rotdet2sky

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Abstract

This task uses information from the previously created count image in sky coordinates to rotate the detector coordinate model particle background images produced by *mosback*, model swcx images produced by *swcx*, and model soft proton images produced by *proton* into images in sky coordinates. This task was part the XMMGOF *esas* task 2009-2021. This is a comprehensive rewrite of the original task, which was called by perl wrapper *rot-im-det-sky*, which was eliminated for SAS-20.

1 Instruments/Modes

Instrument	Mode
EPIC	Imaging

2 Use

pipeline processing	no
interactive analysis	yes

3 Description

rotdet2sky uses information from the previously created count image in sky coordinates to rotate the detector coordinate model particle background images produced by *mosback* and model soft proton images produced by *proton* into images in sky coordinates. *rotdet2sky* obtains the DETX/DETY and X/Y reference coordinates then does the transform calculations.

Warning and requirements: *rotdet2sky* is part of the *esas* package integrated into SAS, but it is limited to work within the *esas* data reduction scheme. This is specially true wrt the structure and names of the input files. In particular, *rotdet2sky* assumes that other tasks from the package, *mosspectra/pnspectra* and *mosback/pnback* have been successfully run for the recasting of the particle background, as well as *proton* for the recasting of the soft proton background.

4 Parameters

This section documents the parameters recognized by this task (if any).

Parameter	Mand	Type	Default	Constraints
intemplate	no	dataset	'default'	

Input FOV image dataset (used as template for output image).

inimage	yes	dataset		

Input background image dataset (in DET coords, to be rotated)

outimage	no	dataset	'default'	

User-selected output name (will derive if not entered).

withmask	no	bool	F	

Apply a mask file?

inmaskimage	no	string	'default'	

Optional mask image dataset (in DET coords, to be applied to outimage)

withdetxy	no	bool	F	T/F

Supply DETX and DETY reference coords (T), or use intemplate CRVAL1/2 (F)?

detx	no	real	-999999	

DETX central coord (user selected from, e.g., esky2det output)

ONLY if withdetxy=T

dety	no	real	-999999	

DETY central coord (user selected from, e.g., esky2det output)

ONLY if withdetxy=T

withskyxy	no	bool	F	

Supply X and Y (skyx/skyy) reference pixel (T) or use inbkgimage CRPIX1/2 values (F)?

skyx	no	real	-999999	

Sky X reference pixel (e.g. CRPIX1)

ONLY if withskyxy=T

skyy	no	real	-999999	

Sky Y reference pixel (e.g. CRPIX2)

ONLY if withskyxy=T

5 Errors

This section documents warnings and errors generated by this task (if any). Note that warnings and errors can also be generated in the SAS infrastructure libraries, in which case they would not be documented here. Refer to the index of all errors and warnings available in the HTML version of the SAS documentation.

COORDSwrong *(error)*
Input template image must be in SKY coordinates

DIMSwrong *(error)*
Input template image must be 900x900

DIMSwrong *(error)*
Input mask image must be 900x900

INSTwrong *(error)*
Instrument must be M1, M2, or PN only, check obj input file

noCoordKeys *(error)*
Input FOV image missing required coordinate keywords

imgNoRA_NOM *(error)*
File does not have RA_NOM attribute

imgNoDEC_NOM *(error)*
File does not have DEC_NOM attribute warnings and errors from IO routines

6 Input Files

1. Template 900x900 Int32 SKY coord image from mos/pnspectra (e.g. mos1S001-fovimsky-2000-7200.fits)
2. Input 780x780 Int32 DET coord image from mos/pnspectra (e.g. mos1S001-bkgimdet-2000-7200.fits)
3. input 900x900 Int32 SKY coord mask from mos/pnspectra (e.g. mos1S001-maskim-2000-7200.fits)

Note: in principle, any SKY coord image can be used as a template and any DET coord image can be rotated. Output from SWCX, PROTON, etc.

7 Output Files

Output 900x900 Real32 SKY coord image (e.g. mos1S001-bkgimsky-2000-7200.fits)

The user can input (the output file name via the param outimage, but if none is entered the program will derive a filename based on the instrument and expid from the input file, e.g. mos1S001-bkgimsky-2000-7200.fits)

8 Algorithm

```
1. Read in parameters
2. Open input FOV template image.
3. Extract coordinate keywords from input FOV template image.
4. Open input DEC coordinate image to be rotated.
5. Cast the observation in DET coords thusly:

   do i=1,imgpix_X
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      do ii=1,imgpix_Y
         if(input(i,ii) .ne. 0) then
            x = alpha - i*cos(theta) + ii*sin(theta)
            y = beta + ii*cos(theta) + i*sin(theta)
            ix = nint(x)
            iy = nint(y)
            if((ix .ge. 1) .and. (ix .le. 900) .and. &
                 (iy .ge. 1) .and. (iy .le. 900)) then
               rotarr(ix,iy) = rotarr(ix,iy) + input(i,ii)
               n = n + 1
               rn = rn + input(i,ii)
            endif
         endif
      enddo
   enddo
 6. Apply a mask if selected.
 7. Open output SKY image file.
 8. Transfer input template image coord attributes to new file.
 9. write rotarr above to PRIMARY header of output SKY image file.
10. Close files.
```

9 Comments

The original code for this task appeared in the *esas* task 2009-2021 as a combination of the f95 subtask *rot_det_sky* and the perl wrapper subtask *rot-im-det-sky*. These were combined into a single f95 and modular task for SAS-21. The *esas* task was removed in SAS-21.

References