Name: Ola Hall
Organization: Massachusetts Institute of Technology
Address 1: Dept. of Civil and Environmental Engineering
Address 2: 15 Vassar Street
City: Cambridge
State: MA
Zipcode: 02139
Country: US
Business Phone: 617-2547516
Other Phone:
Fax:
Email: ohall@mit.edu
Presentation Type: Poster

Presentation Title: Physically Based Interpolation of Data Voids in SRTM Data

Abstract: A characteristic feature of the unedited SRTM data is numerous data voids originating from a number of factors such as shadowing, layover, or other radar-specific causes. Previous work suggests that these voids can be subdivided into two equally likely groups: a group consisting of six or fewer contiguous missing values, and another with more than six contiguous missing elevation values. We present here a physically based interpolation algorithm which is comprised of two steps.

First, a smooth interpolant in the irregular domain A is obtained by solving the biharmonic equation with given boundary values for the solution u and its normal derivative u_n. This produces a smooth surface with the purpose of finding geomorphological macro structures. Second, micro structures are imposed on the smooth surface by adjusting elevation points according to a simple physical model. The structure of catchment topography depends largely on the interactions between hillslope and channel processes. The transition from convex hillslopes to concave valley forms is understood as a change in process dominance and can ideally be observed as a sharp break in the slope-area scaling. A plot of log-Slope versus log-Area for most landscapes reveals two distinct process regimes. The break in the slope-area scaling relationship typically marks the shift from convex to concave forms. Observed slope-area scaling is used in the proposed algorithm to adjust elevations points in such a manner that interpolated void regions are consistent with the local process dominance. We show that the algorithm can be generalized for all U.S. geomorphological regions.