Micro-simulations inside the VO: the BaSTI case

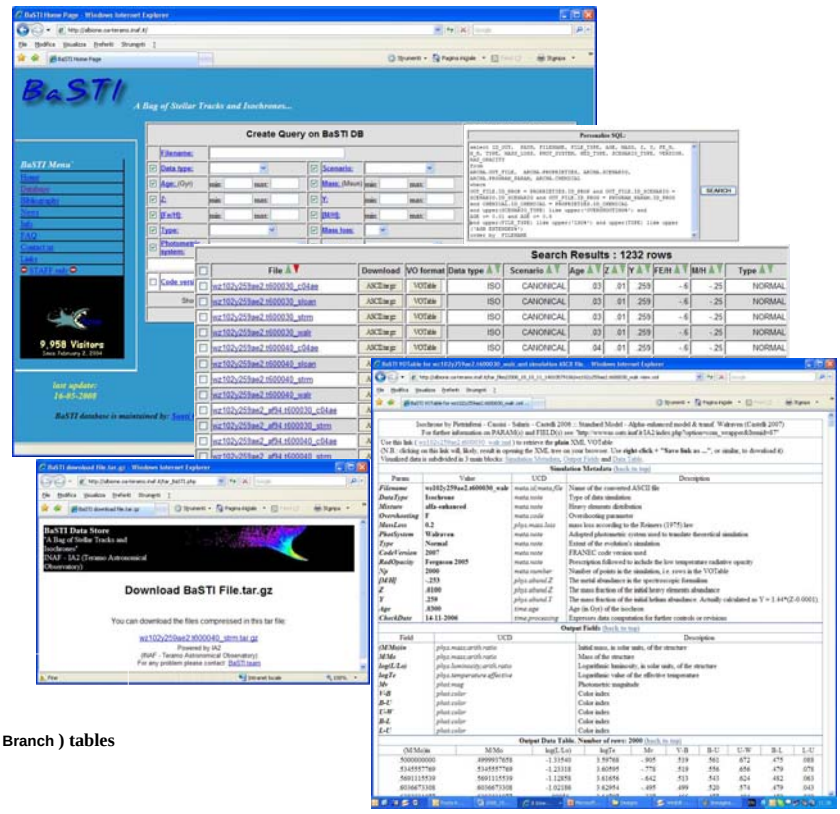
P. Manzato(1), M. Molinaro(1), F. Gasparo(1), F. Pasian(1), A. Pietrinferni(2), S. Cassisi (2), C. Rodrigo(3) , M. Cerviño(4), E. Solano (3)

INAF - SI / Trieste Astronomical Observatory; (2) INAF – Teramo Astronomical Observatory; (3) LAEFF-INTA / Spanish VO; (4) Instituto de Astrofísica de Andalucía – CSIC / Spanish VO

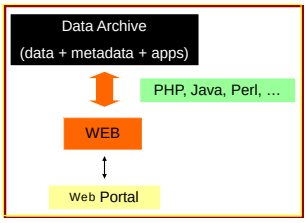
ABSTRACT A generalization of the Theoretical Spectral Access Protocol (TSAP) standard called S3P (Simple Self-described Service Protocol) has been used to search and access stellar model data. In particular, a web server has been implemented that searches for synthetic isochrones and tracks computed using the FRANEC code and stored inside the BaSTI (a Bag of Stellar Tracks and Isochrones) relational database. The S3P allows an easy creation of a collection of micro-simulations: this protocol is able to provide information about which parameters can be queried and which values are available and, as a second step, makes a viable query to the database using the parameters chosen by the user. The collection of tracks and isochrones is returned as a standard VOTable. The TSAP is a use case of a SSAP (Simple Spectra Access Protocol) standard. We implemented this self-describing service for opening the VO door to the micro-simulations. In the future we will implement it also for the BaSTI web tools (an isochrones maker and track interpolation program, a luminosity function program and a synthetic CMD code) to give them more visibility to the scientific community and to allow easier comparisons between different simulations or between observation and simulation data. This project is developed within the Italian Theoretical Virtual Observatory (ITVO) project as part of the Italian Virtual Observatory initiative (VObs.it) and in collaboration with Spanish Virtual Observatory (SVO).

Micro-Simulations

Inside the BaSTI database are stored the evolutionary tracks and isochrones computed by using the FrascatiRAphson Newton Evolutionary Code (**FRANEC**) evolutionary code. The stored data cover a wide range of stellar masses and chemical compositions, as well as of choices about important parameters such as mass loss and core convective overshooting efficiency



Archive Access & Web Portal

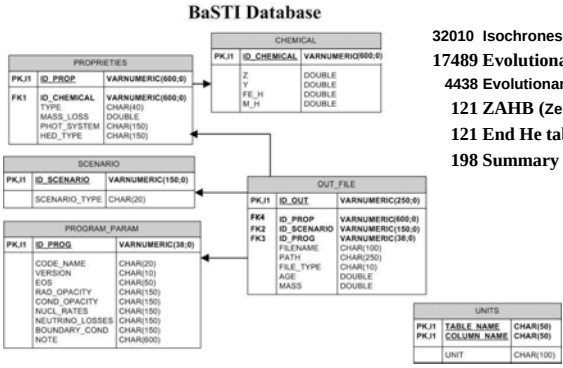


The BaSTI web portal is accessible at URL:
http://albione.oa-teramo.inaf.it

The data retrieval is allowed for two kinds of format: ASCII files and VOTable.

Database

The metadata of the stored stellar simulation are archived in an Oracle 10g Database. There all program parameters are stored (name code, version, initial conditions, boundary conditions, EOS, radiative and conductive opacities, nuclear reaction rates, neutrino losses), quantities of chemical compositions and others parameters as mass loss, type of model, photometrical system, heavy element distribution, and the scenario (canonical, overshooting, diffusion, rotation). At the end in the OUT_FILE table there is the information on the output files .



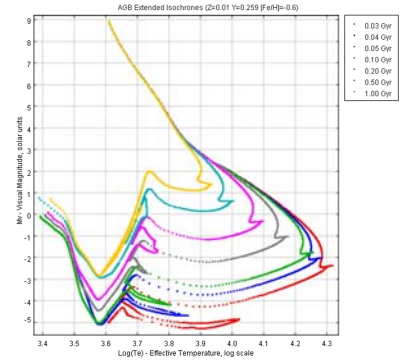
32010 Isochrones
17489 Evolutionary tracks
4438 Evolutionary HB tracks
121 ZAHB (Zero Age Horizontal Branch) tables
121 End He tables
198 Summary tables

Web tools to Web services

The output format are ASCII tables that can be converted in VOTable via Web portal, so it is easy to create a plot via TOPCAT VO tool. It is also possible to generate the plot inside the Web site via **STILTS** (http://www.starlink.ac.uk/stilts/, Mark Taylor, Bristol, UK). We would transform also the 3 web tools in web services:

1. Isochrone Maker and Track interpolation program;
2. Luminosity Function Program;
3. Synthetic CMD Code.

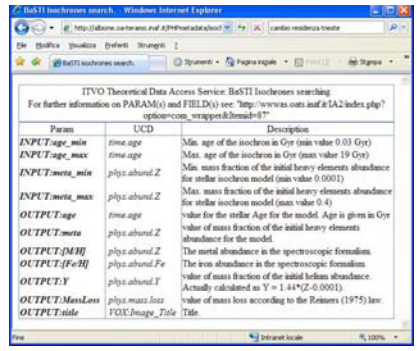
STILTS tool used to create a plot of a isochrones with [Fe/H]=-0.6, Z=0.01 and Y=0.259.



S3P (Simple Self-Described Service Protocol) implementations

In collaboration with SVO (the Spanish Virtual Observatory) we presented S3P in the last IVOA Interoperability Meeting. S3P (Simple, Self-described Service) is a protocol oriented to handle theoretical data in the VO framework. It is based in the ability of the data server to describe itself in a simple standardized way.
This is a step by step protocol:
1 step: the service described it self (input and output parameters);
http://myservice.com/s3.php?format=metadata
2 step: http query and response in VOTable format;
http://myservice.com/s3.php?param1=value1&param2=value2...
3 step: retrieve the simulated files of interest via http GET;
http://myservice.com/s3.php?id=12

We developed two prototype implementations of S3P for BaSTI: one for isochrones and one for tracks:
http://albione.oa-teramo.inaf.it/PHPmetadata/BaSTIisochron.php?format=metadata
http://albione.oa-teramo.inaf.it/PHPmetadata/BaSTItrack.php?format=metadata



Conclusions

One of the aims of the Virtual Observatory is to guarantee a full interoperability not only between observational data but also between them and theoretical data. This work allows scientists to access and compare theoretical and observational data in an easy and homogeneous way using IVOA standards. It also enables a reuse of theoretical data and at the end the implementations of S3P allows an easy search and registration of these kind of data following the VO philosophy.