

ALGORITHMS FOR GDAAS

LAURENT EYER
OBSERVATOIRE DE GENÈVE
WEDNESDAY 6TH OF JULY 2005

PLAN OF THE TALK

- GDAAS
- Variability in GDAAS
- Detection of variability (Statistical tests)
- Period search
- Characterisation of variability

GDAAS

Gaia Data processing: Challenge of the highest order!
often underestimated (SDSS)

- 100-200 TB of data, Database of 1-2 PB

- 10^{20} flops (S.Ansari)

- if 1 sec per object and task $\xrightarrow{\text{1 billion stars}}$ 30 years of CPU

ESA started:

GDAAS = Gaia Data Analysis and Access Study

Global simulation of the data processing

VARIABILITY

- Document of Lennart Lindegren LL-044

2.15 Variability analysis (2-03-S)

2.15.1 Function

To detect variability, and for detected variables make simple lightcurve analysis and classification.

2.15.2 Method

Analysis of calibrated photometric data, expressed in the standard (instrument) system, for a specified range of CCDs. Details TBD.

2.15.3 Input data

- source ID
- range of CCDs considered
- source parameters
- corresponding elementary data
- corresponding photometric calibration data
- satellite ephemerides (for correction to barycentre)

2.15.4 Output data

- variability class (0 = no variability detected)
- variability parameters (if class \neq 0)
- lightcurve

Deadline: September 2004

DETECTION VARIABILITY

- Cambridge meeting-April 2004:
 - Focus on variability detection: G-band (highest precision)
 - Cumulative formulation of the variability tests
 - Proposition of statistical tests for the detection of variability
- Barcelona meeting- July 2004:
 - Description on the input data

STATISTICAL TESTS

Classical hypothesis testing (H_0 , H_1 , p-value)

- Chi square
- Skewness
- Kurtosis
- Abbe test
- Test of outliers
- Test of slope

Please draw situation on black board

PERIOD SEARCH

- Paris meeting, October 2004:
 - Lomb-Scargle algorithm

Now no optimisation-comparison with other methods

Wide frequency interval searched
(should be narrowed by use of variogramme for example)


CHARACTERISTICS OF TIME-SERIES AND VARIABILITY

- Mean, standard deviation, median, deciles (D. Evans)
- Values of the six statistical tests
- Main period and amplitude from periodogram

CLASSIFICATION

- The problem is complex, we refer to a coming presentation by L.Eyer

PRESENT STATUS

- GDAAS focused Global Iterative Solution (Astrometry)
- Variability software ready  shortcut
 1. Simulations of time series (D.Evans)
 2. Tested with GRID ... next presentation by Salim Ansari ...