

Image-Based Rendering for Volume Visualization by Using Principle Component Analysis

Yinghan Xu, M.Sc.

University of Dublin, Trinity College, 2017

Supervisor: John Dingliana

This dissertation investigates and analyses improvement to a PCA approach for image-based rendering in C++ based on paper [2]. This technique allows to visualize volume data with lower GPU requirement and lower computing complicity than direct volume rendering. First, eigenspaces were calculated with a volume data set, pre-rendered using a standard ray-caster, from a spherically distributed range of camera positions. The parallel programming with CUDA was used to speed up the reconstruction process. Then, PCA function in OpenCV is used to calculate eigenspaces and reconstruct results. Artefacts in the result of paper [2] were smoothed by MedianBlur with small computing costs. Results quality, memory cost and frame rate were tested and evaluated under different conditions. The result with different resolution of images, cells dimension, number of eigenvectors were given for real-world application.