INPUT CATALOGUE FOR THE 2DF QSO REDSHIFT SURVEY

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Abstract We discuss the construction of a homogeneous catalogue containing $\sim 46\,000$ ultra-violet excess (UVX) selected QSO candidates. These objects will be observed with the 2-degree field (2dF) facility at the Anglo-Australian Telescope (AAT) to create a catalogue of over 25000 QSOs, providing a unique perspective on the large-scale structure of the Universe at scales $< 1000\mathrm{h}^{-1}$ Mpc.

1. The 2dF QSO Redshift Survey

Observations that radio-quiet QSOs exist in average galaxy cluster environments (Smith et al. 1995 and references therein) demonstrate that QSOs can be used to derive important information on the structure of the Universe at the largest scales. Previous studies of QSO clustering have been frustrated by the lack of large QSO redshift surveys. Although QSO clustering is detected in the largest existing QSO catalogues (see Shanks & Boyle 1994), it is difficult to place strong limits on the cosmological evolution of QSO clustering or the level of clustering at large scales ($> 10\mathrm{h}^{-1}$ Mpc) with current QSO catalogues.

Over the next 2 years the proposed 2dF survey will result in a 20-30 fold increase in the number of QSOs in a suitable, homogeneous catalogue with which to study large-scale structure; yielding approximately 25 000

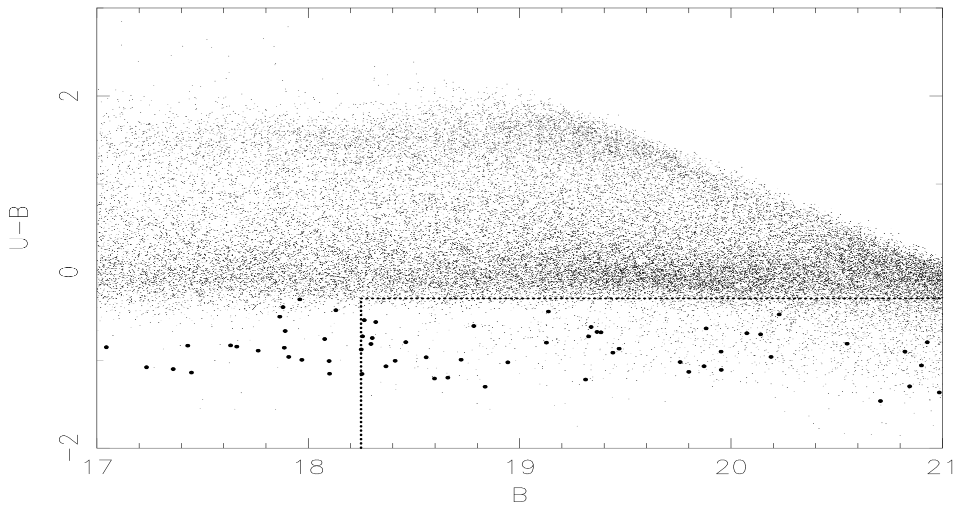

Figure 1. Colour-Magnitude plot showing all the stellar objects detected on one particular survey field (F864). Filled circles show the location on the plot occupied by all previously known QSOs in this region of sky (Veron-Cetty & Veron catalogue v.7 (1995) with some X-ray selected QSOs from Almaini (1996)). Dotted lines give an example set of selection criteria.

QSO redshifts in the ranges; $0.3 < z < 2.2$ and $18.25 < B < 21.0$ over two $75° \times 5°$ strips on the sky.

2. The Input Catalogue

The input catalogue is based on candidates selected by their ultra-violet excess from APM scans of ~ 120 U and J UKST plates/films of 30 UKST fields. (The UKST J plates give a broad band B magnitude). In constructing this catalogue, it is of utmost importance that we take great care in the minimization of systematic photometric errors across the survey area. We find that there is a correlation between the local sky background, as determined by the APM, and the photometric error, so we have developed an algorithm to make a magnitude dependent correction to all stellar objects' magnitudes, which is an extension of the process used by Maddox et al. (1990) in the creation of the APM galaxy survey. After this correction, we have directly confirmed that the systematic photometric errors in the B magnitudes (calibrated using CCD sequences in each UKST field) are less than 0.1 mag from field-to-field.

After correcting the J plates, we matched up the U data. Any small residual photometric variations in the magnitudes showed up as colour shifts over the field and were removed by applying a small field-dependent

Total area of survey	: 740 deg^2	Number of candidates	: 46 077
Magnitude limits	: $18.25 \leqq B_J \leqq 21.0$	Expected completeness	: 90%
Colour selection	: $(U-B_J) \leqq -0.36$	Number of expected QSOs	: 25 000

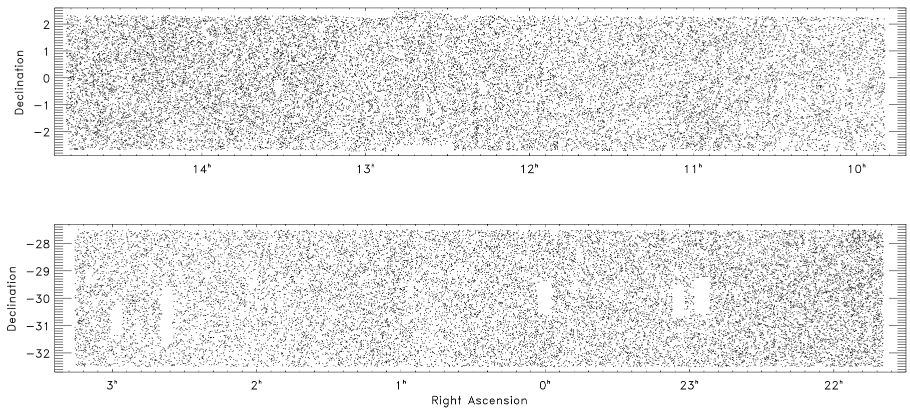

Figure 2. The completed UVX catalogue. The RA and dec of all the QSO candidates are shown in their two $75° \times 5°$ strips. Increasing contamination by Galactic sub-dwarfs at lower Galactic latitudes gives an obvious gradient ($< 50\%$) in number density along the survey strips. Completeness estimates are based on our success at recovering previously identified QSOs (see Fig. 1) and on statistical consideration of the effect of our quoted errors.

correction (< 0.05 mag) to the calibrated U magnitudes to ensure that the median $U - B$ colour of the stars remained constant over each UKST field.

As a first step towards analysis of this data, we have measured the two point correlation function, $w(\theta)$, for this survey. We detect a significant signal at small angular scales, adequately fit by a power-law of the form $w(\theta) = 0.002\theta^{-0.7}$. At larger scales, > 1 degree, the amplitude of the angular correlation function is always less than 0.005.

This is the first large-area UVX survey where considerable attention has been devoted to securing as uniform a photometric catalogue as possible. We intend to include data from the UKST R plates in these fields in the near future to generate a truly wide-field, multi-colour stellar catalogue which will be made available on the WWW within the next year.
Our URL address: http://www.aao.gov.au/local/www/rs/qso_surv.html.

References

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