Registering and Resampling Images in STSDAS

R.L. Williamson II (STScI)

Registering different images can be difficult, especially if the images to be registered are images at different wavelengths, where features in one image may look entirely different or be absent from the second image. Using two new packages soon to be added to the STSDAS package, REGISTER and RESAMPLE, this job is done automatically.

The REGISTER package allows the user to determine the amount of translation, rotation, and/or magnification needed to make two images, spectra, or time series congruent.

The methods implemented to compute the registration parameters use:

- A set of the pixel coordinates of the same features identified in two files, or

- The FITS coordinate transformation parameters in the headers of two data files, or

- A single feature identified as the peak of a cross-correlation between two vectors.

The coefficients describing the registration are defined by the equations(for a two-dimensional image):

$$X = a + bx + cy,$$
$$Y = d + ex + fy,$$

where (X,Y) are the pixel coordinates of a feature in the Reference image, (x,y) are the pixel coordinates of a feature in the Secondary image, and the computed coefficients are a, b, c, d, e, and f.

Results may be produced by linking the output of REGISTER to RESAMPLE in a command language procedure. The output from REGISTER and the input to RESAMPLE consists of a matrix of coefficients (a through f above) fully specifying the registration.

The RESAMPLE package resamples simple vector or image data for a given amount of translation, rotation (images only), and magnification, or reflection of the science data. Specific options included are:

- Image rotation about the FITS reference pixel

- Scale changes, i.e. magnification or demagnification (for images, independently on both axes)

- Simple translation

- Reflection (for images, about one or both axes)

- Resampling and registration to a reference dataset

Output from the RESAMPLE task is the resampled image which may then be displayed and compared with the reference image.