colimchain

January 12, 2017

Abstract

A script to make (optionally smoothed) image plots, colour coded to represent the relative intensities in either two or three spectral bands.

1 Instruments/Modes

Instrument	Mode
EPIC MOS:	IMAGING
EPIC PN:	IMAGING

2 Use

pipeline processing	yes
interactive analysis	yes

3 Description

colimchain is a perl task which is intended to facilitate the production of colour images from pipeline products. The user supplies **colimchain** with the location of the products, the instrument and the sequence of energy bands desired and **colimchain** does the rest. Smoothing via **asmooth** can be applied if the parameter `smooth` is set. In this case each of the input images is smoothed using the same template and mask, the smoothed images then being used as input to **colimplot**. If smoothing is not desired, **colimchain** supplies **colimplot** with the raw images. However, if no smoothing is desired, there is not much to be gained by using **colimchain** rather than **colimplot** directly.

A limited set of parameters from **asmooth** and **colimplot** have been provided. These are simply piped through to the corresponding parameters of the respective tasks. The task documentation for these tasks should be consulted for further description of the function of these parameters.

It is intended eventually to expand the task to accept OM images but this has not yet been done.

4 Parameters

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

Parameter	Mand	Type	Default	Constraints
prodsdir	no	string	.	

Directory where the input images are to be found.

clobberprods	no	boolean	no	yes—no

'Yes' forces overwrite of **colimchain** output.

astest	no	boolean	no	yes—no

If 'yes', the task makes no system calls. This mode can be used if it is desired just to test the perl script.

instrument	no	string	m1	m1—m2—pn

XMM instrument.

idtype	no	string	index	index—full

Specifies how the user wants to enter the observation and exposure information. If 'index', the task looks for the parameters `obsindex` and `expindex`; if 'full', the task looks for the parameters `obsid` and `expid`.

obsindex	no	integer	0	obsindex> 0

Read by the task if `idtype`='index'. If there is more than 1 observation in the indicated product directory, **colimchain** lists them internally in increasing order, and produces output only for that member of the list indicated by this parameter. Note that the numbers start at 0.

expindex	no	integer	0	expindex> 0

Read by the task if `idtype`='index'. If there is more than 1 exposure for the selected observation, **colimchain** lists them internally in increasing alphanumeric order, and produces output only for that member of the list indicated by this parameter. Note that the numbers start at 0.

obsid	no	string		

Read by the task if `idtype`='full'. This is the 10-digit observation ID number.

expid	no	string		

Read by the task if `idtype`='full'. This is the 4-character exposure ID string: either S or U, followed by a 3-digit number.

bandlist	no	integer list	2 3 4	

List of energy band numbers. These should be in increasing order.

withthumbnails	no	boolean	no	yes—no

To be set if it is desired to write thumbnail colur images.

thumbnaildir	no	string	./thumbnails	

The directory in which to write the thumbnail images.

smooth	no	boolean	yes	yes—no

'Yes' invokes **asmooth** to smooth the input images before they are supplied to **colimplot**.

maxwidth	no	real	20.0 pixels	$0.0 \leq$ `maxwidth` ≤ 20.0 pixels

asmooth parameter. The maximum allowed value of the width σ of the smoothing gaussian is specified via this parameter.

desiredsnr	no	real	20.0	> 0

asmooth parameter. The maximum desired signal-to-noise ratio of the output image can be specified via this parameter.

nconvolvers	no	integer	30	$2 \leq$ `nconvolvers` $\leq$ 126

The maximum number of gaussian smoothing kernels is specified via this parameter.

rebinimage	no	boolean	no	yes/no

colimplot parameter. Rebin the image to the specifications dictated by the parameters `dividexby` and `divideyby` or `newnxbins` and `newnybins`.

newnxbins	no	integer	100	$10 \leq$ `newnxbins` $\leq$ 1000

colimplot parameter. The number of x pixels in the rebinned image.

newnybins	no	integer	100	$10 \leq$ `newnybins` $\leq$ 1000

colimplot parameter. The number of y pixels in the rebinned image.

weirdness	no	real	-0.7	$-1.0 \leq$ `weirdness` $\leq$ 1.0

colimplot parameter. This parameter exerts control over the colour values of the plot. Values of `weirdness` that approach -1 give output colours in the so-called 'thermal' sequence, ie that are similar to those acquired by heated black bodies; values that approach 1 give highly non-thermal colours such as greens and violets.

heat	no	real	0.0	$-1.0 \leq$ `heat` ≤ 1.0

colimplot parameter. This parameter exerts control over the colour values of the plot. Smaller values of `heat` make all the pixels 'cooler' in the thermal sequence of colours (ie redder); larger values in contrast 'heat up' the colour values, ie make them bluer.

heatspread	no	real	0.0	$-1.0 \leq$ `heatspread` $\leq$ 1.0

This parameter exerts control over the colour values of the plot. Smaller values of `heatspread` pull all the pixels in towards white, larger values spread them out more along the thermal sequence of colours.

cutoff	no	real	0.05	$0.0 \leq$ `cutoff` ≤ 1.0

colimplot parameter. Pixels which have a total flux which is less than `cutoff` times the maximum total flux are not included in calculations of the reference multiplet. The purpose of this is to prevent such calculations being skewed by background values, which usually dominate an image in terms of numbers of pixels involved.

gainstyle	no	string	auto	auto—user

colimplot parameter. If 'auto', the gain is calculated such that the median image flux is scaled to about a third of the output brightness range. If 'user', the value given via the parameter `gain` is used.

gain	no	real	8.0	$0.0 \leq$ `gain`

colimplot parameter. The image brightness is multiplied by this constant. Note it is only user-settable

when parameter `gainstyle` = 'user'.

pgdev	no	string	/png	

colimplot parameter. The pgplot device name.

expandtomask	no	boolean	yes	yes/no

colimplot parameter. If a mask set is employed, this parameter can be set so as to expand the output image until the unmasked part of it just fills the available area. The exposure map is frequently used as a mask.

plotfile	no	string	test.ps	

colimplot parameter. If the pgplot device is one that requires an output file, this gives the name of the file.

withframe	no	boolean	no	yes/no

If `pgdev`='/ppm' and `withframe`='yes', the task constructs a frame plot around the image, containing various pieces of information such as the name of the observer and the target. This is written to a .gif file named frame.gif, which can be combined with the output image by **colimchain**.

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.

tooFewBands *(error)*
The user has supplied no elements to parameter `bandlist`.

noCifSpecified *(error)*
The user has not set the environment variable SAS_CCF.

noProductSubdirectory *(error)*
The directory specified in `prodsdir` was not found.

outputExists *(error)*
The output file exists but `clobberprods` was not set.

notYetSupported *(error)*
The user asked for an OM colour image. Can't do this yet.

badInstrument *(error)*
The value of `instrument` was not recognized.

someImagesNotFound *(error)*
The task has looked in `prodsdir` for images which match the bands specified in `bandlist`, but not all the required images were found.

maskAllZeros *(error)*
One of the exposure maps was found to contain all zeros.

expMapNotFound *(error)*
Can't run **asmooth** because no exposure map was found.

templateImageIsFlat *(error)*
No point in running **asmooth** on the template image because it is flat.

templateAsmoothFailed *(error)*
The task attempted to invoke **asmooth** to make the template image but failed.

asmoothFailed *(error)*
The task attempted to invoke **asmooth** but failed.

allImagesFlat *(error)*
All the images are flat. No point in making 3-colour plots!

allImagesZero *(error)*
All the input images are zero-valued.

colimplotFailed *(error)*
The task attempted to invoke **colimplot** but failed.

noProdFiles *(error)*
No matching files were found in `prodsdir`.

badFimgstat *(error)*
Couldn't get sensible result from fimgstat.

inTestMode *(warning)*
The `astest` parameter is set: no files will be written.
corrective action: The task proceeds in test mode.

tooFewObs *(warning)*
The number of observations is fewer than the required `obsindex`.
corrective action: The task uses the last in the sequence of observations for `obsindex`.

tooFewExposures *(warning)*
The number of exposures is fewer than the required `expindex`.
corrective action: The task uses the last in the sequence of exposures for `expindex`.

expMapNotFound *(warning)*
No exposure map was found for this observation+instrument+exposure.
corrective action: **colimplot** is run with –withmask=no

Note: The task does not at present use the **error** interface, but uses internal message, warning and error functions. The warning and error labels are therefore not relevant and have been omitted.

6 Input Files

1. 1 or more PCMS-product (uncompressed) fits images, from any of the three EPIC instruments.
2. (Optional) PCMS-product (uncompressed) fits exposure map.

7 Output Files

One of the following:

1. An image in one of the PGPLOT file formats.
2. An image directly written in postscript.
3. An image directly written as a 3-plane FITS image.
4. An image directly written in ppm (Portable Pixel Map) format.

8 Algorithm

```
Read command-line parameters;

Construct the requisite filenames and check that they exist;

if (smooth) {
  make template file;

  for each (input file) {
    invoke asmooth with the input file, the template file and the
      exposure map as a mask file;
  }
}

invoke colimplot;
```

9 Comments

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References