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Sky-view factor visualization for detection of archaeological remains

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Many archaeological remains are covered by sand or vegetation but it still possible to detect them by remote sensing techniques. One of them is airborne laser scanning that enables production of digital elevation models (DEM) of very high resolution (better than 1 m) with high relative elevation accuracy (centimetre level), even under forest. Thus, it has become well established in archaeological applications. However, effective interpretation of digital elevation models requires appropriate data visualization. Analytical relief shading is used in most cases. Although widely accepted, this method has two major drawbacks: identifying details in deep shades and inability to properly represent linear features lying parallel to the light beam. Several authors have tried to overcome these limitations by changing the position of the light source or by filtering.

This contribution addresses the DEM visualization problem by sky-view factor, a visualization technique based on diffuse light that overcomes the directional problems of hill-shading. Sky-view factor is a parameter that describes the portion of visible sky limited by relief. It can be used as a general relief visualization technique to show relief characteristics. In particular, we show that this visualization is a very useful tool in archaeology. Applying the sky-view factor for visualization purposes gives advantages over other techniques because it reveals small (or large, depending on the scale of the observed phenomenon and consequential algorithm settings) relief features while preserving the perception of general topography.

In the case study (DEM visualization of a fortified enclosure of Tonovcov grad in Slovenia) we show that for the archaeological purposes the sky-view factor is the optimal DEM visualization method. Its ability to consider the neighborhood context makes it an outstanding tool when compared to other visualization techniques. One can choose a large search radius and the most important features on the global scale will be clearly visible; on the other side, if a small search radius is chosen the local details will stand out. In addition it gives much better impression on the relative elevation of each point in compare to its surroundings.