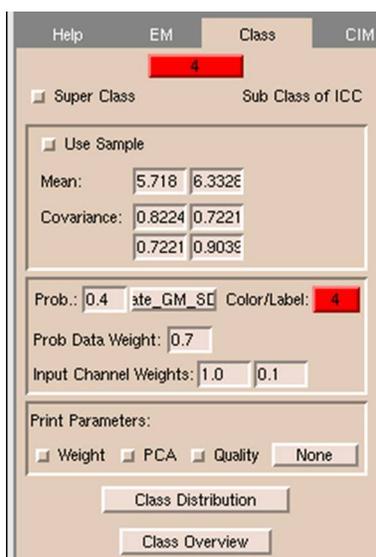Mean: 3.8296, 2.3139
Covariance: 0.4753, 0.1581
0.1581, 0.1682

Figure 4: Parameters for the GM Subclass

Prob: 0.4
Prob Atlas: PrimateSubj001_WM
Color/Label: Green=5
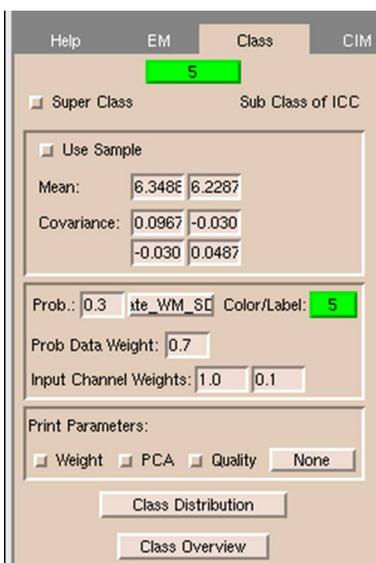Prob Data Weight: 0.7
Input Channel Weight: 1.0, 1.0

Figure 5: Parameters for the WM Subclass

2.4.4 CSF Subclass

For CSF class, set the following parameters

Mean: 3.8296, 2.3139

Covariance: 0.4753, 0.1581
0.1581, 0.1682
Prob: 0.4
Prob Atlas: PrimateSubj001_CSF
Color/Label: Blue=6
Prob Data Weight: 0.7
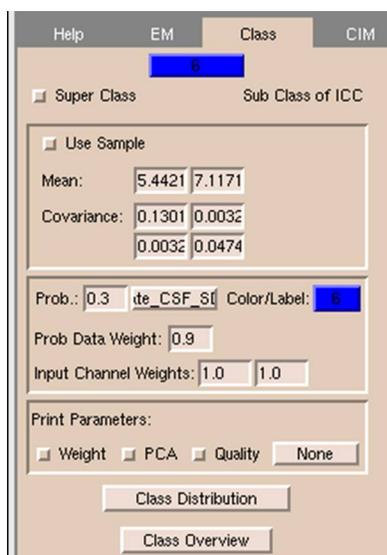Input Channel Weight: 1.0, 0.1

Figure 6: Parameters for the CSF Subclass

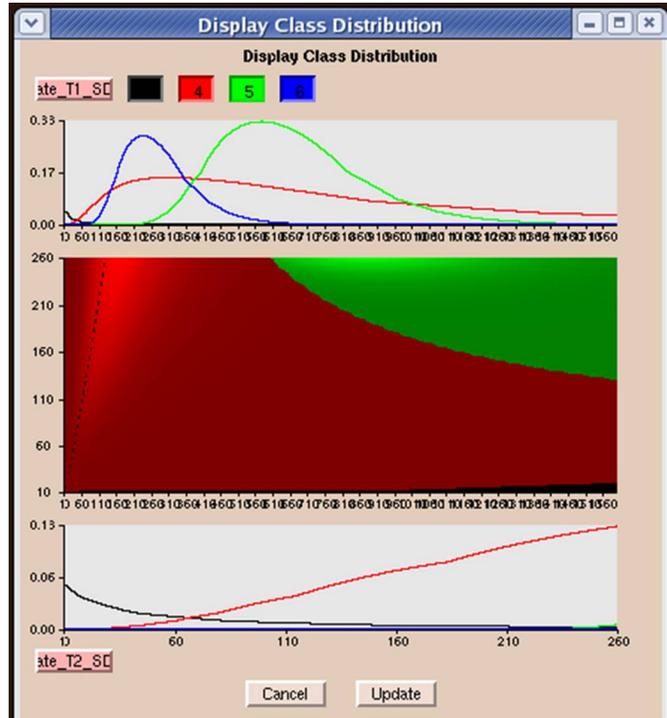### 2.4.5 Subclass Probabilities

2.4.6 Class Distributions

Figure 7: Class Overview window for the ICC super class.

Figure 8: Class Distributions for the Sample Case.