Astronomical Data Analysis Software and Systems XII
ASP Conference Series, Vol. 295, 2003
H. E. Payne, R. I. Jedrzejewski, and R. N. Hook, eds.

A Web-based Tool for SDSS and 2MASS Database Searches

Marci Hendrickson, Alan Uomoto, & David Golimowski

Johns Hopkins University, Baltimore, MD 21218

Abstract. We have developed a web site using HTML, Php, Python, and MySQL that extracts, processes, and displays data from the Sloan Digital Sky Survey (SDSS) and the Two-Micron All-Sky Survey (2MASS). The goal is to locate brown dwarf candidates in the SDSS database by looking at color cuts; however, this site could also be useful for targeted searches of other databases as well.

MySQL databases are created from broad searches of SDSS and 2MASS data. Broad queries on the SDSS and 2MASS database servers are run weekly so that observers have the most up-to-date information from which to select candidates for observation. Observers can look at detailed information about specific objects including finding charts, images, and available spectra. In addition, updates from previous observations can be added by any collaborators; this format makes observational collaboration simple. Observers can also restrict the database search, just before or during an observing run, to select objects of special interest.

1. Introduction

By far the most common objects in the galaxy are low mass stars and brown dwarfs. Only 32 of the coolest brown dwarfs (spectral class T) are known, but hundreds are needed to measure the space distribution, kinematics, and spectral type distribution of these objects.

2. Combining SDSS and 2MASS Photometry

The prototype uses EDR (Early Data Release) SDSS data as well as Second Incremental Data Release 2MASS data.

The coolest brown dwarfs require both SDSS and 2MASS photometry for selection. In the 2MASS catalog (JHK_s photometry), the rare T dwarfs have the same colors as much more common M dwarfs and are hard to find for that reason (Hawley et al. 2002). Also, T dwarfs are sometimes detected by SDSS only in the z-band, and so are hard to distinguish from cosmic rays and high redshift quasars. Fortunately, T dwarfs occupy a sparsely populated region in the $i-J$, $z-J$ color space and can be selected with these color cuts: $i-J > 3.5$ and $z-J > 2.2$.

Red stellar objects are selected from the SDSS database with sdssQT, an SQL-based query tool for the SDSS science database. Photometry and astrom-

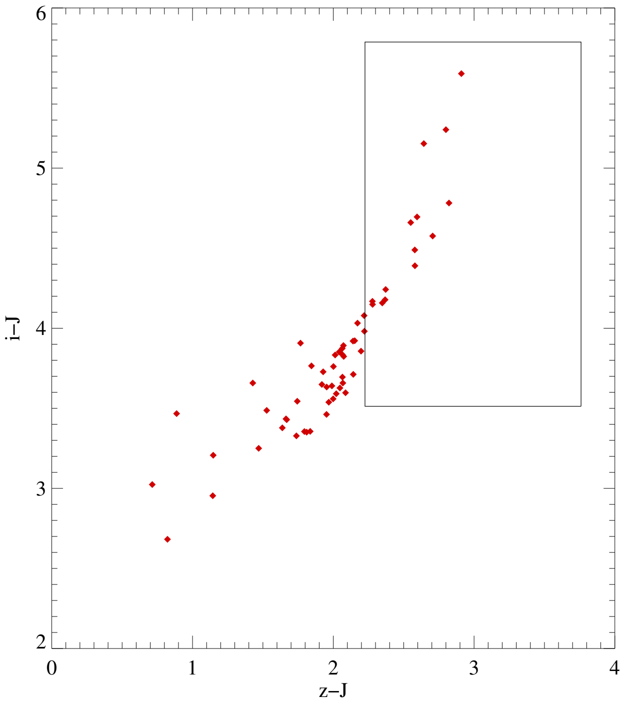


Figure 1. Color-color plot of candidates, using both SDSS (ugirz) and 2MASS (JHK$_s$) photometry. The box indicates the location of probable T dwarfs.

etry for the selected objects are loaded into a MySQL SDSS subset database using Python. This list is then used as input to Gator, a 2MASS database interface, which finds 2MASS objects within five arc seconds of the SDSS subset objects. These are loaded into a MySQL 2MASS subset database.

Brown dwarfs are nearby so we need a relatively large search radius to catch high proper motion objects. Multiple hits (binaries or cosmic rays) are resolved with a visual inspection of the SDSS images.

Automated weekly updates are run: (*i*) a query is performed on the SDSS database, (*ii*) a script is run which appropriately formats the data, (*iii*) a query is performed on the 2MASS data using Gator, and (*iv*) a second script is run to format the data and insert it into the database.

Our color criteria for selecting objects from SDSS are: (*i*) objects detected in r, i, and z, $r-i > 2$ and $i-z > 1.5$, (*ii*) objects detected only in i and z, $i-z > 1.75$, and (*iii*) objects detected only in z, $i-z > 2$.

3. The Web Site – http://annabel-lee.pha.jhu.edu/bd/

Php is used to call MySQL and find matches in 2MASS and SDSS databases. Using Php and HTML, the matches are loaded onto the front page of the web

Selected Candidate

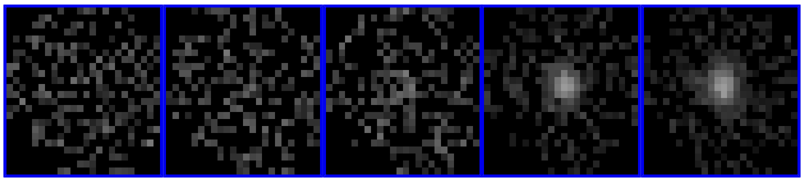
Candidate number

568775004390264

u	g	r	i	z	J	H	K_s
23.20	23.37	22.32	20.18	17.74	14.940	13.851	13.195
r-i	**i-z**	**i-J**	**z-J**	**z-K_s**	**J-H**	**J-K_s**	**H-K_s**
2.14	2.44	5.24	2.8	4.545	1.089	1.745	0.656

Atlas

u g r i z



Spectrum

No SDSS spectra for this object

Notes

Possible T dwarf (MH 10/02)

Add Notes

568775004390264

Remove Candidate

568775004390264

Figure 2. A screen shot showing a likely T dwarf candidate

site. Included is all the color information, as well as a link to the rest of the data available for each object.

When the link is clicked, the rest of the information on the object is displayed. This includes the atlas images, a finding chart, spectra when available, and any notes left regarding the object. There is also an option to add notes, as well as to delete the object if it is not of interest. While this does not delete the object from the database, is does prevent it from being viewed from the main page. An observer can view the list of objects that have been deleted, and can restore them.

Each of these pages are created dynamically using Php. The candidate number, a unique value in the database, is passed from one page to the next, and the data are pulled from the database after the selection is made.

Color-color plots are created using IDL. An observer can look at the plots to determine whether the query run was appropriate.

Users can also select objects based on colors or positions, to customize the main page just before an observing run, making it easier to locate objects of special interest.

4. Future Work

Follow-up spectra will be taken using DIS (Double Imaging Spectrograph) on the Apache Point 3.5 meter telescope. At that time, we will be able to ascertain whether we indeed have found a unique brown dwarf color-color space, and will be able to see what adjustments need to be made on the target selection.

References

Hawley, S. L. et al. 2002, AJ, 123, 3409