# APPLICATION OF SHAPE-FROM-SHADING TECHNIQUES TO THE GENERATION OF "VALUE-ADDED" INTERPRETATION PRODUCTS OF SAR IMAGES OF RUGGED TERRAIN

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## ABSTRACT

Spaceborne synthetic aperture radar (SAR) imagery is a useful information source for the understanding of the large scale topography of rugged terrain because of its radiometric sensitivity to terrain orientation.   Radiometric variability caused by changes in surface cover is generally a second-order effect.   On the other hand, the unique SAR viewing geometry introduces spatial distortions (i.e. foreshortening and layover) which make it difficult to visually interpret physical shapes and sizes of topographic features.

Because of the predominance of topographic effects in both image radiometry and geometry, a research program has been undertaken to assess the applicability of shape-from-shading techniques to the extraction of quantitative terrain information from images of rugged terrain.  Recent analyses of SEASAT images (Guindon, 1989) have shown that radiometric response is an accurate indicator of the magnitude of the local range component of terrain slope.   Based on this observation, a methodology has been developed which can provide both a digital elevation model (DEM) and a corresponding image orthoview from a single input SAR scene.

At various stages during the DEM extraction process, image by-products can be generated which provide quantitative measures of specific terrain parameters (e.g. terrain slope maps, drainage network overlays).  In addition, the DEM-orthoview combination can be subsequently employed to generate self-consistent image perspective views. In short, each product can be considered as some form of terrain interpretation, i.e. as a 'value-added' interpretation and thereby provide additional information for scene understanding.

In this paper, the shape-from-shading methodology is briefly reviewed with emphasis on the derivation of 'value-added' products and their level of accuracy.   Example results are provided for two SEASAT subscenes of mountainous terrain in central British Columbia.

## REFERENCE

Guindon, B., 1989, Development of a Shape-from-Shading Technique for the Extraction of Topographic Models from Individual Spaceborne SAR Images.  Proceedings of the 1989 International Geoscience and Remote Sensing Symposium, pp.597-602.