Galactic Globular Clusters Database: a progress report

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ABSTRACT

The present status of Galactic Globular Clusters Database is briefly reviewed. The features implemented at the time writing are described, as well as plans for future improvements.

1 Introduction

The Galactic Globular Clusters Database (briefly, *Gclusters*) [1] is focused on presenting, in an organized way, a comprehensive list of bibliography, parameters and data for each of the globular clusters belonging to the Milky Way (GGCs). The need for a rational and organic assembly of these data is well described in a famous paper by W.E. Harris (1996):

"The globular clusters in the Milky Way have proven thoughout this century to be irrepleaceble objects in an amazingly wide range of astrophysical studies: they provide critical observational boundary conditions on cosmology and galaxy formation, the evolution of low mass stars, stellar dinamycs, the properties of variable and binary stars, and Galactic structure and dynamics, among many other areas. Year after year, it has proven important to have readily available up-to-date lists of parameters for these unique objects."

After more than ten years, these words appear even more true: the amount of available data on GGCs has increased at a steady rate, following closely the enhanced capability of the technical instrumentations. Not only we have new and more reliable data for a great part of the known clusters, but - thanks also to recent surveys conducted in bands different from the visible, such 2MASS (Skrutskie et al. 2006) - several other objects have gone to increase our list of Milky Way clusters (e.g., Froebrich et al. 2007, Bonatto et al. 2007). However, such data are inevitably scattered among the various papers, so what is needed is a simple way to have the relevant informations on a given cluster in a single source.

The Harris' catalogue of GGCs [2] is surely an unique resource for the researchers, in what it provides an extensive list of parameters for all the GGCs known at the time of its last revision (Feb. 2003): such a compilation is accessible online and is composed by three main tables, namely *"Positional Parameters", "Photometric Parameters", "Structural Parameters"*, in the form of flat text files.

Gclusters was designed to allow a more flexible fruition of available data, so to make possible things such as ordering clusters according to the value of a given parameter, select objects whose parameters fall in a given interval, display related bibliography and colour magnitude diagrams, or even leave a note pertinent to that cluster.

2 A quick tour on Gclusters

Initially built around the Harris' compilation, *Gclusters* is growing incorporating data from other sources, such as colour magnitude diagrams, images of the cluster, as well as links to selected bibliographic entries, related websites, NASA Astrophysics Data System (ADS) searches, Clement's variable stars [3] pages, etc...
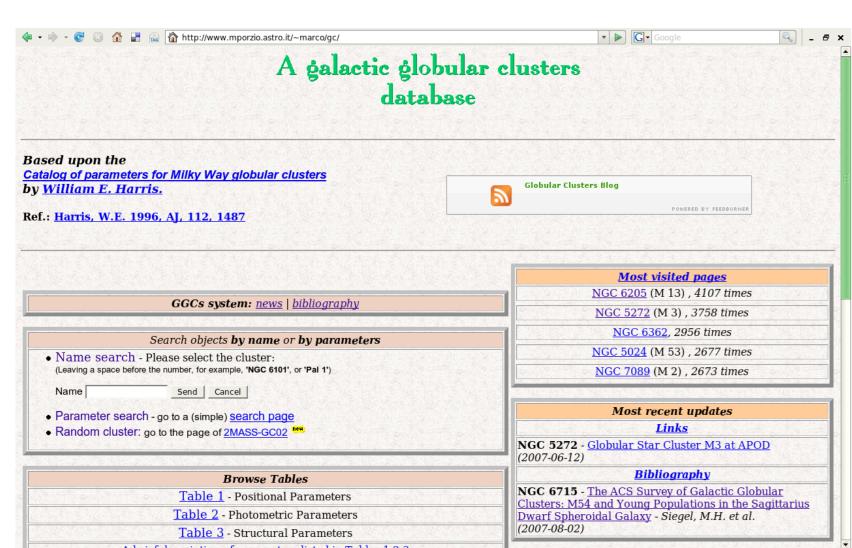

Figure 1. The main page of the GGCs- DB

Documentation available for a given cluster is gathered in one page for the user's commodity. For example, typing "M 3" (one of the most popular cluster in the database, according to the access counts) in the search box, we obtain a webpage like that:
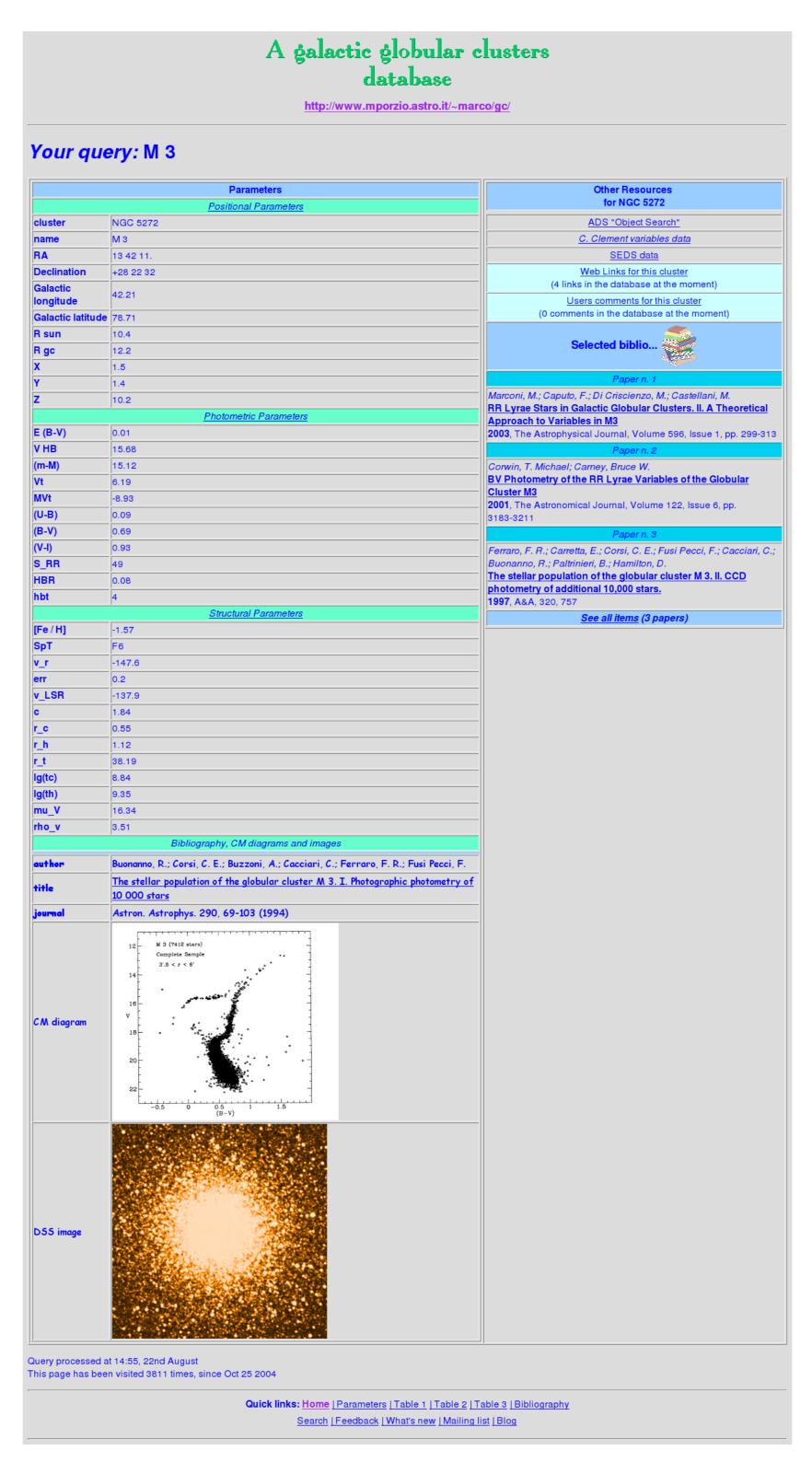

Figure 2. The webpage for M3

In this page, you can browse the parameters of the cluster, together with a colour magnitude diagram choosen from a recent paper, and a Digital Sky Survey image of the cluster. On the right columns, you can find links to other related resources available on the web, as well as a direct access to selected bibliography. Papers are "hand-picked" in order to be useful for people who mainly deal with stellar population studies; anyway, a link is always present to perform a quick "search for object" into the NASA ADS database.

2.1 Searching...

Apart from browsing data for a given cluster, it is possible to select certain clusters whose parameters match some given criteria. Suppouse that, in order to complete your (fundamental) paper, you need to know (quickly) what are the globular clusters that have metallicity greater than [Fe/H]=-1.6 and present a V magnitude of *Horizontal Branch* less than 15. Filling the *search page* with your data, you obtain the output shown in Fig. 3., with the list of the clusters that match your requirements. A wide combination of searches are possible.
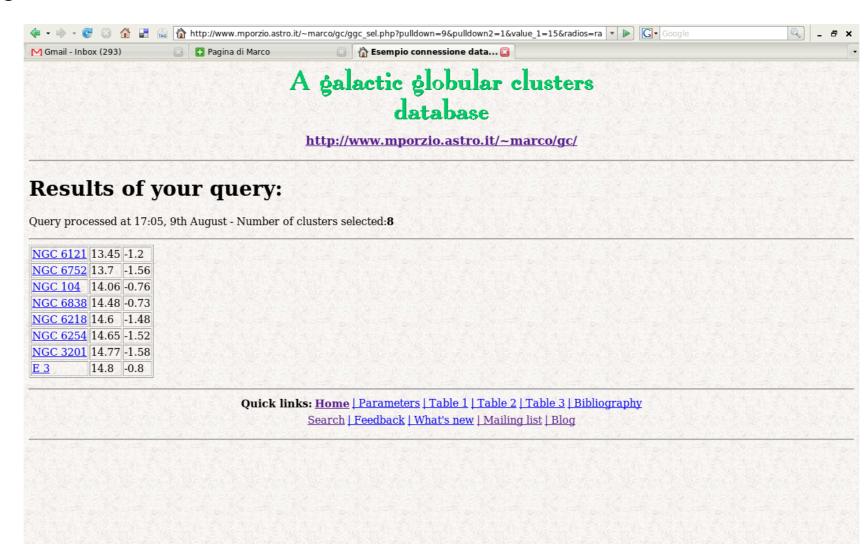

Figure 3. The result of your search

2.2 Harris' tables revisited

The list of clusters are also conveniently divided into three tables that mimic the division made by Harris, plus one table of "essential" bibliography.
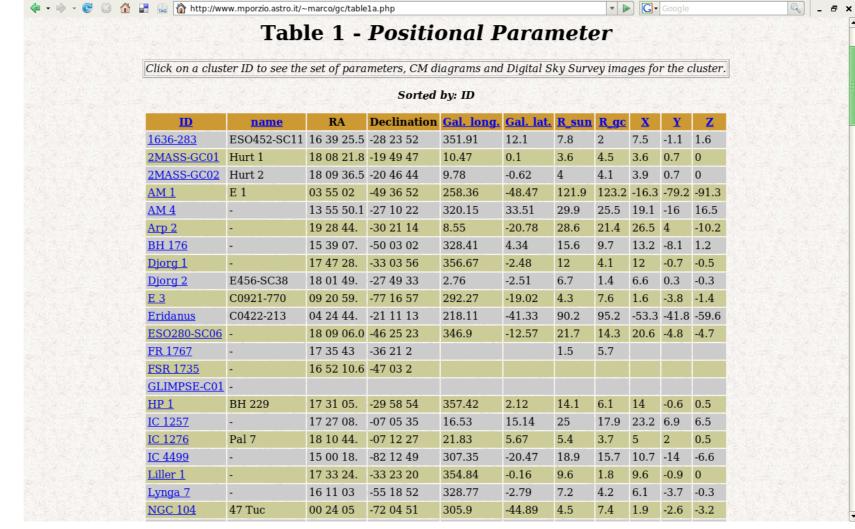

Figure 4. Listing "positional parameters" of the clusters

Clusters in each of the three tables can also be sorted according to the value of one of the listed parameters.

3 Technical Info

This project is developed with Open Source software; specifically, it is a plane *LAMP application*. To quote wikipedia,

"The acronym LAMP refers to a solution stack of software programs, commonly open source programs, used together to run dynamic Web sites or servers. The original expansion is as follows: (1) Linux, referring to the operating system; (2) Apache, the Web server, (3) MySQL, the database management system (or database server); (4) PHP, the programming language." [4]

Storing the parameters in form of tables of a *relational database* instead of plane text files, makes possible to use them in a much more flexible way: searches, ordered listings, and other queries on the data can be performed directly from the Gclusters website. Adding new data and putting them in relation with existing data is also a straightforward procedure.

4 Some Statistics...

Taking as example a period starting from May 15 and ending to June 15, Gclusters website collected a total of **3832 page views**, corresponding to **1171 different visitors** (source of data: *Google Analytics*). As a curiosity, the days of maximum of page views is June 9, with a total of 493 visualized pages (Fig.5) : this is an effect of having been linked from the NASA "Astronomical Picture Of the Day" (APOD), which on the same day presented a nice image of the globular cluster M3 ([5]). The major number of visits came, in decreasing order, from United States, Italy, Canada, Brazil and United Kingdom.

Figure 5. The "APOD effect"...

5 Open to the scientific community

It is possible to collaborate to the project at a wide range of "levels", from pretty scientifical tasks (such as insertion of new data and bibliographic items) to fairly technical ones (mainly HTML and PHP coding). The nature of the project make easy an Internet based collaboration. People interested are kindly invited to contact me.

6 Future developments

Several branches of the project are still under developments. In particular, Gclusters could evolve along these paths:

- insertion of available data for whom it exist a compilation for a good number of galactic globulars. For instance, dynamical data (e.g., Aguilar et al. 1988).
- possibility to perform complex queries to select clusters that combine any range of given condition; possibility to refine searches.
- availability of a wider collection of CM diagrams and of a more complete bibliography.
- insertion of data (periods, magnitudes...) for variable stars belonging to GGCs (e.g., Castellani et al. 2003)

Recently, a connection was established with people of the WEBDA Open Cluster Database [6]. We are now working on the definition of a common environment for both the databases, to go toward a definition of a unique "Stellar Cluster Database", which comprehend WEBDA and Gclusters. Interested reader are invited to check the respective websites in the near future.

A dedication The Galactic Globular Clusters Database is dedicated to Vittorio Castellani, who passed away in May 2006.

References

Aguilar, L. *et al.* 1988, ApJ, 335, 720

Bonatto, C. 2007 *in press* (astro-ph 0708.0501)

Castellani, M. *et al.* 2003 A&A, 410, 871

Froebrich, 2007 *in press* (astro-ph/0703318)

Harris, G.W. 1996, AJ 112, 1487

Skrutskie, M.F. *et al.* 1996, AJ, 131, 1163

Links

[1] http://www.mporzio.astro.it/~marco/gc

[2] http://www.physics.mcmaster.ca/Globular.html

[3] http://www.astro.utoronto.ca/~cclement/read.html

[4] http://en.wikipedia.org/wiki/LAMP_%28software_bundle%29

[5] http://apod.nasa.gov/apod/ap070609.html

[6] http://www.univie.ac.at/webda/