Subject: Re: FITS WCS routines

Posted by wlandsman on Thu, 19 Aug 2010 20:49:14 GMT

View Forum Message <> Reply to Message

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 (http://fits.gsfc.nasa.gov/registry/sip.html) in the Astronomy 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

View Forum Message <> Reply to Message

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:

- > 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 ).
> have implemented a more popular distortion convention -- the Simple
> Imaging Polynomial or SIP (
> http://fits.gsfc.nasa.gov/registry/sip.html ) in the Astronomy
            Unfortunately, that won't help you if you are given files
> Library.
> 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 Jeremy Bailin on Fri, 20 Aug 2010 13:09:08 GMT
View Forum Message <> Reply to Message
On Aug 19, 4:49 pm, wlandsman <wlands...@gmail.com> wrote:
> 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 inhttp://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).
> have implemented a more popular distortion convention -- the Simple
> Imaging Polynomial or SIP (http://fits.gsfc.nasa.gov/registry/sip.html) in the Astronomy
           Unfortunately, that won't help you if you are given files
> Library.
> 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

Yeah, I thought about putting "standard" in quotes. ;-)

Right now my tentative solution is to get IDL to write an IRAF script that uses we script 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
View Forum Message <> Reply to Message

```
On Aug 20, 9:09 am, Jeremy Bailin <astroco...@gmail.com> wrote:
> On Aug 19, 4:49 pm, wlandsman <wlands...@gmail.com> wrote:
>
>
>
>
>
>> 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 inhttp://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).
>> have implemented a more popular distortion convention -- the Simple
>> Imaging Polynomial or SIP (http://fits.gsfc.nasa.gov/registry/sip.html) in the Astronomy
>> 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
  Yeah, I thought about putting "standard" in quotes. ;-)
>
> Right now my tentative solution is to get IDL to write an IRAF script
> that uses we setran 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.
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
  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:
              Output strings of HH:MM:SS and DD:MM:SS format.
   /STRING:
 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
```