

Development of a Virtual Observatory Tool for the Characterization of Stellar Objects in the DUNES Project Framework

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Abstract Most of the projects that aim at detecting extrasolar planets require a careful selection of the central stars as well as an extremely detailed knowledge of their properties and environment. However, gathering information in a wide variety of types and formats from a large number of heterogeneous astronomical data services can be a tedious, very time-consuming task even for a modest dataset. To overcome this situation the LAEFF Scientific Data Centre, in the framework of the Spanish Virtual Observatory¹, has developed a VO-compliant discovery tool for DUNES². This tool allows accessing, visualizing, filtering and retrieving relevant information of lists of objects. In this poster we describe the main characteristics and functionalities of the system.

1 Introduction

DUNES is a Herschel Open Time Key Programme that aims at finding and characterizing faint exo-solar analogues to the Edgeworth-Kuiper Belt in an unbiased, statistical sample of nearby FGK main-sequence stars. The sample is volume-limited (distances ≤ 20 pc) and spans a broad range of stellar ages from 0.1 to 10 Gyr. All stars with known extrasolar planets within that distance are included; additionally,

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¹ <http://svo.laeff.inta.es>

² <http://sdc.laeff.inta.es/dunes/>

some M- and A-type stars will be observed in collaboration with the DEBRIS Herschel OTKP, so that the whole sample covers the range from 0.2 to 2 solar masses.

This ambitious endeavour requires an extremely detailed knowledge of the properties and environment of the targets. Nowadays there exists a huge amount of astrophysical data and information about the DUNES targets, distributed in a number of archives and services. The compilation of all this information is very inefficient if approached outside the framework of the Virtual Observatory.

2 VO Aspects

Fast and efficient discovery of information is one of the consequences of the VO standardization. Here we will describe the main characteristics of the VO application we have developed for accessing, visualizing, filtering and downloading the relevant information for the DUNES consortium already available in astronomical archives and services.

3 Application Description

3.1 Initial Search Parameters

The starting point is the definition of the list of objects of interest. As seen in Fig. 1, the list may be provided both in coordinates or using object names. In case the names are provided, the system automatically performs a name resolution to obtain the corresponding coordinates. The system also implements a filtering utility to discard catalogued binaries.

The information to be queried is fully configurable. As shown in Fig. 2 it comprehends a broad variety of physical parameters that are obtained from a real-time exploration of VizieR using VO protocols. *Ad hoc* access to other services of interest (like NstED) is also provided.

3.2 Browsing the Results

Once the search has been performed the results are presented in a summary, as shown in Fig. 3. The detailed information obtained for each object is displayed in a new window. All the gathered information can be downloaded both in ASCII and VOTable format.

The application also includes a tool developed by the Spanish Virtual Observatory to perform a exploration of the VO services containing images or spectra for the objects of interest. A use example of this tool is presented in Fig.4.

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The screenshot shows the 'DUNES VO Discovery Tool' interface. At the top, there's a header with the DUNES logo and 'DUST around Nearby Stars'. Below the header, a text box explains the tool's purpose: 'This Virtual Observatory tool allows accessing, visualizing, filtering and retrieving relevant information of the DUNES targets that is already available in astronomical archives and services. The tool also estimates some fundamental parameters from photometric (Strömgren and 2MASS) information.' Below this, there are two input fields: 'List of object names (one line each)' and 'List of object coordinates (one line each)'. The coordinates field has a 'Format: deg deg or hh:mm:ss' and a 'Radius: 2' with units 'arcmin' and 'arcsec'. At the bottom, there's an 'Output Columns:' section with checkboxes for 'OBJName', 'HIP', 'HD', 'RAJ2000', and 'DEJ2000'.

Fig. 1 Main search parameters

The screenshot shows the 'Output configuration' section of the DUNES VO Discovery Tool. It lists various services and parameters that can be selected for output. Under 'Photometric Data', there are options for 'uvby8 Strömgren photometry', 'JHK photometry', 'IRAS photometry', and 'ROSAT photometry', each with a 'Radius' field and unit selection. Under 'VO Services', there are checkboxes for 'Physical Parameters' and 'The Extrasolar Planets Encyclopedia'. Under 'Physical Parameters', there are checkboxes for 'Teff', 'logg', '[Fe/H]', 'E(B-V)', 'Vaini', 'Spec. Type', 'Age', 'Radial Velocity', 'Proper Motion', 'Space Velocity', 'Parallax', 'Bolometric Luminosity', 'Variability', 'Activity', and 'Multiplicity', each with a corresponding 'Explore vizier' checkbox.

Fig. 2 Output configuration

DUNES: Results

Search parameters:
 Spectral type: [A, F, G, K, M]
 Luminosity Class: [All]
 Johnson B-V colour(mag):
 Ecliptic latitude: From: To:

New search

Order by:
 HIP Sort

Total results: 3

Mark	HIP	HD	_RAJ2000	_DEJ2000	SpType	VO Services	Physical Parameters
<input checked="" type="checkbox"/>	34	224758	00 00 23.900	26 55 05.18	F7.5IV-V	Search	View
<input checked="" type="checkbox"/>	77	224820	00 00 55.338	-30 03 50.99	A0V	Search	View
<input checked="" type="checkbox"/>	439	225213	00 05 24.428	-37 21 26.50	M2V	Search	View

Retrieve/Display Marked Data In **VOTable** format and notify me at this e-mail address: raul.gutierrez@iaeff.inta.es when they are available.

Vsini

Catalog Name	Catalog Code	Vsini	Vsini error	NomCol	Units	UCD
Glebocki*, 2000	W226	21.00	3.00	vsini	km/s	phys.veloc.rotat
Hoffleit*, 1991	V/50			RotVel	km/s	phys.veloc.rotat
Nordstrom*, 2004	V/117	21		vsini	km/s	phys.veloc.rotat

Fig. 3 Output of the query

SVO-OVE

File Help

Results Objects Services

Object	SIAP	SSAP	CONE
Unknown	12	5	20

Log
Search finished!

Aladin sky atlas

File Edit Image Catalog Overlay Tool Help

Location: 00:00:23.90 -26:55:05.18 CON

2MASS J00002390-26550518

6.37" x 3.30"

8 oct 22 00:20:00

Fig. 4 VO services exploring tool implemented in the system.