phasecalc

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Abstract

Given an ephemeris, calculate a phase column for an event table.

1 Instruments/Modes

Instrument	Mode
all	all modes with time information

2 Use

pipeline processing	yes (?)
interactive analysis	yes

3 Description

Given an ephemeris and a list of event tables, **phasecalc** calculates the phase of each event in each of the tables. The calculated values are stored in a column named `PHASE`. If the column exists it is overwritten.

phasecalc relies on the event table having a `TIME` column and the two attributes `MJDREF` and `TIMEZERO`.

- `MJDREF` is the Modified Julian Day from which times are calculated.
- `TIMEZERO` is the clock correction at the start of the observation in seconds.

The time of event n is then:

$$t(n) = \texttt{MJDREF} * 86400 + \texttt{TIMEZERO} + \texttt{TIME}[n] \quad (1)$$

where $\texttt{TIME}[n]$ is the value stored in the `TIME` column.

An ephemeris is specified in terms of four quantities:

- reference epoch t_0;
- reference phase ϕ_0;
- frequency ν in Hz;
- frequency time derivative $\dot{\nu}$ in Hz/s.

The phase of event n is defined as:

$$\phi(n) = \phi_0 + \{t(n) - t_0\} \times \nu + \frac{1}{2}\{t(n) - t_0\}^2 \times \dot{\nu}\,. \tag{2}$$

3.1 Examples

- `phasecalc --tables=events.ds:EVENTS --frequency=29.8309503578 --frequencydot=-374213.62e-15 --epoch=2001-04-01T00:00:00`
  Calculate the phase of each event in `events.ds:EVENTS` for the given ephemeris.

4 Parameters

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

Parameter	Mand	Type	Default	Constraints
tables	yes	T	set.ds:EVENTS	

List of tables to operate on.

frequency	no	r		

Frequency [Hz].

frequencydot	no	r		

Frequency dot [Hz/s].

epoch	no	w		

Epoch of the phase.

phase	no	r		

Phase at the epoch.

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.

TimezeroDoesNotExist *(error)*
The table does not contain the attribute `TIMEZERO`. The absoulte time of the events cannot be calculated.

MjdrefDoesNotExist *(error)*
The table does not contain the attribute `MJDREF`. The absoulte time of the events cannot be calculated.

TimeColumnDoesNotExist *(error)*
The table does not contain the column `TIME`. The absoulte time of the events cannot be calculated.

PhaseColumnExists *(error)*
The `PHASE` exists, and clobber is not enabled.

SubProcessError *(warning)*
Move on to the following table.
corrective action: An error was found while processing one of the inout tables. The message indicates what the table and error ware.

6 Input Files

1. An event dataset that must contain:
   - a real64 column `TIME`;
   - the attribute `MJDREF`;
   - the attribute `TIMEZERO`.

7 Output Files

1. The input data set, modified by the addition of a real64 column `PHASE`.

8 Algorithm

```
read ephemeris
open table
if( cannot calculate absolute event time ) error
call selectlib with table and phase formula
```

9 Comments

phasecalc is meant to be used in conjunction with **evselect** or **xmmselect** to perform second order filtering.

phasecalc is not a general tool, in that it has a very specific knowledge of how to calculate the absoulte time of an event based on the XMM-Newton conventions. On the other hand, this affords a paramter interface focussed on the astronomical data. For a more generic tool to perform arbitrary math on binary tables see **tabcalc** ().

10 Future developments

References