Multidrizzle

New and Improved!

Andrew Fruchter & Warren Hack
with
Nadia Dencheva, Perry Greenfield
Mike Droettboom, Megan Sosey,
Richard Hook, Jay Anderson
What is Multidrizzle?

- At its core, multidrizzle combines images through drizzling
- Also creates the astrometric header (makewcs)
- Handles bad pixels, cosmic ray removal, etc.
- Can take user defined position updates to refine image combination
Why Create a New Multidrizzle?

- Images are not truly calibrated. Require separate astrometric reference files.
- Code is difficult to support -- not modular; mixture of coding techniques
- Distortion in ACS varies; this is not corrected by multidrizzle/makewcs
- Shift and rotation updates poorly handled
The Way Forward

- Put all astrometric information into the headers
- Use SIP convention for low-order astrometric info (WCS + polynomial)
- Use FITS extensions for higher order distortions
- Use WCS as basis for all alignment issues
SIP done Simply

- SIP represents distortions as combination of a CD matrix and two polynomials

\[
\begin{pmatrix}
  x \\
  y
\end{pmatrix}
= \begin{pmatrix}
  \text{CD1.1} & \text{CD1.2} \\
  \text{CD2.1} & \text{CD2.2}
\end{pmatrix}
\begin{pmatrix}
  u + f(u, v) \\
  v + g(u, v)
\end{pmatrix}
\]

- Eliminates separate (confusing) linear terms in polynomial and CD matrix
- But presence of the skew term in the CD matrix applies skew to higher order terms (and later distortion corrections)
Differential Geometry

Differential geometry files required after polynomial

Corrections up to 0.2 pixels

Repeating pattern in x due to mask error in fabrication process
Time Dependent Skew Removal

Image alignment for images taken on 7 Mar 2005 and 25 Nov 2005 without TDD
RMSE(x) = 0.137708, RMSE(y) = 0.137708

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Image alignment for images taken on 7 Mar 2005 and 25 Nov 2005 with TDD
RMSE(x) = 0.076110, RMSE(y) = 0.082237

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Some Days Are Better Than Others
Not Our Fault!
Remaining SImPle Steps

- Original DGEO files are 32x64 interpolated tables
- We will need to recreate DGEO files and separately add in periodic column shifts
- WCSDEP convention (Doug Mink) + Paper IV may give a clean way of incorporation into FITS
- Differential corrections must be transformed for each image to cancel changing skew.
What is Left?

- In order to handle multiple visits and mosaics users must be able to determine relative positions and orientations of images

- Tools required include ones for:
  - catalog creation; catalog to offset determination
  - header (WCS) revision to align images
  - transfer of offset determination from combined images to individual exposures

- Headerlets
Documentation!

- Internal documentation now handle via a Wiki page
- Wiki is converted to Frame (with little human intervention)
- Frame converted to HTML using standard STScI procedure
- Wiki allows rapid update, and could have examples, discussion beyond that in the official manual; however, version control is not strict
- STUC input on use of Wiki would be helpful