

# High performance three–horizon composition algorithm for large scale terrains

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## Abstract

The continuous creation of larger and higher resolution Digital Elevation Models (DEMs) allows for a very accurate horizon calculation. The implementation of the horizon computation requires a huge amount of computational resources. Only a good combination of an accurate horizon algorithm along with parallel computing could face the significant computational demands involved. This work presents a high performance algorithm to compute the horizon in very large high resolution DEMs. Stewart’s algorithm has been used as the core of our implementation. We have considered that the horizon has three components: the ground, near, and far horizon. A multi-resolution halo method has been introduced to eliminate the edge effect associated with Stewart’s algorithm. A new data partition approach has been introduced to substantially increase the parallelism in the algorithm. In addition, several optimizations has been proposed to considerably reduce the number of arithmetical operations in the core of the algorithm. The experimental results has demonstrated that by applying the above described contributions, the proposed algorithm is more than three times faster than Stewart’s algorithm while maintaining the same accuracy.

**Keywords:** Three-horizon composition; multi-resolution halo; four-overlapping grid tiling partition; parallel computing; multicore nodes.

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