

SOME RESULTS OF THE BATC CCD COLOR SURVEY

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1. Introduction

The BATC (Beijing-Arizona-Taiwan-Connecticut) CCD color survey started 2 years ago. It is based on observations with the 60/90cm f/3 Schmidt Telescope of the Beijing Astronomical Observatory using a 2k×2k CCD and 15 intermediate band filters covering from 300nm to 1000nm to obtain the spectral energy distribution (SED) of all objects in 500 selected fields down to $m_V = 20$ (Chen 1994). The basic framework of the survey including instrumentation, data acquisition system, archive data system, and the various steps of data reduction has been established. About 60 fields have been observed. Most fields are still short of observations in UV band. We are waiting for a new thinned CCD to improve the quantum efficiency.

The method of using the SED, image structure and astrometric information combined with stellar evolutionary track calculations, stellar population synthesis, and the model SED template data (theoretical and observational) to separate stars/galaxies, to classify the SED of the stellar objects, to select abnormal SED sources (QSO, AGN, CV *etc.*), to discover moving and variable objects and to determine the redshift of galaxies is being developed (Proceedings of Workshop on BAO Schmidt CCD Astronomy, 1996).

2. M67 Observations

The studies of M67 field (Fan *et al.* 1996) provide good evidence that we can obtain spectrophotometry from the ultraviolet to 1000nm with an intrinsic accuracy of better than 0.02 mag. for all objects in the nearly 1 square degree field of the CCD, using Oke-Gunn primary standard stars. The CMD shows not only the morphology consistent with previous ones, but define better than most the gap in the main sequence. The stellar

track and atmosphere model fits the CMD very well for an age of 4 Gyr and $[\text{Fe}/\text{H}] = -0.10$, yielding a reddening of $E(\text{B}-\text{V})$ between 0.015 and 0.052 mag and a distance modulus $(m - M)_0 = 9.47 \pm 0.16$ mag. As our data combines deep images, accurate photometry and wide field coverage more than previous survey, we are able to observe both direct and implied evidences of substantial dynamical evolution issues pertaining to this old galactic cluster, such as the mass dependent spatial distribution of “single” stars, binaries and blue stragglers; the two dimensional shape of M67 elongated along an angle of 15° relative to the galactic plane; the volume dependent luminosity function rising from the main sequence turnoff and then flattening out at fainter absolute magnitudes; the leveling off for lower mass stars in the mass function, which may be due to the evaporation of stars through dynamical evolution of this old cluster.

3. Other Observations

An automatic SED classification technique has been applied to this and other fields. The classification is accurate to a subtype of spectral and luminosity class and has been confirmed by a sample of 80 stellar objects observed with slit spectra. The abnormal SED objects can then be selected. Some bright objects were observed spectroscopically and identified as QSOs and metal poor HII galaxies. The SEDs of several known high redshift QSOs in our selected fields shows that our system is very efficient in selecting QSOs.

Other research work in progress using the BATC survey data includes multi-color surface photometry of nearby galaxies and the fields of Abell clusters.

References

- Chen, J.-S., 1994, in “Astronomy From Wide-Field Imaging” Proceedings of IAU Symposium no.161, 20.
Fan, X. *et al.* 1996, *Astron.J.*, 112, 628