User's Guide for the program `trend_rr`

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The program `trend_rr` removes trends and jumps from the RR Lyrae data observed by CoRoT satellite.

The source code (`trend.f`) is written in standard Fortran-77 language. It can be compile with the usual way

```
f77 -o trend_rr trend_rr.0.2.f
```

both on linux and Sun/Solaris platforms.

The program includes two algorithms for trend filtering and one for removing jumps.

Either of the optional trend filtering algorithms divides the data set into time intervals. The length of the intervals can be set arbitrary. Within each interval the fluxes and times are averaged and the obtained function (averaged flux vs. time: see in file bin.filename) is interpolated at the observed data points. Then these values are subtracted from the observed ones.

In the case of the alternative filtering a boxcar function is moved along the data with a given (small) stepsize. Naturally, both the width of the boxcar function and the stepsize can be changed. The result of this process is a moving averaged function (see ma.filename) which is interpolated again and subtracted from the observations.

The code ensures automatically that all bins and stepsizes became equal by fine tuning of the input parameters.

The program search for jumps in the following way: it calculates the difference between subsequent points of the light curve and if it is above a threshold the program indicates a jump. The threshold is characterized by a factor of standard deviation (σ) and it is also changeable. According to the jumps the program split the data into sections, and any of the above trend filtering algorithms is applied each section separately.

1 Input

`data file`

Before you use this program, any highly scattered points should be carefully remove from input files, otherwise it could result false output or even hangs!

Structure of data files: header – arbitrary number of lines within a # character in its first columns ; data part – columns (minimum 2, maximum 50) includes Heliocentric Julian Date, observed fluxes and might be other numerical informations.

Although, the *name of the data file* can be arbitrary on linux machines, Sun Fortan could handle fixed length of strings only, so the default length of the name is 12 character.

`trend_rr.param`

The file contains the variable parameters. Here can be set the name of the data file, used data columns, ordinal number of used colour (0 for monocrom data), the size of the bins or the width of the boxcar function and its stepsize. Here can be choosen between trend filtering algorithms and set the threshold for jump searching.

2. Output

`bin.filename`, or `ma.filename`

These file include the binned or moving averaged funtions.

`avgint.filename`, or `arma.filename`

The input file is supplemented a last column containing the trend and jump filtered flux with an average of zero. In the case of a cromatic data the name of output file also contains the ordinal number of used colour.

`mag.filename`

To get the correct magnitudes the formula $m = +2.5 \log_{10}[(F_o - F_f)/F_o]$ should be applied, where F_o and F_f are the observed and filtered fluxes, respectively. These magnitudes are presented in the mag.* files