Scalable Graphics Algorithms
(스케일러블 그래픽스 알고리즘)

윤성의 (Sung-eui Yoon)
KAIST

Abstract

Recent advances in model acquisition, computer-aided design, and simulation technologies have resulted in massive databases of complex geometric data occupying multiple gigabytes and even terabytes. In various graphics/geometric applications, the major performance bottleneck is typically in accessing these massive geometric data due to the high complexity of such massive geometric data sets. However, there has been a consistent lower growth rate of data access speed compared to that of computational processing speed. Moreover, recent multi-core architectures aggravate this phenomenon. Therefore, it is expected that the current architecture improvement does not offer the solution to the problem of dealing with ever growing massive geometric data, especially in the case of using commodity hardware.

In this tutorial, I will focus on two orthogonal approaches--multi-resolution and cache-coherent layout techniques--to design scalable graphics/geometric algorithms. First, I will discuss multi-resolution techniques that reduce the amount of data necessary for performing geometric methods within an error bound. Second, I will explain cache-coherent layouts that improve the cache utilization of runtime geometric applications. I have applied these two techniques into rendering, collision detection, and iso-surface extractions and, thereby, have been able to achieve significant performance improvement.

I will show live demonstrations of view-dependent rendering and collision detection between massive models consisting of tens of millions of triangles on a laptop during the talk.