backscale

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Abstract

A tool for calculating and writing the BACKSCAL keyword in EPIC spectra.

1 Instruments/Modes

Instrument	Mode
EPIC	SPECTROSCOPY

2 Use

pipeline processing	yes
interactive analysis	yes

3 Description

This task calculates the area of a source region used to make a spectral file. The area is written into the header of the SPECTRUM table of the file in the keyword BACKSCAL.

The final value is:

```
area = geometric_area - ccd_gaps - bad_pixels
```

In normal use only pixels which lie within the CCD boundaries and not on bad pixels contribute to the total area. The units of area are *detector pixels* which are square pixels of side 0.05 arcseconds.

If the parameter `withbadpixcorr` is set false then the pure geometric area will be calculated regardless of where the source region lies. If `withbadpixcorr` is true then pixels lying off the edges of all the CCDs will be subtracted from the total area. If `withbadpixcorr` is true and `badpixlocation` is set to a file containing bad pixel extensions (typically the input event file) then bad pixels lying within the source

region area are also subtracted from the total area. By default, area outside the field of view is not included in the backscale calculation. This can be overridden by setting `ignoreoutoffov` false on the command line.

By default the code allows arfgen to choose the grid pixel size for the calculation of the area. This is currently 0.5" for imaging mode and 0.25" for TIMING/BURST modes. A less accurate value, but faster execution time, may be achieved by setting the parameter `badpixelresolution` to a larger number, e.g. 2.0.

4 Parameters

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

Parameter	Mand	Type	Default	Constraints
spectrumset	yes	string	spectrum.ds	

Name of the input file

badpixlocation	no	string	notSpecified	

Name of the file containing the bad pixels, initially this is the event file.

withbadpixcorr	no	boolean	yes	

Whether to use bad pixels and chip gaps in the calculation.

useodfatt	no	boolean	no	

Whether to use the ODF attitude file to construct position info.

ignoreoutoffov	no	boolean	yes	

Whether area outside the field of view should be included in the backscale calculation.

withbadpixres	no	boolean	no	

Whether a grid resolution has been specified on the command line. If not set then the task uses the default badpixelresolution set by the **arfgen** task.

badpixelresolution	no	float		

The grid resolution to use when calculating the area. If set then this overrides the value used internally by **arfgen**. A value such as 2.0, will result in a faster execution time at the expense of accuracy.

5 Errors

There are no errors specific to **backscale**. See the **arfgen** documentation for a list of its internal errors.

NB: A lot of warnings may be generated by arfgen when being run in this backscale calulation mode. These may look worrying but are ALL irrelevant and should be ignored !

6 Input Files

- an EPIC spectrum file containing a datasubspace definition
- an optional second file containing the bad pixel extensions

7 Output Files

- The input spectrum is modified

8 Algorithm

```
Create a grid which encompasses the source region
with
   grid_element_Width = 20 * badpixelresolution

area=0
Loop over each grid element
{
   if (element lies within a CCD) {
      area = area + grid_element_Width * grid_element_Width
   }
}
Loop over each bad pixel
{
   if (bad pixel lies within source region) {
      area = area - bad_pixel_area_in_detector_pixels
   }
}
```

9 Comments

To improve the execution time of the task the source region is divided into a grid which is used to check whether pixels lie on a CCD. The width of each grid element is set by default to be 40 detector pixels ($\sim$ 2.0 arcseconds). It has been chosen like this to give reasonable coverage of CCD gaps where they make a significant contribution to the total area while keeping reasonable execution times for larger areas. To improve the accuracy the resolution should be increased to e.g. 0.5 arcseconds.

References