GRAPHICS AND ANIMATION
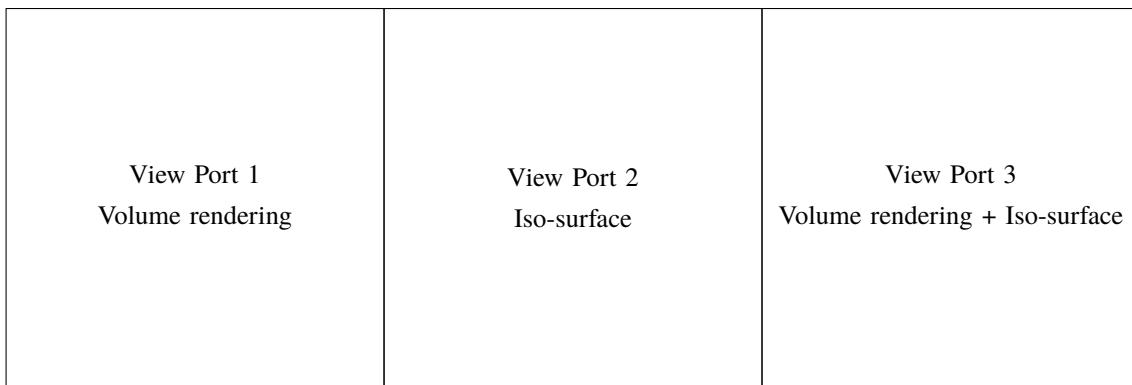# ASSIGNMENT 2

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1   Volume Rendering

This assignment aims to render a medical image volume using both volume rendering and iso-surface representation. While the provided instructions focus on VTK, you may use any other library or GUI program to complete the assignment. Additionally, you can use any publicly available volumetric medical imaging dataset licensed under Creative Commons. 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 (12 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) (6 Marks)

4. A README section that provides instructions on downloading the data used for the assignment, running the code, and additional details such as the VTK version used in the implementation. (1 Mark)

1.2 Submission

Please submit a report containing the information mentioned above as a PDF file via Canvas on or before February 24, 2026. 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.