QSO COLOR SELECTION IN THE SDSS

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1. Introduction

The Sloan Digital Sky Survey (SDSS) will image 10,000 square degrees in the north galactic cap in five filters. We hope to identify and obtain spectra for about 100,000 quasars brighter than 20th magnitude in this area. The selection will be primarily on the basis of point spread function and colors, but we will also identify quasars from a catalog of FIRST radio sources. The selection areas in color space must be determined during the testing period prior to the official start of the survey. This task may determine the length of the test period. In anticipation of this becoming the critical path, we have written a body of software that will allow us to quickly analyze a set of multicolor data and make a first cut at the selection limits.

2. Parameterization of the Stellar Locus

We model the stellar locus with a set of locus points, each with an ellipse fit to the stellar locus cross section at that point. Here, *stellar locus* will refer to the data points in color space, and *locus points* will refer to the model. Each locus point is iteratively moved to the centroid of its associated stars, which are (roughly) those that are closer to that locus point than they are to any other. Ellipse fits to the stellar locus are measured at each locus point from the projection of the associated stars onto a plane perpendicular to the stellar locus. With each iteration, new locus points are added in between the existing locus points, but only in places along the locus where the distance between locus points is larger than a factor times the local width of the stellar locus. This allows points to be more closely spaced when the stars are concentrated in a narrow line, but keeps the locus from wandering freely when the stellar locus is broad. This algorithm takes as input parameters the two approximate endpoints of the stellar locus, the

B.J. McLean et al. (eds.), New Horizons from Multi-Wavelength Sky Surveys, 291–292.

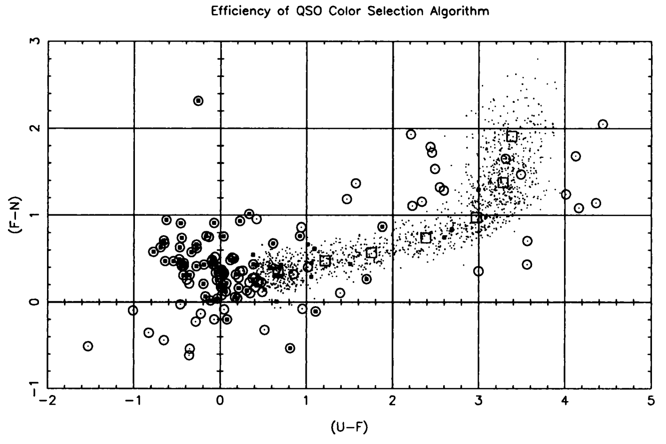

Figure 1. This plot shows the stellar locus fit (open squares) to the Trevese *et al.* data. By selecting sources outside a three sigma ellipse around the fit locus points, we found 63 of the 80 QSOs (79%), with 53% of the selected targets yielding QSOs. Stars are represented by dots, and quasars by filled squares. Sources that were chosen as quasar candidates are circled. We expect the Sloan survey to have approximately the same completeness and efficiency. Although this data set goes 1 or 2 magnitudes fainter (which makes it easier to find QSOs), the photometric errors are about five times larger than we expect the SDSS to achieve.

maximum distance from the stellar locus that a star will still be considered as part of the locus, the number of iterations of the algorithm, and the factor which determines how closely spaced the locus points can be. We generally iterate until the number of locus points is limited by the width of the locus itself, and then iterate several more times until the locus has stabilized.

3. QSO Color Selection

We have applied a simple target selection algorithm to a set of UJFN point source data from Trevese *et al.* (1994), and used their QSO identifications (from color selection and proper motion studies) to check the completeness and efficiency of algorithm. A three sigma cut from the model stellar locus yields 79% completeness with 47% contamination (Figure 1).

References

Gaidos, E. J., *et al.* 1993 Publ.Astron.Soc.Pacific, 105, 1294

Trevese, D., *et al.* 1994, Astrophys.J., 433, 494

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