Subject: Re: FITS WCS routines
Posted by wlandsman on Thu, 19 Aug 2010 20:49:14 GMT
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On Aug 19, 3:51 pm, Jeremy Bailin <astroco...@gmail.com> wrote:
> Does anyone know of a good IDL implementation or wrapper of up-to-date
> routines to deal with world coordinate systems in FITS files? The ones
> in the astronomy library aren't sufficient - in particular, I need
> something that can deal with a TNX coordinate system (tangent point
> plane with distortions).

Well, to be fair, there is no established standard yet for
representing distortions within FITS. (There is a draft standard
that has been in the works for at least 10 years -- but nobody uses
it (see Paper IV in
http://www.atnf.csiro.au/people/mcalabre/WCS/index.html)

The TNX distortion keywords and convention were created by the IRAF
software group (http://fits.gsfc.nasa.gov/registry/tnx.html). I
have implemented a more popular distortion convention -- the Simple
Imaging Polynomial or SIP (
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Library. Unfortunately, that won't help you if you are given files
using the TNX keywords.

I think I once saw IDL code for parsing the TNX keywords but I can't
remember where just now. Perhaps someone else will have idea. --
Wayne

Subject: Re: FITS WCS routines
Posted by Chris[7] on Thu, 19 Aug 2010 21:02:06 GMT
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I would also love to see the IDL astro WCS procedures handle
N-dimensional (or at least 3 dimensional) image arrays. I've had to
write clumsy wrappers to extract coordinate information from spectral
data cubes.

chris

On 8/19/10 10:49 AM, wlandsman wrote:
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Subject: Re: FITS WCS routines
Posted by Jeremy Bailin on Fri, 20 Aug 2010 13:09:08 GMT
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On Aug 19, 4:49 pm, wlandsman <wlands...@gmail.com> wrote:
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Yeah, I thought about putting "standard" in quotes. ;-)

Right now my tentative solution is to get IDL to write an IRAF script
that uses wcsctran to do the coordinate transformation, spawn IRAF to
run the script, and then read in the transformed coordinates. Which is
not exactly elegant.

The other solution is to take my current FITS file, use IRAF to
reproject it into an undistorted tangent plane projection, and then
use that reprojected image with XYAD etc. But for various reasons I'm
suspicious about what's happening in that projection step, so I'd
rather be able to operate on the original image.

-Jeremy.

Subject: Re: FITS WCS routines
Posted by Jeremy Bailin on Sat, 21 Aug 2010 19:50:40 GMT
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On Aug 20, 9:09 am, Jeremy Bailin <astroco...@gmail.com> wrote:
> On Aug 19, 4:49 pm, wlandsman <wlands...@gmail.com> wrote:
>
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>
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> use that reprojected image with XYAD etc. But for various reasons I'm
> suspicious about what's happening in that projection step, so I'd
> rather be able to operate on the original image.
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> -Jeremy.

In case anyone's interested, here's some wrappers I just wrote to the
WCStools sky2xy and xy2sky commands that seem to do the trick.
Requires the astronomy library and a couple of the UWashington
routines in addition, of course, to WCStools.

-Jeremy.

```
;+
; NAME:
;    SKY2XY
;
; PURPOSE:
;    Converts between sky coordinates and pixel coordinates of a FITS
image
;    using the WCSTOOLS sky2xy routine. Useful for images with WCS
keywords
;    that are not implemented in the astronomy library (such as the
TNX
;    convention for distortions).
;
; CATEGORY:
;    Astro
;
; CALLING SEQUENCE:
;    Result = SKY2XY(Filename, Ra, Dec)
;
; INPUTS:
```

```
;    Filename:   Name of FITS file that contains the WCS to use.
;
;    Ra:   Vector of right ascensions. Assumed to be in decimal
degrees unless
;          /STRING is set.
;
;    Dec:  Vector of declinations. Assumed to be in decimal degrees
unless
;          /STRING is set.
;
; OPTIONAL INPUTS:
;    /STRING:   Ra and Dec are strings in HH:MM:SS, DD:MM:SS format.
;
; OUTPUTS:
;    The function returns a structure with fields .X and .Y which are
arrays
;    containing the x and y pixel values.
;
; NOTES:
;    Requires WCSTOOLS to be installed. Edit the wcstoolsdir= line
near the
;    top of the function to point to the location that the binary
sky2xy and
;    xy2sky files are located.
;
; EXAMPLE:
;    FIXME
;
; MODIFICATION HISTORY:
;    Written by:    Jeremy Bailin
;    20 August 2010   Initial release
;
;-
function sky2xy, fitsfile, ra, dec, string=stringp

wcstoolslib='/Users/jbailin/src/wcstools-3.8.1/bin'

astrolib
skyfile=tmpfile('tmp','dat',4)
xyfile=tmpfile('tmp','dat',4)
if ~keyword_set(stringp) then begin
  radec, ra, dec, rahr, ramn, rasc, dede, demn, desc
  forprint, rahr, ramn, rasc, dede, demn, desc, format='(%"%02d:%02d:
%06.3f %+3d:%02d:%06.3f")', $
    textout=skyfile, /nocomment
endif else begin
  forprint, ra, dec, textout=skyfile, format='(%"%s %s")', /nocomment
endelse
```

```
spawn, wcstoolslib+'/sky2xy '+fitsfile+' @'+skyfile+' > '+xyfile
readcol, xyfile, x, y, format='x,x,x,x,f,f'
file_delete, skyfile, xyfile

return, {x:x, y:y}

end




;+
; NAME:
;    XY2SKY
;
; PURPOSE:
;    Converts between pixel coordinates of a FITS image and sky
coordinates
;    using the WCSTOOLS xy2sky routine. Useful for images with WCS
keywords
;    that are not implemented in the astronomy library (such as the
TNX
;    convention for distortions).
;
; CATEGORY:
;    Astro
;
; CALLING SEQUENCE:
;    Result = XY2SKY(Filename, X, Y)
;
; INPUTS:
;    Filename:   Name of FITS file that contains the WCS to use.
;
;    X:          Vector of x coordinates.
;
;    Y:          Vector of y coordinates.
;
; OPTIONAL INPUTS:
;    /STRING:    Output strings of HH:MM:SS and DD:MM:SS format.
;
; OUTPUTS:
;    The function returns a structure with fields .RA and .DEC which
are arrays
;    containing the RA and Dec values in decimal degrees (or in
strings,
;    if /STRING is set).
```

```
;
; NOTES:
;    Requires WCSTOOLS to be installed. Edit the wcstoolsdir= line
near the
;    top of the function to point to the location that the binary
sky2xy and
;    xy2sky files are located. Also requires the UWashington TMPFILE
and
;    DIR_EXIST routines.
;
; EXAMPLE:
;    FIXME
;
; MODIFICATION HISTORY:
;    Written by:    Jeremy Bailin
;    20 August 2010   Initial release
;
;-
function xy2sky, fitsfile, x, y, string=stringp

wcstoolslib='/Users/jbailin/src/wcstools-3.8.1/bin'

astrolib
skyfile=tmpfile('tmp','dat',4)
xyfile=tmpfile('tmp','dat',4)

forprint, x, y, textout=xyfile, /nocomment
spawn, wcstoolslib+'/xy2sky '+fitsfile+' @'+xyfile+' > '+skyfile
readcol, skyfile, ra, dec, format='a,a,x,x,x'
file_delete, xyfile, skyfile

if ~keyword_set(stringp) then begin
  ra = 15. * tenv(ra)
  dec = tenv(dec)
endif

return, {ra:ra, dec:dec}

end
```