

Photometric Survey of Galactic Open Clusters with 50BiN*

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Introduction:

The 50 centimeter Binocular Network (50BiN) project is a subnet of Stellar Observation Network Group (SONG), a Chinese initiative that maximizes the scientific potential of SONG's infrastructure. It is planned as a sub-system of SONG (<http://song.bao.ac.cn>). The sites of 50BiN are exactly the same as those of SONG in the northern hemisphere, i.e., the Canary islands (Observatorio del Teide), West-China (Delinha), US continent (APO) and Hawaii islands (Mauna Loa).

50BiN's primary science objective is to do time-domain observations of open clusters with both long time baseline and high photometric accuracy. The targets for that major goal will be a selected sample of Galactic open clusters (OCs) visible in the northern hemisphere. At the commissioning stage, 50BiN will perform a photometric survey of all visible and suitable OCs in the northern hemisphere so that the 50BiN targets can be selected from. The survey will bring us the homogenous and multi-color photometric data for ~500 OCs.

50BiN: System parameters:

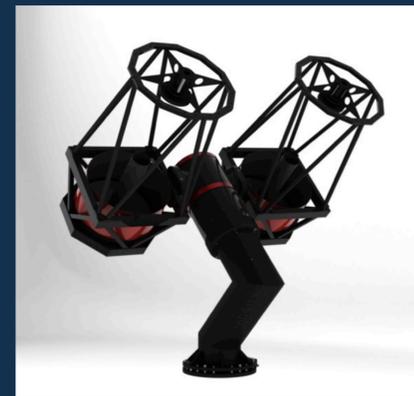
Layout: Twin telescope (German APM company)

Camera: two 2Kx2K CCD on independent optical path co-mounted on equatorial system (direct drive).

Field of View: 20'x20' (identical in both channels)

Filters: Broadband V & R or SDSS r & i (a wheel with 5 positions will be applied, can possibly support other systems)

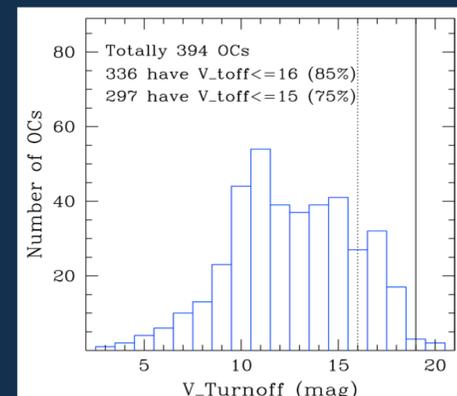
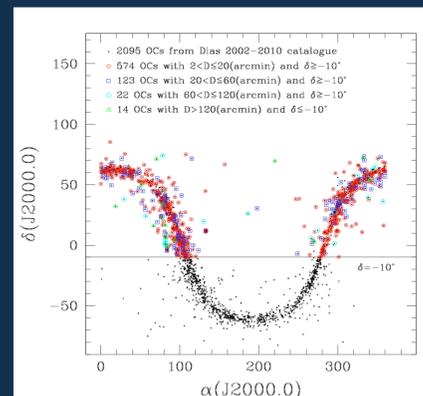
Limiting mag: $V_{\max} \sim 19$ mag ($\sigma \leq \pm 0.03$ mag)



Sample selection strategy of OC survey

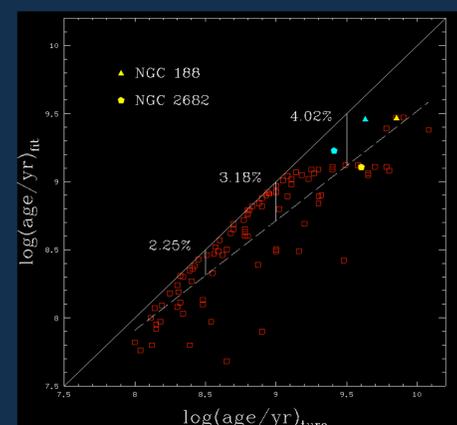
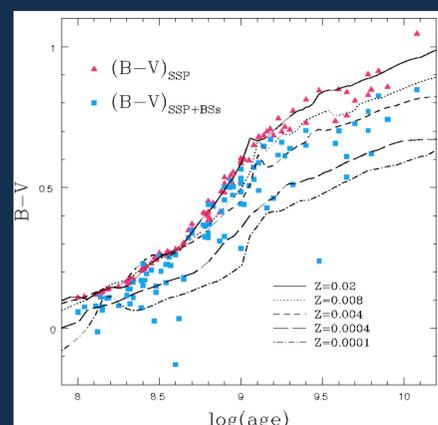
1. Totally 2095 OCs are cataloged in Dias 2002-2010 statistics. Given $\delta \geq -10^\circ$ (as 50BiN telescopes are located in the northern hemisphere), there are 574 OCs have diameters (D) in the ranges between 2 and 20 arcmins, 123 OCs have $20 < D < 60$ arcmin, and 733 OCs have $D > 60$ arcmin (shown in the left panel).

2. Based on WEBDA data, we have the turnoff magnitudes of 394 OCs measured. The survey requires the photometry reaches at least 3 magnitudes below the turnoff. As a rough statistics, 85% OCs have the turnoff mag brighter than 16 mag, 75% brighter than 15 mag (shown in the right panel).



Potential scientific output from the OC survey

1. Construct a homogenous photometric database of northern hemisphere Galactic OCs. The fundamental parameters of these OCs can be determined in a uniform way, e.g., age, metallicity, extinction and distance. This will serve as a fundamental base for further study of variable objects in 50BiN's major surveys.
2. Study the formation and chemical evolution history of the Galactic disc and arms indicated by the Galactic OCs.
3. Study the properties of special populations in OCs in a statistical way, e.g., blue stragglers, red clumps, red giants.
4. Building up a new catalog of blue stragglers and to minimize the scatters (shown on the right) in the integrated properties of the sample clusters.



Left panel: Integrated color (left) as function of age. Right panel: Ages of OCs fitted by integrated spectra versus cluster ages (Xin & Deng 2005; Xin Deng and Han 2007). The scatter are very big in the plots, possibly due to observations. Such studies can be largely improved by a homogeneous photometry of clusters.

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