Nick Long

Abstract

Mentors: Craig E. Deforest (SWRI); Martijn Van Schaardenberg (SWRI); Tim A. Howard (SWRI)

During the CU Boulder summer REU program, I was assigned to a project involving Point Spread Functions (PSFs) and convolution. In this application, a PSF describes the light scattering defects from optical imperfections and dust. These defects can be corrected by creating an inverse PSF and convolving it with an image. With solar images, a PSF can be created from terrestrial occultations. By making the eclipsed area perfectly black, the original effects of light scattering can be created with a trial PSF. By creating an initial guess for the PSF, an equation fitter can be used to fit the PSF to achieve better accuracy. This is valuable to science because light scattering can cause false representations of brightness in images. For example, solar theory suggests that a solar prominence is expected to have a brightness ratio between its top and bottom. Images of solar prominences do not agree with solar theory often because of light scattering. The use of a PSF and convolution can correct this problem by removing the light scattering. Thus, better comparisons of solar images with scientific theory can be made.

During my REU, I gained my first programming experience where I learned the Perl + PDL combination. Then I applied my newly learned tool to create a PSF for the Stereo B spacecraft at the 304 band pass. My research will continue with my mentor over the rest of the summer and into the 2010-2011 school year.