Segmentation results of Martian surface structures by a robust segmentation algorithm using HRSC elevation data

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Owing to a series of successful space missions the global coverage of digital elevation data of numerous celestial bodies, including the Mars, has increased. The HRSC (High Resolution Stereo Camera) instrument on board of ESA Mars Express has been delivering vast amount of imagery that are suitable for generating high-resolution digital elevation data.
This increasingly large coverage of Martian surface gave impetus to large-scale geomorphometric evaluation: the level of automation should be increased in order to keep pace with the size of the dataset.
A robust DTM segmentation method has been developed recently for various geoscientific applications, including analysis of Martian DTMs. The implementation includes computation parallelization, kd-tree approach for storage and sophisticated techniques in seeking for seed points to improve performance. It allows the processing of complete DTMs of an orbit on high-capacity multi-core computers.
The algorithm takes a point cloud as input and is searching for planar features that fulfill certain criteria controlled by user-defined parameters (number of points to calculate local normal vectors, point-to-plane distance, angular tolerance, etc.). Although the segmentation is often sensitive to the initial parameters, in many cases many fitted planes are stable. The typical number of planar facets is several thousand for a full-orbit DTM.
Many planes tend to outline Martian geomorphic features (see Figure), and therefore they are suitable for further geomorphometric analysis.
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