GRAPHICS AND ANIMATION ASSIGNMENT 3

Kumar Punithakumar, University of Alberta   February 28, 2023

1 Volume Rendering

The aim of this assignment is to render a medical image volume using volume rendering and iso-surface representation. For this assignment, you could use any public volumetric medical imaging dataset available for teaching under a creative commons license. A list of open access repositories is available at https://www.aylward.org/notes/open-access-medical-image-repositories

1. Read the dataset using an appropriate reader class such as `vtkDICOMImageReader`, `vtkMetaImageReader` or `vtkNIFTIImageReader`.

2. Create a suitable colour transfer function for volume rendering.

3. Create a suitable opacity transfer function for volume rendering.

4. Create viewports as shown below and render the dataset in viewport 1.

View Port 1 Volume rendering	View Port 2 Iso-surface	View Port 3 Volume rendering + Iso-surface

5. For viewport 2, display the iso-surface extracted at a suitable intensity value using the marching cubes algorithm. Check the online documentation for `vtkMarchingCubes` class for usage information.

6. For viewport 3, display both the volume-rendered medical imaging data as well as the iso-surface extracted using marching cubes algorithm. Reuse the objects created for viewports 1 and 2, and do not create separate objects to display on viewport 3.

7. Synchronize all three viewports so that they all display the same view. (Hint: Viewports 2 and 3 can be synchronized by setting the cameras to viewport 1 camera. Refer to `GetActiveCamera()` and `SetActiveCamera()` functions of the `vtkRenderer` class.

1.1 Grading (15 Marks)

You are required to submit the following information for this assignment:

1. Provide the following details about the medical dataset used—dimension, voxel resolution, minimum & maximum pixel intensities, and file size (3 Marks)

2. A screen shot image showing the output (Please rotate the view from the default rendering before saving the screen shot) (2 Mark)

3. A commented source code (Please include the source code as a part of the report in human readable format) (9 Marks)

4. A README section containing details on how to run the code and other information such as VTK version used for writing the code (1 Mark)

1.2 Submission

Please submit a report containing the information mentioned above as a PDF file via eClass on or before March 14, 2023. A penalty of 10% per day will be applied for late submissions. Please complete the assignment on your own without discussing the details with anyone else. A blind marking approach will be used for grading the assignment. Therefore, please do not include your name in the report or on the submission filename.