CS8395 ITK ASSIGNMENT

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I am quite new to the medical image process field, therefore, I have used the class RegistrationITK sample [1] as guidance and added more features on top of it. Since we are not not actually writing a report, I will answer each question in different sections.

1. REGISTRATION APPROACH

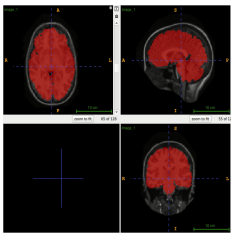
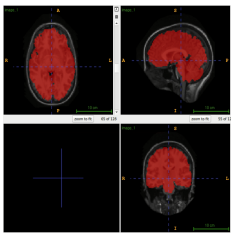
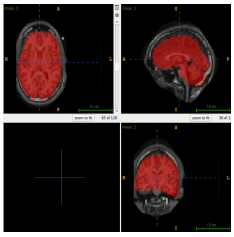
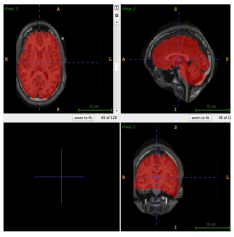
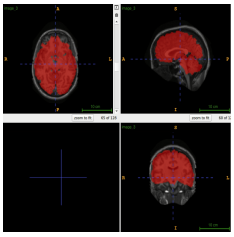
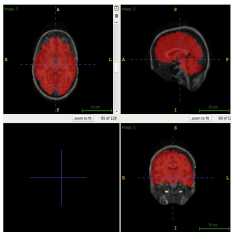
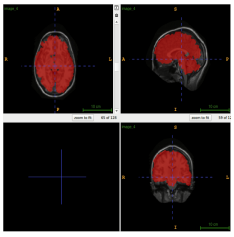
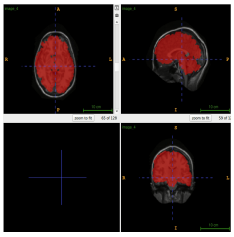
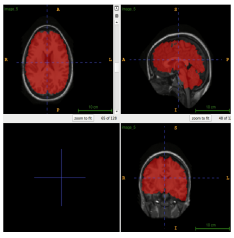
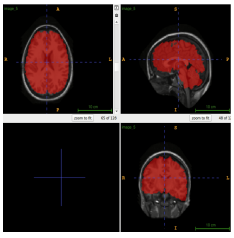
To start off the project, I used the itkMultiResolutionImageRegistrationMethod with itkImageFileReader as the parameter. The metrics I used for the registration include itkLinearInterpolateImageFunction, itkMeanSquaresImageToImageMetric, and itkRegularStepGradientDescentOptimizerr. For the Affinely register, I used the itkAffineTransform to transform the image. As for the Transformation to binary image and Deformably register, I have followed the ITK website instruction and examples.[2] [3] [4]and I used the itkBSplineTransform to deformably register my image. Lastly to optimize the result images, I used the itkRegularStepGradientDescentOptimizer to optimize my image and my binary image. Lastly, to compute the volume, I used the itkStatisticsImageFilter to compute the volume and get the result number.

2. ALTERNATIVE APPROACH

Since I am new to the topic, I had to follow the ITK document example and class codes. Therefore, there's not much of alternation and different approaches that I took. However, I have encounter a situation that I did not use the itkRegularStepGradientDescentOptimizer to optimize my binary image and result in a bizard registration of the image.

3. USAGE INSTRUCTION

The source code can be download from the repository [5].
1. Create empty "build" folder in the Set-ITK-HW folder.
2. Navigate to the created build folder in terminal by "cd build/".
3. After navigate to the build folder, you can type "ccmake ../src" to build the source code.
4. During ccmake function, you will need to first type c to configure the project and type "RELEASE" to configure the project.

Name	Laff	Lm	Volume Mea
Image_1			169140
Image_2			172223
Image_3			182727
Image_4			170319
Image_5			168136

5. After the project been configured, type g to generate the make files.
6. Simple type "make" in the terminal to make the file.
7. To generate the desire image, type "./RegistrationITK your atlas image your moving image your label image your desire Iaa image name.nii.gz your desire Laa image name.nii.gz your desire Lm image name.nii.gz
8. You can find the volume measurement at the end of terminal after "print outvolume measurement:.
9. You can find the generated images in your build folder.
10. Open generated images with ITKSnap and inspect the result.

4. REFERENCES

[1] oguzi, "Registrationitk.cxx," *Github*, vol. https://github.com/VU-CS8395-Fall2022/ClassCode/tree/main/RegistrationITK/src, November 2022.

[2] ITK:Insight Toolkit, "Examples/registrationitkv4/deformableregistration15.cxx," *itk.org*, vol. https://itk.org/Doxygen/html/Examples$_2 RegistrationITKv4_2 DeformableRegistration15_8 cxx-example.html_a 13, November 2022.

[3] ITK:Insight Toolkit, "Examples/registrationitkv4/deformableregistration12.cxx," *itk.org*, vol. https://itk.org/Doxygen/html/Examples$_2 RegistrationITKv4_2 DeformableRegistration12_8 cxx-example.html_a 13, November 2022.

[4] ITK:Insight Toolkit, "itk::statisticsimagefilter¡ tinputimage ¿ class template reference," *itk.org*, vol. https://itk.org/Doxygen/html/classitk$_{11} StatisticsImageFilter.html, November 2022.

[5] Chia-Cheng Chang, "Cs8395-itk-assignment," *Github*, vol. https://github.com/jonathan34c/CS8395-ITK-Assignment, November 2022.