

# Volume Rendering Optimisations for Mobile Devices

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Historically volume rendering has been associated with lacking the performance of traditional mesh-based rendering to achieve interactive speeds. The parallelism in modern CPUs and GPUs has allowed volume rendering to become a viable choice in movie special effects, destructible environments in games and medical imaging. Different software techniques have been developed to unlock the potential of the massively parallel architecture of the GPU. While a modern desktop hardware is more than capable of achieving volume rendering at interactive speeds, a modern mobile device is significantly lacking in power. A use for volume rendering on a mobile device would be a doctor using a device capable of reconstructing a 3D representation of a patients bone structure without stationary MRI scanner and then rendering the volume. This paper investigates the performance of ray casting against texture based volume rendering on mobile devices using OpenGL ES shaders as well as the performance of ray casting volume rendering using general purpose programming on the GPU (GPGPU) using CUDA. This project contributes a cross-platform volume renderer on Windows and Android with four performance tested implementations: ray casting using shaders, ray casting using CUDA, single-threaded texture based and multi-threaded texture based volume rendering. Results show that generally the single-threaded approach is the fastest but produces lower quality image while ray casting using shaders is significantly faster than raycasting using CUDA.