Overview

• The simulation of surface clutter is an invaluable tool in the analysis of airborne and spaceborne radar sounding data in order to discriminate true subsurface reflectors from off-nadir surface echoes with similar time delays [1,2][Figure 2].

• Software has been developed to simulate surface clutter, but to date each instance has been specifically written to work with a single dataset or instrument [1,3].

• The algorithms employed to perform a clutter simulation are not unique for different planetary bodies or radar instruments.

• The creation of a generalized, re-usable clutter simulation program is possible, and facilitated by open source libraries such as GDAL and NumPy [5,6].

Software Description

• The clutter simulation software created uses a facet-based model for the calculation of surface reflection [Figure 1].

• Facet-based clutter simulations have been shown to be effective even when the model of surface topography is of lower resolution than the radar wavelength [2].

• Generality is accomplished in the software largely through the use of the Geospatial Data Abstraction Library (GDAL) [5] that can read in many digital elevation model (DEM) formats and perform conversion between different coordinate systems.

• Both focused and unfocused radar data can be simulated by changing the dimensions of the faceted surface.

Future work

• Adjusting for non-isometric antenna patterns.

• Multi-threading either the simulations for individual points in a navigation file or individual navigation files in a list of files to simulate.

• Memoization to speed up the facet return calculation, but would take a large amount of memory.

• An option to output the simulation data in common scientific formats such as NetCDF and SEG-Y.

References


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