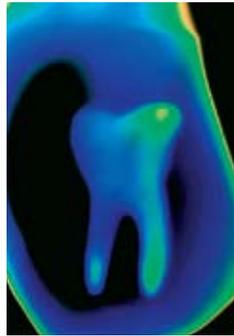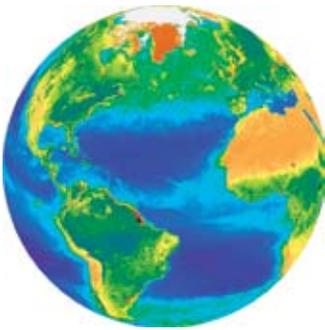**technology opportunity**

Recursive Hierarchical Segmentation (RHSEG) Data Analysis

For faster, highly accurate processing of high-resolution images and other complex data sets in 2D and 3D

Benefits

- **Improved analytical capabilities:** Optional weighted spectral clustering allows the grouping of similar but non–spatially adjacent regions, providing a robust object representation.

- **Increased speed:** RHSEG's divide-and-conquer approach and parallel implementation increase the speed of computation, making it practical for extremely large data sets.

- **Refined results:** RHSEG presents results in a hierarchical set of image segmentations, enabling selection of results for additional analyses.

- **Flexibility and control:** RHSEG provides the user with the flexibility and control to tailor the regions of interest based on the purpose of the analysis.

- **Accuracy:** Because RHSEG maintains full spatial resolution at all region boundaries, it provides finer resolution of overall detail and a more accurate portrayal of boundaries.

- **Ease of use:** The HSEGViewer is an easy-to-use tool to view, analyze, and understand RHSEG's output.

NASA Goddard Space Flight Center invites companies to license this image segmentation software for use in commercial applications. Optimized for speed and accuracy, RHSEG significantly improves the extraction of patterns from image and nonimage data sets, providing the user with precise control. Originally designed for remote sensing, RHSEG can improve pattern recognition and extraction in a broad range of applications from medical imaging to data mining.

Technology Details

The RHSEG approach involves partitioning two- and three-dimensional image data into regions at various levels of detail. Using this approach, regions of data at coarser levels of detail are hierarchically related to regions of data at finer levels of detail. Following processing by the software, data are grouped and can be analyzed in terms of hierarchically related regions, rather than as individual data points, enabling a more consistent and accurate analysis.

The software partitions the image data and then compares each region with spatially adjacent regions. The most similar pairs of spatially adjacent regions are then combined to form larger regions. At the user's option, RHSEG can compare pairs of non–spatially adjacent regions and then combine those regions that are at least as similar as the previously compared spatially adjacent regions. Once a prespecified number of regions is reached (depending on the detail desired), RHSEG provides options for controlling the output of the segmentation hierarchy from that number of regions down to a two-region segmentation. The hierarchical nature of the segmentation results allows the user to choose which level of segmentation best accommodates the purpose of the data analysis. The user also can combine levels to arrive at a hybrid of segmentations that makes the image objects of interest clearly visible.

Licensing and Demo Software

Several versions of RHSEG are available for license, based on the user's needs—parallel vs. serial implementation, 2D vs. 3D data. A 90-day evaluation copy is available to help demonstrate RHSEG's capabilities. For more information, visit http://ipp.gsfc.nasa.gov/RHSEG/ and click the "Register Your Interest" link.

RHSEG software produces a hierarchical set of segmentations as illustrated in these samples.
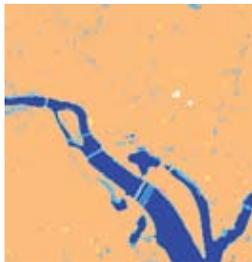
(a) 7-region level from segmentation hierarchy

(b) 50-region level from segmentation hierarchy

(c) 11 regions selected from the 7-region, 25-region, and 50-region levels of the segmentation hierarchy

Partnering Opportunities

This technology is part of NASA's Innovative Partnerships Program, the goal of which is to transfer technologies into and out of NASA to benefit both NASA space missions and the American public. NASA invites companies to consider licensing technologies in the RHSEG suite for use in commercial applications.

For More Information

To learn more about the RHSEG suite, please contact:

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