

Licensable Technologies

RADIUS: Rapid Automated Decomposition of Images for Ubiquitous Sensing

Applications:

- Geospatial image analysis
- Content-based image search and retrieval
- Radiograph analysis for DHS and proliferation detection
- Scalable image rendering, graphics, and compression

Benefits:

- Scalable, distributed algorithm (laptops to clusters)
- Rapid image segmentation
- Linear scaling with image size
- Vector representation of images
- Features related in hierarchical segmentation by inclusion
- Features available as polygons for shape recognition

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Sensors, sensors, everywhere... we face a deluge of digital image data.

- We are looking, but are we seeing?
- Sensing power has outstripped processing power, leaving analysts with a glut of data to process.
- Can computers help analysts see what they are looking for? Can they mimic how an analyst searches?

At Los Alamos National Laboratory (LANL), project RADIUS is emulating human visual perception in efficient algorithms and software to extract meaningful features at multiple scales from imagery.

The goal: Bring analysis capability in line with sensing capability and provide broad area search support.

Under RADIUS, LANL has developed computational framework for structural representation of images that uses polygons instead of pixels. The RADIUS framework provides:

- data reduction from millions of pixels, representing image colors, down to thousands of polygons, representing image features:

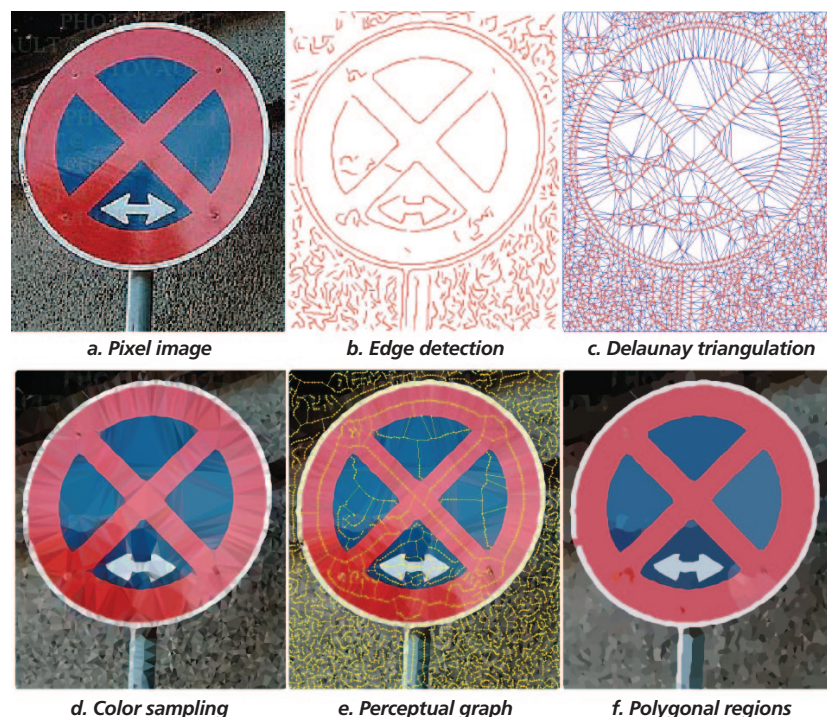


Fig. 1. The core idea is the utilization of a sparse, but informative, subset of pixels, namely edge pixels (Fig. 1b), as anchor points for a Delaunay triangulation of the image (Fig. 1c). The triangulation serves as an image-adaptive grid from which perceptual underpinnings of human vision such as proximity, symmetry, continuity, etc., between edges can be computed. Using these relationships as grouping criteria, the triangles are selectively merged to obtain visually meaningful polygons (Fig. 1f). This rapidly (1 Megapixel/sec on a 3.0 GHz Intel Xeon, ~15 megapixels/sec on an 8 core 2.66Ghz Intel Xeon with 32 GB of RAM) reduces data by three orders of magnitude, from millions of pixels down to thousands of polygons, paving the way for efficient image analysis.

LANL intellectual property associated with RADIUS is available for licensing

Multiscale Characterization and Analysis of Shapes, U. S. Patent No. 6,393,159

Vectorized Image Segmentation via Trixel Agglomeration, U. S. Patent No. 7,127,104

Image Segmentation by Hierarchical Agglomeration of Polygons using Ecological Statistics. (U.S. Pat. Pending)

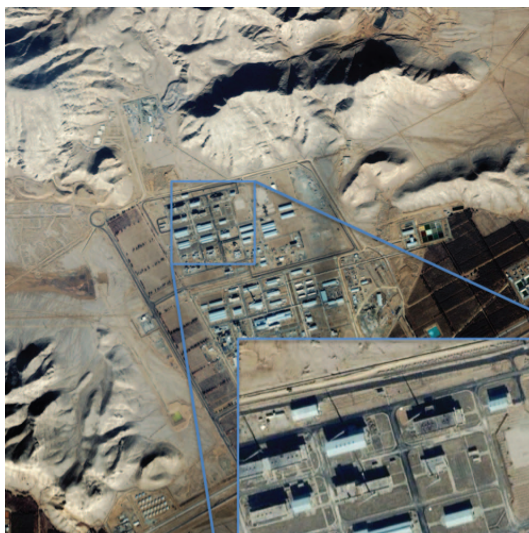
RADIUS software

- a hierarchical scheme for extracting multiscale features by successive grouping of polygons based on structural, spectral, and statistical attributes:



Hierarchical Segmentation by successive perceptual agglomeration of polygonal features.

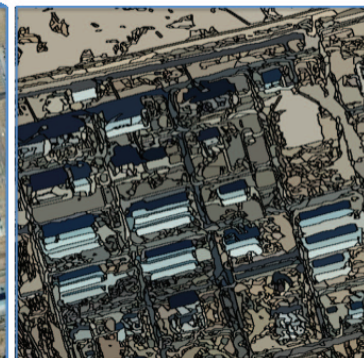
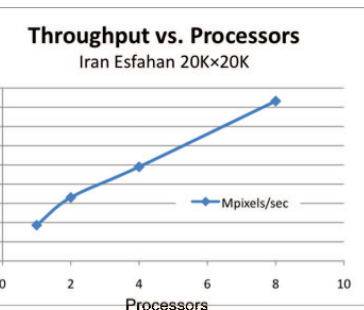
- a graph-based, traversable image representation in terms of polygonal features and their adjacencies to enable contextual characterization and recognition of features and scenarios.



DigitalGlobe© image



Detail



Fine scale polygonization

High Performance Implementation

Average of ~15 megapixels/sec on an 8 core 2.66Ghz Intel Xeon with 32 GB of RAM

Scalable implementation from desktops to supercomputers

- Accelerating algorithms using advanced architectures
- Many-core support for demanding applications

LANL is seeking partners to enhance/apply the capabilities of RADIUS

Required:

Potential partners must

- Provide targeted applications of interest to the image-user community at large
- Have qualified staff
- Have the ability to enter into a CRADA (or other appropriate contractual agreement) with LANL.

Preferred:

A potential partner who can

- Identify applications for RADIUS in the GIS and other workflow arenas
- Identify and collaborate on future R&D funding opportunities
- Has the capability to further develop the RADIUS technology into a commercial product or service.