HRSC Level4 RGB & pan-sharp

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RGB with “xvd”
Pan-sharpening

• What is it?

Fusion of a color data set with a panchromatic (greyscale) one with higher spatial resolution
Example: Landsat 7 ETM+
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PAN sharpening algorithms

- Multiple algorithms for pan-sharpening
  - IHS
  - Brovey
  - PCA
  - Wavelet
  - ..... 

- Multiple tools / software packages available for pan-sharpening:
  - E.g. Envi

Brovey transformation

\[ \text{DN}_\text{fused} = \frac{\text{DN}_\text{b1}}{\text{DN}_\text{b1} + \text{DN}_\text{b2} + \text{DN}_\text{b3}} \times \text{DN}_\text{pan} \]
RGB & Pan-sharpening

- HRSC Level4 data in all available color bands (RE, GR, BL, IR, ND) have already the same aspect ratio (no. lines/no. columns)
- RGB color composite is immediate
- Pan-sharpening is easy to perform
RGB: example

H0360_0000
PAN sharpening

WHAT TO DO:

• Nadir at full resolution
• Red, green, blue oversampled, fitting to Nadir (same no. lines, columns)
• RGB to Lab Color
• Nadir pasted into Intensity Channel

L: Lightness of the color (L=0 black, L*=100 white)
a: Position between magenta and green (a<0 green, a>0 magenta)
b: Position between yellow and blue (b<0 blue, b>0 yellow)
PAN sharpening

321 image

Lightness channel from 321 image

Panchromatic image

Pan-sharpened 321 image
PAN sharpening - How?

• Requirement: Nadir & RGB coregistered, same number of lines & samples
• Build and RGB with Red, Green, Blue bands
• Transform RGB in Lab Color (lightness, a, b)
• Open Nadir
• Paste Nadir into “lightness”
• Transform back Lab Color in RGB
With Gimp

Open RGB image

A similar task can be achieved with any image processing software, e.g. Adobe Photoshop
With Gimp

Transform RGB in Lab Color
With Gimp

Lab Color

Open Nadir
With Gimp

Recompose RGB
With Gimp

Recompose RGB

Nadir
“A” from RGB
“B” from RGB
With Gimp

Recompose RGB
PAN sharpening

RGB + Nadir = Pan-sharp
PAN-sharp result
PAN-sharp result
Why not with Level3?

- Level3 data are NOT orthorectified on HRSC DTM !!!
- Color misalignment on Level3 RGB (across topographic features)
- RGB with MOLA used as DTM for orthorectification gives poor results
- Level4 data solve the problem