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Information measures for terrain visualization

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Abstract

Many quantitative and qualitative studies in geoscience research are based on digital elevation models (DEMs) and 3D surfaces to aid understanding of natural and anthropogenically-influenced topography. As well as their quantitative uses, the visual representation of DEMs can add valuable information for identifying and interpreting topographic features. However, choice of viewpoints and rendering styles may not always be intuitive, especially when terrain data are augmented with digital image texture. In this paper, an information-theoretic framework for object understanding is applied to terrain visualization and terrain view selection. From a visibility channel between a set of viewpoints and the component polygons of a 3D terrain model, we obtain three polygonal information measures. These measures are used to visualize the information associated with each polygon of the terrain model. In order to enhance the perception of the terrain's shape, we explore the effect of combining the calculated information measures with the supplementary digital image texture. From polygonal information, we also introduce a method to select a set of representative views of the terrain model. Finally, we evaluate the behaviour of the proposed techniques using example datasets. A publicly available framework for both the visualization and the view selection of a terrain has been created in order to provide the possibility to analyse any terrain model.

Keywords: information measures, best view selection, elevation model, photorealistic, lidar

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