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A Parallelized Screen-based Method for Rendering Polylines and Polygons on Terrain Surfaces

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Abstract

Two dimensional (2D) vector features, when rendered on terrain as reference or highlight features, can improve the intelligibility of three dimensional (3D) scenes. This research proposes a new screen-space based method to render solid color 2D polylines and polygons on terrain. Using the z-buffer value and window coordinates in screen space, a pixel's spatial extent in real world coordinates can be calculated. The pixel's color is changed, if its spatial extent intersects with a polyline or polygon feature, to reflect the fact that there is a polyline going through or a polygon covering the pixel. Compared to other existing methods, our method eliminates undesirable rendering artifacts. A parallel computing schema was proposed and implemented as well to improve rendering performance.

Keywords: virtual geographical environment; 3D cartography; rendering technique; screen-based rendering; image line combination.

1 Introduction

As an abstraction and, in some cases, generalization of geographic features, two-dimensional (2D) vector symbols are the basic elements of traditional cartography. Remote sensing imagery is usually used as a base layer in GIS whereas