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Assignment 5

1. Direct volume rendering subtasks/components:
   1. **Data sampling**

Sampling data points via voxels to use in calculation of an aggregate data corresponding to a screen pixel.

* 1. **Color/opacity assignment by transfer functions**

Making volume data visible by mapping colors and opacity to data values.

* 1. **Compositing**

Method of combining color/opacity values in an ordered way to create a consolidated data point from gathered samples.

Color/opacity assignment is the most important subtask. Without meaningful color assignments to the volume samples, insights and relative data contrasts would not be visible in the rendered volume.

1. An issue in image-order DVR methods like ray casting is the problem of mismatching data size to screen size. If the data size is large and screen resolution small, data sampling for each screen pixel will miss voxels that are not in range of the screen resolution: effective losing source data information.

To solve this problem, the casted ray can sample a wider field of voxels but weight them according to their distance from the ray. Voxels further from the ray will contribute less to the pixel with a lower weight while voxels directly intercepting the ray will contribute more with a higher weight. This weighted voxel strategy will allow more voxels to be encoded into each pixel but still focus on the closest-ray voxels.