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Abstract

About 500 remote, mainly compact clusters of galaxies have been identified on ESO (R) Schmidt plates; around 40 of these have been observed with the ESO CCD camera on the Danish 1.5-m telescope on La Silla. We describe the method of identifying the clusters and give some preliminary photometric results.

A search is being conducted on ESO (R) Schmidt plates (IIIa-F + RG 630, 120 min) obtained with the ESO 1-m Schmidt telescope for the (R) half of the joint ESO/SRC Survey of the Southern Sky. Twelve fields have been searched by a visual/automatic method, as described by West and Kruszewski (Irish Astr. Bull., 15, 25, 1982). Cluster candidates are identified visually and the corresponding 5×5 arc min² areas are scanned. Individual objects are identified automatically by recently developed VAX software and main image parameters are determined. The images are subjected to simplified, but efficient, automatic cleaning procedures, removing contributions from blended objects and are separated into stars, galaxies and defects.

In order to calibrate photometrically the Schmidt plates, CCD observations have been made of selected clusters found during this search. Standard Gunn filters (g, r, i, z) were placed in front of the ESO CCD camera attached to the Danish 1.5-m telescope at La Silla, and 15- to 45-min exposures were obtained of about 40 clusters, not all of them, however, in all colours. Observations were made of standard stars (Hoessel, private communication) in order to transform into the standard system. In Fig. 1 we show an example r versus (g-r) for the cluster 0630-566 (z = 0.35) in the instrumental system, but with calibrated zero-point. The limiting magnitude in this sample is defined by the need to separate stars and galaxies with high confidence (about $r = 21^m.5$ for 15 min exposures). Also shown are histograms for the (g-r), (r-i) and (i-z) colour indexes. The hatched areas and the filled circles refer to objects inside a circle with 40 arc sec diameter, centered on the cluster. The colours can be seen to cluster near certain values, which can apparently be quite accurately determined from observations like these. We also note a dependence of the (g-r) colour on the r magnitude in the

sense that fainter objects are bluer.

In Fig. 2 we show the cluster 0630-566 as seen on the (R) Schmidt plate and on a 30-min (r) CCD frame. The limiting magnitudes are approximately 22^m_0 and 23^m_0 for the Schmidt and CCD, respectively ($A = 19.18$; $B = 22.26$).

Figure 3 compares results of the automatic object identification and magnitude determination program applied to both images presented in Fig. 2. Objects classified as galaxies on both frames are denoted with filled circles. Objects classified as galaxies on the CCD frame and as stars on the Schmidt plate are shown with open circles. Small arrows indicate magnitudes of galaxies which have not been detected on the Schmidt plate.

During the continuation of this project, calibrated magnitudes of individual galaxies in cluster candidates will be used to establish a homogeneous sample of distant, rich clusters in selected sky regions. It is the intention to measure redshifts of selected objects with a CCD spectrograph at the ESO 3.6-m telescope and to use the same as a well-defined starting point for the study of cosmological and evolutionary effects.

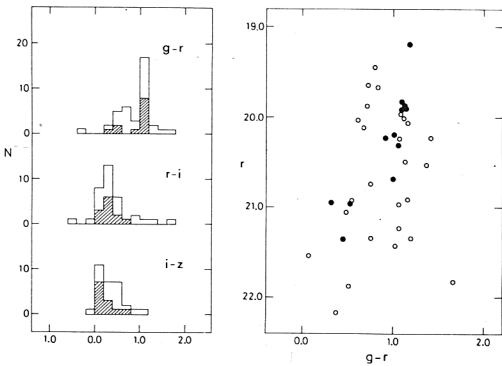


Fig. 1

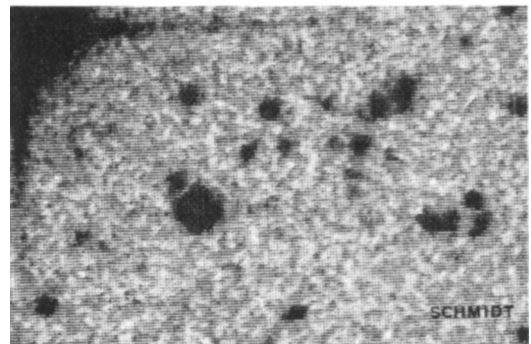
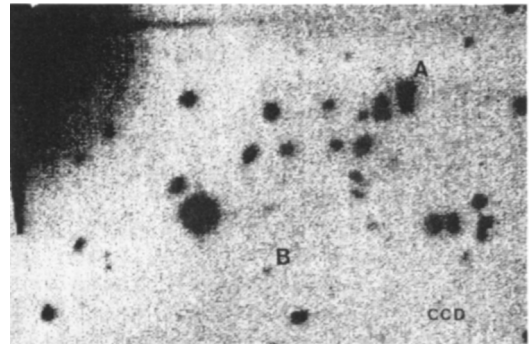


Fig. 2

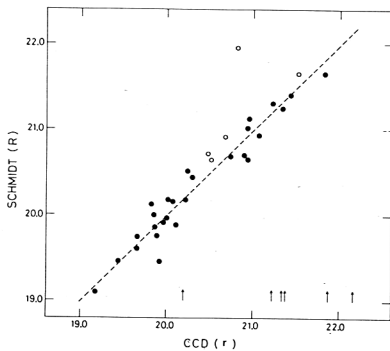


Fig. 3

(*This paper was read for the authors by Dr. M. Tarenghi. Eds.*)

Discussion

- Ellis:* How many galaxies per cluster (on the average) were photometered with the CCD, and how were they selected?
- Tarenghi:* The cluster 0630-566 is a good example of the rich clusters selected for the CCD observations.
- Abell:* Our experience, based on film copies of ESO Schmidt plates in the first shipment from ESO of the Southern Survey, is that they definitely show fewer faint galaxies than the blue (J) Siding Spring Schmidt plates. Were these plates (used by West and Kruszewski) taken especially for their program, with longer exposure?
(Of course, everything else being equal, the red plates should show faint galaxies better; this is true, for example, for full-exposure red plates taken with the Siding Spring Schmidt with the new red correcting lens, compared with the Siding Spring J-plates.
(Perhaps the difference between our experience and that of West and Kruszewski is in the J plates used for comparison; is this possible? Where were the comparison J-plates taken?)
- Tarenghi:* West and Kruszewski did their search on a usual plan copy of the ESO/SRC atlas. More technical information, including a comparison with the blue plates, is given in their Irish Astr. Bull. paper.