COSC 6344 Visualization
Assignment 5

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1. **There are a number of important components (or sub-tasks) needed by direct volume rendering. Please describe them. Which one is the most important sub-task, and why?**

The components o needed by direct volume rendering are :

<u>Ray Casting</u>: Historically the first volume rendering technique. We observe how a ray would pass through an object and we sample the scalar fields along this ray.

<u>Sampling:</u> We can sample at intervals along the ray. These intervals can be fixed or we can use voxels. We use this to render our results.

<u>Interpolation</u>**:** Depending on the location of the sample points in the voxel we may need to interpolate the value at the sample point using the value at the center of the voxel.

<u>Compositing</u>: Once we have our sample values we can then use these to composite the final image. This can be done by:

- MIP – Maximum Intensity Projection

- LMIP – Local Maximum Intensity Projection

- Alpha compositing

- Average Intensity Projection

I would say that compositing is the most important as depending on the compositing method our end result/ rendering can vary drastically. Each method could potentially miss or highlight crucial information and therefore must be done with consideration and care.

2. **One issue of the image-order method (e.g., ray-casting) is that not all voxels participate during the rendering. Describe a strategy that may involve more voxels during the ray-casting *without using the object-order approach*.**

An alternative to ray casting can be raytracing. In this approach we consider how the ray bounces from the object as well allowing us to gather more information about the object and thus being able to generate more realistic and higher quality results. This can be achieved due to the analysis of the voxels along the ray and the reflected rays as well.