Image Classification Using Spatial Enhancement

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Background

- This study was created to show the usefulness of satellite imagery in identifying interstates in Louisiana.
- The study area was chosen because of other work being done on the same area at my workplace (Castle Rock Consultants).
The image was derived from a Landsat 7 panchromatic scene of north central Louisiana, taken April 17, 2003.

The panchromatic band was chosen for its 15 meter resolution.

Most US and state highways are not wide enough for study at such resolution, so an interstate was chosen as most suitable.

An AOI was taken to clip out a small study area surrounding the town of Ruston.

This area was chosen based on the easily visible "hump" shape of Interstate 20, which would make it more obvious visually and in classification.
Methods, Attempt #1

- Classification of Interstate 20 was first attempted using the Erdas Imagine Signature Editor.
- A segment of the highway was imported from ArcMap to use in training for the classification.
- However, for unknown reasons, it was not possible to obtain a proper signature.
- So instead the Knowledge Engineer was employed to do classification...

Methods, Attempt #2

- The best value ranges on Interstate 20 for each image were determined in a spot check using the Inquire Cursor.
- These ranges were refined by trial and error in the Knowledge Engineer with output images.
- Only the original panchromatic AOI image and the spatial enhancement images derived from the original panchromatic image AOI that added unique and useful information were used.
- They were then combined, with further refinements made.
Non-Directional Edge

- Uses the Sobel and Prewitt filters for edge detection.
- These are two very common filters which use orthogonal kernels convolved separately with the original image, and then combined.

Texture

- An Erdas Imagine filter which enhances the texture in a raster layer.
Results

- This resulted in a final classified image using value ranges that removed most of the background “noise”, while retaining as much as possible of the highway itself.

Final Classified Image

- The final classified image was a composite of:
  - The AOI image
  - A non-directional edge spatial enhancement image
  - A texture spatial enhancement image
Conclusions

- Using spatial enhancement techniques combined with the original image resulted in a reasonable classification of a section of Interstate 20 near Ruston, Louisiana.
- However, other techniques could be used for further image refinement and classification.
- For more information on the latest such techniques, see the December 2004 Photogrammetric Engineering & Remote Sensing journal.