

## ***Multi-spectral Image Fusion***

Image fusion is the concept of combining information from multiple images into a single image. Pan-sharpening is an example of image fusion.

### **Pan-sharpening and Satellite Imaging**

Pan-sharpening refers to the fusion of low resolution multispectral (colour) images with high resolution panchromatic (black & white) image to produce a high resolution colour image. The input images are assumed to be co-georegistered. The output image retains (ideally) the spectral features of the colour images and the spatial features of the panchromatic image.

Most Earth resource satellites provide multispectral images at a lower spatial resolution and panchromatic images at a higher spatial resolution. This is true for SPOT, IRS, Landsat 7, IKONOS, and Quickbird.

### **Application Areas**

Satellite multispectral image data find extensive use in areas such as:

- Military and Public Security
- Urban Planning
- Environmental monitoring
- Natural Resources management
- Coastal planning
- Aerial and Satellite Mapping

### **NeST Solution for Fast and High Quality Image Fusion**

There are quite a few Pan-sharpening methods reported in the public domain over the last decade. Most are based on multi-resolution wavelet transforms, Principal Component Analysis (PCA) and Intensity-Hue-Saturation (IHS) transforms. Taking a completely different approach, researchers at NeST have evolved an Image Fusion algorithm with far superior performance. While the visual quality is unquestionable, there is also the assurance of mathematical correctness. What makes this algorithm a winner is its potential to become the fastest fusion algorithm.

## Test Results

Figure 1 is a color image (with R,G and B components). Figure 2 is the high resolution panchromatic image. By combining these inputs, a high-resolution colour image is produced as shown in Figure 3.



Figure 1 Multispectral Image



Figure 2 Panchromatic Image



Figure 3 Pan-sharpened Image

### What Makes This Exceptional?

- Very High Visual appeal (Better than other competing techniques - wavelet, contourlet, curvelet and IHS based)
- Very good spatial and color quality
- Fast implementation (Order of magnitude faster compared to wavelet and contourlet techniques)

## Roadmap

- Study is in progress for algorithm level optimization for an Ultra fast implementation
- Improved adaptations for naturalness of colour