Image Classification Using Spatial Enhancement

By
Dara Zike

Background

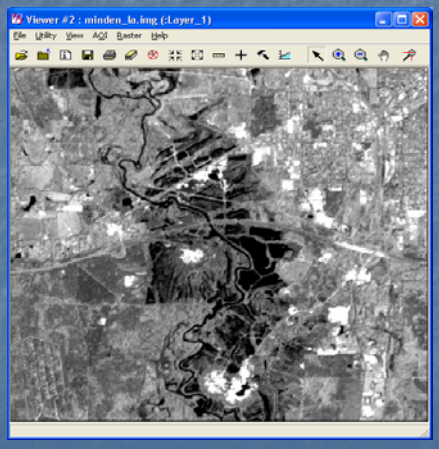
- This study was created to show the usefulness of satellite imagery in identifying interstates in Louisiana.
- The study area was chosen because of other work being done on the same area at my workplace (Castle Rock Consultants).

Base Image

- The image was derived from a Landsat 7 EMT+ 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.

AOI

- 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

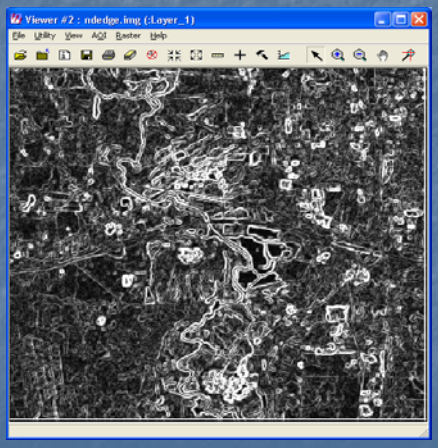
- Classification of Interstate 20 was first attempted using the Erdas Imagine Signature Editor.
- A segment of the highway was imported from ArcMap to use in training for the classification.
- However, for unknown reasons, it was not possible to obtain a proper signature.
- So instead the Knowledge Engineer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

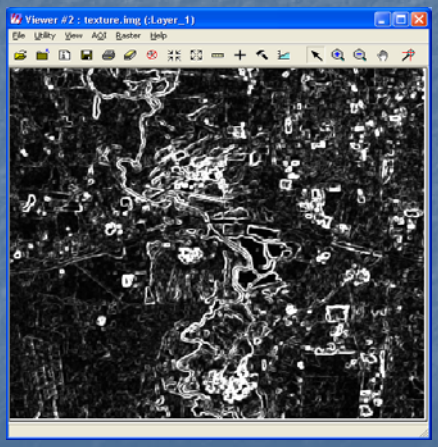
Non-Directional Edge

- 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.

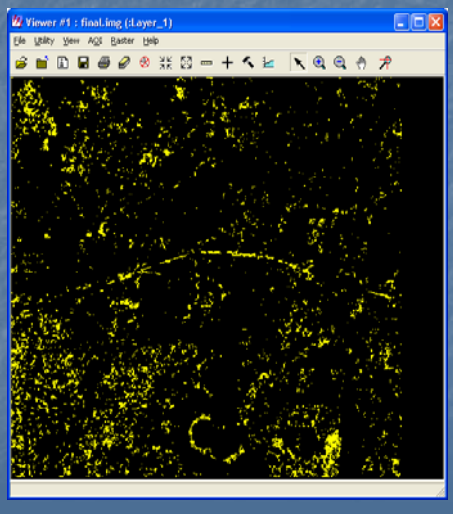


Results

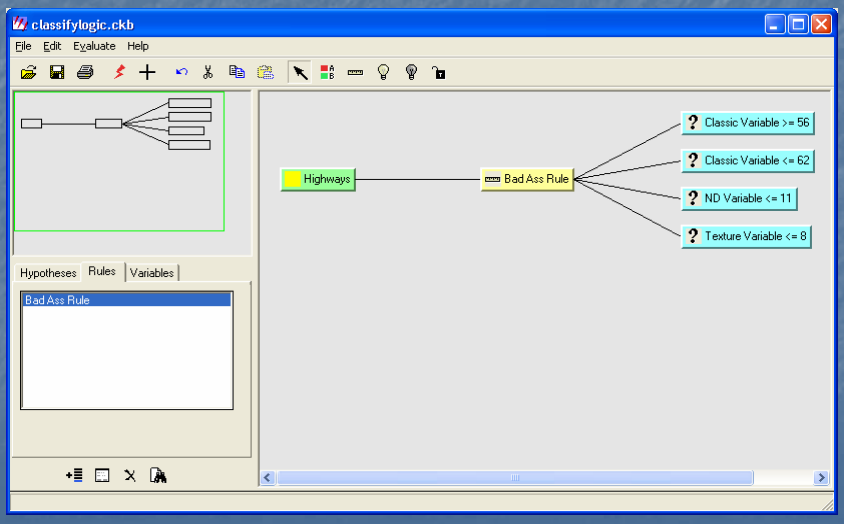
- This resulted in a final classified image using value ranges that removed most of the background “noise”, while retaining as much as possible of the highway itself.

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



Combined Image Value Ranges



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