HPC Course Visualization assignment

Prerequisites

For this assignment you will need ParaView which can be downloaded for free from http://www.paraview.org/. This assignment consists of a challenge that needs to be solved through visualization. You can earn the credits that go with this course by solving the challenge and submitting a report that explains your approach.

One submission per student. Make sure you mention **your name and student number** in the report. Deadline for submission is 18:00 on January 24, 2022. E-mail your solution to R.G.Belleman@uva.nl.

Introduction

Download the dataset from http://bit.ly/1s7Vi3E

This data set contains image data, much like what is generated by medical imaging devices, such as CT or MRI scanners. This particular data set is stored as raw binary data: there is no information in the file that can tell applications anything about its structure. This is where you come in: it is your job to visualize the data and identify its contents.

Assignment

Unzip the data and determine the size of the resulting file: it should be 8,388,608 bytes exactly.

1. Most imaging devices produce stacks of 2D images that are either 256 x 256 or 512 x 512 pixels each. You think this data may have all images concatenated into one volume. Assume each pixel is represented by 1 byte (also referred to as "unsigned char"): determine the number of images in the stack.

Read the data into ParaView as "Raw (binary) data". Select the file using the Open command in the File menu. Configure the panel in the "Properties" panel to reflect your findings. In particular: you need to figure out the correct settings for:

- Data Scalar Type: this is the data type for each pixel, for which there was a hint above;
- Data Extent: the dimensions of the whole dataset, which you just calculated.

2. Analyze the data with a Histogram filter. Make sure the binning is set to a finer value than what is used by default. If you configured the panel correctly, you should see at least two distributions in the scalar distribution of this data. Show the histogram in your report.
3. Figure out a way to visualize the content that corresponds with the histogram distributions[1]. Explain in your report what each distribution represents.
4. You will notice the object looks "compressed": alter the Data Spacing (: the size of each pixel, or "voxel" as it is called in 3D) in the input dataset parameters to compensate for this and report the numbers in your report.
5. Visualize a contour at value 75. Notice anything unusual? Explain what you see in your report and provide an explanation on the cause.
6. Bonus points if you can find the origin of this famous data set. A URL will suffice.

[1] You should see one object. If you see multiple, you misconfigured the panel with the input dataset parameters.