elcbuild

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Abstract

elcbuild takes a set of NTimeSeries time series which must contain the five columns: `RATE`; `ERROR`; `BACKV`; `BACKE`; and `FRACEXP`, as its input. The output file has the same extension and columns, but each column contains a two dimensional array (NtimeSeries:nRates), where nRates is the number of rates of the `RATE` extension. This output can then be plotted by **lcplot**.

1 Instruments/Modes

Instrument	Mode
EPIC MOS	IMAGING, TIMING
EPIC PN	IMAGING, TIMING

2 Use

pipeline processing	yes
interactive analysis	yes

3 Description

This task manipulates FITS files. **elcbuild** reads between 2 and 9 time series, which must contain the columns `RATE`, `ERROR`, `BACKV`, `BACKE`, `FRACEXP`. Such a FITS file can be obtained from the task **lccorr**. **elcbuild** stores the columns: `RATE`; `ERROR`; `BACKV`; `BACKE`; and `FRACEXP`, in a matrix of dimensions (NTimeSeries:nRates), and then writes the matrix into the RATE extension of the output time series. This output file can then be plotted by the task **lcplot**. **lcplot** generates a plot of both net and background count rates, for each time series.

elcbuild reads each input file and takes the values of the keywords E_MIN, E_MAX from their RATE extension. For file number i, it writes the values into the keywords E_MINi, E_MAXi of the output file. A keyword NUMBAND, whose value is the number of input files, is also added to the header of the RATE extension of the output file.

elcbuild will raise an error if the number of input time series is less than 2, and if the time series 1) do not cover the same time interval (`TIMEZERO`, `TSTART`, `TSTOP`) or 2) do not have the same binning time (`TIMEDEL`), or equivalently the same number of rates (nRates).

3.1 Examples

To create a FITS file, called lcoutput.ds, which is composed of the three lightcurves, lightcurve1.ds, lightcurve2.ds, lightcurve3.ds, a command such as,

```
elcbuild sets='lightcurve1.ds, lightcurve2.ds, lightcurve3.ds' outset=lcoutput.ds
```

can be used.

4 Parameters

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

Parameter	Mand	Type	Default	Constraints
sets	yes	list of datasets	""	

List of input time series

outset	no	dataset	"lc_combined.fits"	

Output time series

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.

InsufficientInput *(error)*
elcbuild needs more than 2 time series as input.

difftimeintervals *(error)*
The input time series must cover the same time intervals defined by `TSTART`, `TSTOP`, `TIMEZERO`, and must have the same binning time (`TIMEDEL`).

6 Input Files

1. *sets* This is the list of input time series (e.g. file1, file2, file3). All input time series are OGIP compliant FITS files and must contain the columns: `RATE`; `ERROR`; `BACKV`; `BACKE`; and `FRACEXP`. These files can be generated by **lccorr**.

7 Output Files

1. *outset* This is the output time series. It is an OGIP compliant FITS file, which can be plotted by **lcplot**.

8 Algorithm

```
Read the input parameters

Raise an error if the number of input time series is less than 2

From the RATE extension header of the first time series
     Get the number of rows of the RATE extension (nRates)
     Get some mandatory keywords (e.g. TSTART, TSTOP, TIMEDEL, TIMEZERO)

Do for input time series 2 to NTimeSeries
   Check keyword values against those of the first input time series
   (nRates, TSTART, TSTOP, TIMEDEL, TIMEZERO)
   If not the same then raise an error and exit
End Do

Create the output dataset

Propagate the keywords from the first time series to the output
time series for both the primary and RATE extension headers.

Do for each input time series (dataset)

    Read the RATE extension from file i
    Read the values of E_MIN, E_MAX from the header
    Store these values as E_MINi, E_MAXi in the header of the
          RATE extension of the output file
    Get columns RATE, ERROR, BACKV, BACKE, FRACEXP
    Store corresponding arrays in matrix(NtimeSeries,nRates)

End Do

Write matrix in the RATE extension of the output dataset

Release output dataset
```

9 Comments

- This task is primarily intended for PPS use. **elcbuild** was developed to fill the hole between **lccorr** and **lcplot**, for multiple time series. In this way several time series products can be plotted by the task **lcplot**.
- All input files must be OGIP compliant, so that the output file will also be OGIP compliant

and must contain the columns: `RATE`; `ERROR`; `BACKV`; `BACKE`; and `FRACEXP`. These files can be generated by **lccorr**.

- The test is twofold: First it checks that the output file has been created, and then runs **lcplot**, produces a color postscript file, and finally checks on the validity of the postscript file produced.

References