QSO Color Selection in the SDSS

H.J. Newberg and B. Yanny

Fermi National Accelerator Laboratory
P.O. Box 500, Batavia, Illinois 60510

January 1998

Published Proceedings of the IAU Symposium No. 179, New Horizons from Multi-Wavelength Sky, Baltimore, Maryland, August 26-30, 1996
Disclaimer

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, expressed or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

Distribution

Approved for public release; further dissemination unlimited.
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 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