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Imaging Demonstration for Human Factors

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Topics

- Assumptions:
  - Analyst needs to interpret information within 30-60 seconds of imagery acquisition by SIBRS-Low spacecraft(s).
  - Imagery can be acquired looking down at earth or out to space.
  - Fused and interpreted product presented to analyst.
- Relevant Technology Developed at JPL
  1. Real-time tracking of moving targets with Grayscale Optical Correlator (GOC) using MACH and Neural-Net algorithms
  2. Earth background/clutter characterized by satellite image mosaics
  3. Supersampling/superresolution of images
  4. Integrating 3-D object models with imagery to help determine object's characteristics

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Real-time Tracking of Moving Targets

- Originally Developed under *Vigilante* Project for BMDO
  - Grayscale Optical Correlator (GOC)
- Algorithms
  - MACH (Maximum Average Correlation Height) ATR identifies from source library and tracks
  - Adaptive Neural Net Trains and then Tracks
- Capabilities
  - Real-time finding and tracking moving objects against clear sky or cluttered Earth backgrounds.

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Earth Background/Clutter Characterization

- Originally Developed for NASA Digital Earth Program
  - Satellite Image Mosaics
- Algorithms
  - Brightness correction across scenes, brightness adjustment across mosaic
  - Combines ground control and image-to-image tiepoints and elevation models for orthorectification
- Capabilities
  - Prepares continent-size areas from thousands of images
  - Rapid-access archive at variable resolution
  - Landsat TM mosaics (VNIR, SWIR, TIR) @ 30m
  - AVHRR & MODIS mosaics (VNIR, SWIR, TIR) @ 1km

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Supersampling/superresolution of images

- Originally Developed for NASA Planetary Program
- Algorithms
  - *Supersampling* combines several co-registered images to create higher resolution master image.
  - *Superresolution* uses FFT analysis of sensor point spread function to sharpen images
- Capabilities
  - Supersampling usually yields order of magnitude better resolution (i.e. 2+ NIIRS)
  - Superresolution usually yields significant improvement (i.e. 0.5 to 1.0 NIIRS)

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Integrating 3-D Object Models with Imagery

- Originally Developed for NASA Astronomy Program
- Algorithms
  - 3-D Model developed for reflectivity properties simulation.
- Capabilities
  - Compares light/MW reflectance properties received with modelled reflectivity.
  - Rotating and tumbling objects accommodated.