Contribution ID: **88** Type: **Poster**

Stellar energy flux modeling under SYNTSPEC application

Monday, April 12, 2010 6:03 PM (3 minutes)

We present the stellar energy flux modeling tool under the SYNTSPEC application. SYNTSPEC is the gridified tool for stellar spectra analysis. It is an example of a data- and compute-intensive application running on the testbed of the EU BalticGrid-II Project (http://www.balticgrid.org), which brings new quality to the research in astrophysics. The multi job application is run within the Gridcom system –the user friendly interface that allows a common (virtual) work of the physically spread scientific group.

Conclusions and Future Work

The stellar flux and normalized spectra modeling in the GRID environment is a tool that increases the abilities of the SYNTSPEC application and creates a new powerful structure for astronomers. It is a good example ofa user friendly tool with a significant science potential. With the imminent start of the GAIA mission, the future development of the application is planned, but the main tasks are achieved. It is still important to make it more autonomous and time saving for scientists.

Detailed analysis

The stellar energy flux modeling is very important for stellar analysis. The stellar interior isa dense and hot plasma environment where energy is produced by the fusion process. It irradiates a specific flux of energy, that is spread within all range of electromagnetic wavelengths. The photosphere of spectra is the part of star which modifies the energy flux distribution over wavelength range. The atomic and molecular structure of photosphere redistributes the initial energy flux through all the spectrum
employing absorption, reemission, scattering processes and paints the unique shape of flux image of the specific star. The energy flux calculation under SYNTSPEC is a very good example of application that benefits from usage of the BalticGrid-II testbed because of the need of powerful computing resources. It calculates the energy flux normalized to the continuum stellar spectrum, that is applied for stellar classification and determinations of e.g. chemical compositions, effective temperatures and surface gravities of stars. The specific energy flux modeling is the important tool for analysis of data, which will be produced by the European Space Agency's GAIA space observatory (to be launched in 2011).

The gridification of the application was performed in the Institute of Theoretical Physics and Astronomy of Vilnius university. It is set of Fortran and C++ coded programs joined together by scripts. Parametric submission is performed by the GRIDCOM interface. Single job runs for 8 –10 hours. About 50 jobs are required to derive the main parameters of the star and about 15 jobs for every other chemical element. In general it takes more then 400 jobs for one star. The output is not very huge, but a bigger amount of temporary store in every single node is required. Depending on the initial atomic database the program stores more then 100 GB of temporary data. The output follows VOTABLE standards to be compatible within the Virtual Observatory infrastructure.

Impact

The SYNTSPEC application benefits from the usage of large project resources, which makes possible the calculation of synthetic stellar spectra for significant wavelength ranges which is essential for the galactic and stellar research studies. The special added value is the implementation of the energy flux modeling, which makes the application ready for very specific data processing of data for GAIA and other modern observatories.
Running of the application within the Gridcom graphical interface on the BalticGrid- II Special Interest Groups site (http://sig.balticgrid.org) improved the job submission procedures and the possibilities of user interaction. The application can be submitted and analyzed by a dispersed group, which is especially important in remote teaching or analysis of data.

The BalticGrid-II project established a production-level infrastructure, interoperable and complementary with the EGEE grid. It provides the scientists in the Baltic States and Belarus access to critical resources, supports effective research collaborations and made possible the efficient sharing of unique instruments and data.

Keywords

Stellar spectra, energy flux, stellar astrophysics, BalticGrid-II, Gridcom, SYNTSPEC

URL for further information

https://sig.balticgrid.org/SIGs/stellar-spectra/

Authors: Prof. TAUTVAIŠIENĖ, Gražina (ITPA VU); Mr MIKOLAITIS, Šarūnas (ITPA VU)

Presenters: Prof. TAUTVAIŠIENĖ, Gražina (ITPA VU); Mr MIKOLAITIS, Šarūnas (ITPA VU)

Session Classification: Poster session

Track Classification: Experiences from application porting and deployment