

University of Florida
Astronomy 7939 Sec. 3574 Spring 2009
“Stellar Populations”
MWF 3:00 – 3:50pm
Professor Ata Sarajedini
BRT 222 x238
ata@astro.ufl.edu

Galactic Globular Cluster Project
Due in class on April 22, 2009

In this project, you will download the Galactic globular cluster database maintained by Bill Harris and analyze the properties of the clusters. The database itself can be accessed at <http://physwww.mcmaster.ca/%7Eharris/mwgc.dat>. There is also a corresponding bibliography file that gives the references for all of the information.

1. Color-Magnitude Diagram: Construct a $M_V \sim (B-V)_0$ CMD using the integrated photometry of the clusters. Compare this with similar diagrams for star clusters in the LMC and M31. What can you say about how these three diagrams look?
2. Luminosity Function: Construct a M_V luminosity function using the integrated photometry of the clusters. Compare this with similar diagrams for star clusters in the LMC and M31. What can you say about how these three diagrams look?
3. Metallicity Distribution Function: Construct an MDF for the sample of Galactic globular clusters. Plot a binned histogram, a cumulative distribution, and a generalized histogram (adopt an error of 0.2 dex for each metallicity). Divide the MDF into two samples at a reasonable metal abundance and examine the spatial distribution (X, Y, Z) of the two samples. How do they differ? What component of the Galaxy (disk, halo, bulge) does each sample belong to?
4. Metallicity-Galactocentric Distance Relation: Plot the metal abundance of each cluster as a function of its Galactocentric distance. What can you say about the appearance of this diagram? Is there a trend? If so, what does it tell us about how the Galaxy formed?
5. Plot the radial volume density of the clusters (density vs Galactocentric distance) – $\text{Log} (\#/kpc^3)$ as a function of $\text{Log } R$ (kpc). Fit a relation of the form $r \sim R^{-3.5}$ and overplot this on the data. Does the relation match the data over the entire range of R ? If not, speculate on the reasons.
6. Add the mean period of the RR Lyraes to the database for clusters with such stars. A good reference might be Catelan (2005, astro-ph/0507464). Search for a systematic variation of the mean period with any other cluster property. If you find one, comment on why the variation might exist.