A GIS-Based Optical Viewshed Optimization Algorithm

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Abstract

Traditional viewshed analyses distinguish between those areas which can be seen from a given observation point and those which cannot be seen. Given a surface digital elevation model (DEM) and observer properties (location and height), the algorithm computes whether or not each target cell is within the observer's line-of-sight. Just as significant and robust (although yet not commercially available) would be a tool that could search local neighborhoods of the observer to determine if different tower placements could achieve significantly improved viewsheds. This thesis customizes the popular ArcGIS software to demonstrate the implementation of such a tool.

The use of different sampling methods specifies locations to site observation points throughout the Virginia Tech central campus, characterized by having large open areas in an otherwise urban environment. Analysis of the viewsheds calculated both before and after applying the optimization tool determined the amount of coverage gained by moving the observer short distances across the ground. In large open areas (Drillfield, parking lots), optimization achieved minimal gain, however in areas near buildings, significant increases in visible area were possible by moving the observer to the top of a nearby building. This research rejects the common belief that the best location for an observer or transmitter in open areas is always at the highest elevation point. However, in settings with tremendous vertical differences over small horizontal distances (ground to roof), the belief is justified.

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