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CCD photometry of the open cluster King 5

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1. Introduction

We are presenting photometric data of previously unstudied open cluster King 5. The UBVRI CCD photometric observations of stars in the field of King 5 have been used to study the fundamental parameters such as interstellar extinction, age, distance and mass function of the cluster. To obtain these parameters we use colour - colour and colour - magnitude diagrams of the star cluster.

2. Observations and reductions

The observations of the cluster King 5 (C0311 + 525, 1=143°.75, b=-4°.27) were carried out in the UBVRI passbands using the Photometrics CCD system at f/13 Cassegrain focus of the 104-cm reflector of the Uttar Pradesh State Observatory (UPSO), Naini Tal during November-December 1993. In this setup, each pixel of 1024×1024 size CCD corresponds to 24 microns and the entire chip covers a field of 6.0'×6.0'. In order to improve the S/N ratio, the observations were taken in binning mode of 2 pixel × 2 pixel. Multiple exposures were taken with exposure time ranging from 5 to 1800 sec depending upon the presence of bright stars and filter used and the frames were coadded in order to achieve a total integration time of 90 minutes in U, 45 minutes in B, 20 minutes in V, 10 minutes in R and I filters. Two field regions located at ~ 30' towards east and south of the cluster region were also observed to estimate the field star contamination in the cluster region.

The observations have been reduced using the computational facilities available at the UPSO. Clean images been obtained using the ESO MIDAS software package. The photometric reductions were made using DAOPHOT profile fitting software (Stetson 1987). The stellar point spread function (PSF) was evaluated from several uncontaminated stars present in each frame. Landolt (1983) standard stars were observed for calibration purposes.

3. Results

To estimate the interstellar extinction, we have used the (U-B, B-V) diagram shown in Fig. 1. It is found that E(B-V) for cluster stars comes out to be 0.75. The slope of E(U-B)/E(B-V) was taken to be equal to 0.72 (Johnson and Morgan, 1953).

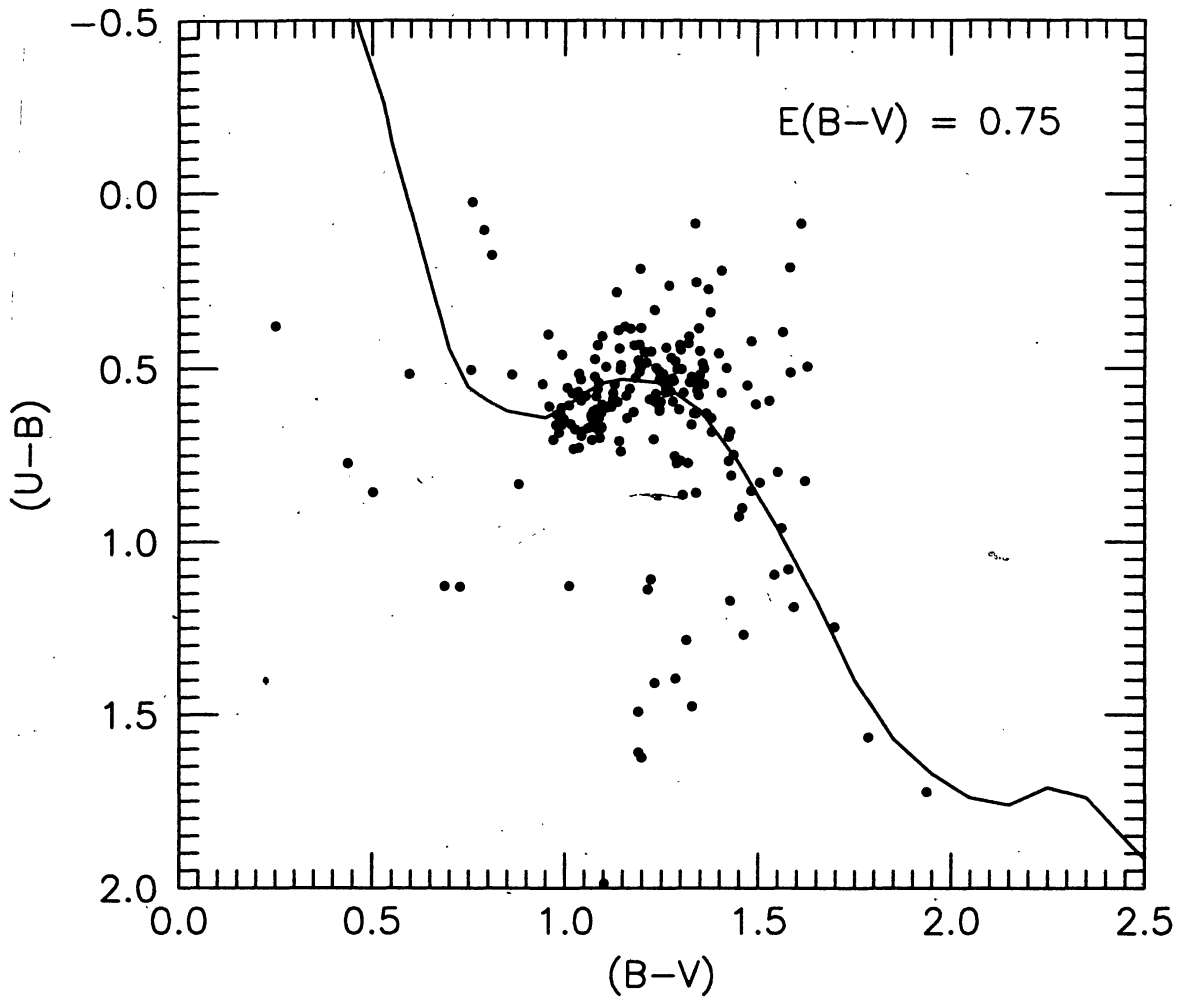

Figure 1. The colour-colour diagram for the stars in the cluster region.

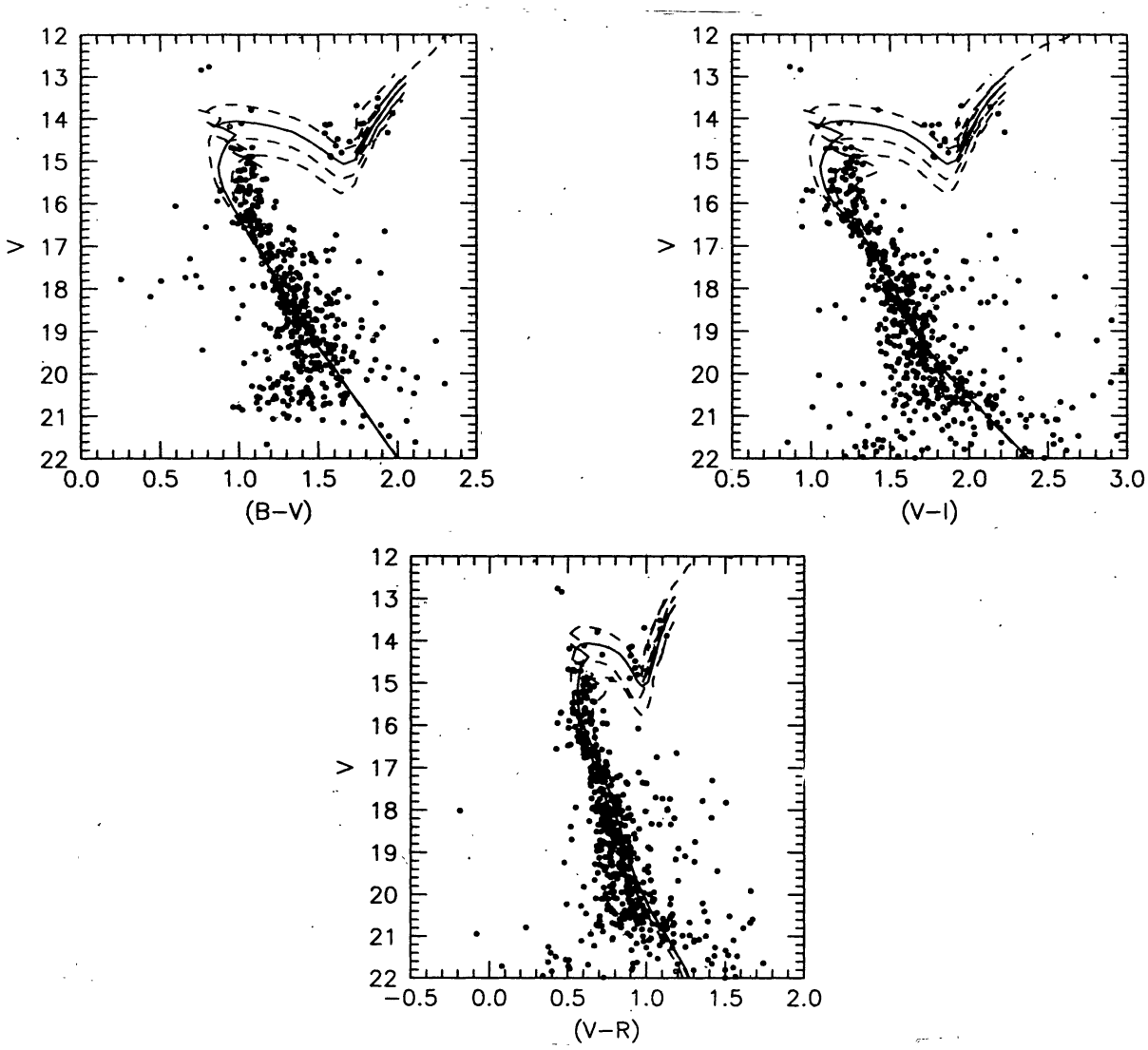

Figure 2. The V, (B-V), V, (V-R) and V, (V-I) diagrams for stars in the cluster region. Isochrones fitted to the cluster sequence are taken from Bertelli et al. (1994). Different curves represent isochrones for age logt = 8.7, 8.8, 8.9 and 9.0.

The CMDs for the cluster region are shown in Fig. 2. A clump of red giant appears near V=14.0, (B-V) ~ 1.85. A broad but well defined cluster MS is clearly visible in the CMDs. The turnoff (TO) is estimated at V~15.5, (B-V) ~ 1.00. The broadness of the main sequence is due to various causes, among which are the photometric errors, the presence of unresolved binary stars, a possible internal reddening and field star contamination.

Age and distance of the cluster has been obtained by fitting theoretical isochrones incorporating convective core overshoot (Bertelli et al. 1994) to the CMDs. The major problem with the observed CMDs, is the absence of data about the metal abundance [Fe/H]. Therefore, we have used isochrones of different metallicity and tried to find out which provides the best global fit. The best comparison with the model, shown in Fig. 2, yields an age 0.5 - 0.8 Gyrs and (m-M) = 14.0 for Z = 0.02.

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