

Cell BE Development Made Simple

RTT AG recently announced a high-performance, real-time ray tracer, RealTrace, as part of DeltaGen, their software for complex 3D visualization. A leading global provider of visualization in the automotive, aerospace and consumer goods sector, RTT created the ray tracer using the RapidMind™ Development Platform running on graphics processing units (GPUs). This application is now being demonstrated on the Cell Broadband Engine™ (Cell BE), achieving excellent performance.

To view a video of the demonstration, go to www.rapidmind.net/samples

What does this mean for you? With the RapidMind platform, *your* application can also take advantage of the performance of the Cell BE. This application is just one example of how easy it is to build high-performance applications using the RapidMind Development Platform. Whether for image processing, scientific computation, game development or content creation, RapidMind eliminates the need to understand the details of the hardware platform in order to achieve the potential of the Cell BE processor.

Real-time Ray Tracing

Why ray tracing? Ray tracing provides physically accurate support for effects such as reflection and refraction, which are not easily obtained otherwise. Ray queries are a fundamental computer graphics operation and are the basis for physically correct light simulations, line-of-sight calculations and collision detection.

Why real-time? Traditionally, ray tracers have been used only for time-consuming offline renderings. Real-time ray tracing brings movie-class effects to real-time visualization applications. Instead of employing large clusters of computers to do this, RTT's solution can run on a single Cell BE processor. This means that a single machine can be used for tasks such as seeing what a proposed headlamp looks like or for checking for bothersome reflections in a windshield.



By exploiting the programmability of the RapidMind platform, the ray tracer allows the use of arbitrary shaders to describe the surface materials of objects located in the scene to be ray traced. Because of the highly parallel nature of the RapidMind Development Platform, rays are traced in a highly efficient matter, allowing large and complex models to be displayed in real-time by making use of the parallel vector processing capabilities of the Cell BE. All of the standard features commonly found in ray tracing engines are supported by RealTrace.

High Performance Made Simple With RapidMind

The Cell BE processor is designed for high performance. The architecture consists of nine processor cores on a single chip. One of the cores on the Cell BE is the IBM PowerPC® Processing Element (PPE). The other eight cores, the SPEs, are specialized processors tuned for high-performance floating point and integer math on short vectors. Since much of the Cell BE's impressive performance resides in the SPEs, *the key to obtaining high performance on the Cell BE processor is efficient use of the eight SPEs.*

The following chart demonstrates the performance (in milliseconds) of the ray tracer on a particularly challenging scene:

| | | Number of SPEs | | | |
|--------------------------|----|----------------|------|-----|-----|
| | | 1 | 4 | 8 | 16 |
| Number of rays per pixel | 1 | 2342 | 603 | 319 | 190 |
| | 5 | 3919 | 1001 | 520 | 300 |
| | 10 | 4801 | 1222 | 633 | 360 |

Scene specifications:

Triangles: 600000
Hardware: Up to two 3.2 GHz Cell BE processors in the IBM® BladeCenter® Server
Resolution: 512x512
Features: Ray intersection, secondary ray shading and ray generation

The results demonstrate how RapidMind performance scales very well with additional processing resources. As the number of SPEs available to the system is increased, the performance scales nearly linearly. Even when the application is run over two Cell BE processors (using 16 SPEs) the application continues to scale. Because the platform balances the load efficiently across the SPEs, increasing the number of rays has a sub-linear effect on performance.

The RapidMind Development Platform allows developers to use standard C++ programming to easily create applications targeted for high performance processors, including the Cell BE and GPUs. In the case of the Cell BE, the RapidMind platform distributes processing across the SPEs, without any explicit reference by the developer to the Cell BE. The RapidMind platform provides a simple computational model that can be targeted by programmers, and then maps this model onto any available computational resources in a system. Code can be written once, then run in parallel on any of the processors that RapidMind supports.

About RapidMind Inc.

RapidMind provides a software development platform that allows applications to take advantage of a new generation of high performance processors, including the GPU, Cell BE, and other multi-core processors. RapidMind enables applications to realize the performance breakthroughs offered by these processors.

For more information on how RapidMind can help you develop applications for the Cell BE processor, visit WWW.RAPIDMIND.NET

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