The CDS Information Hub

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Abstract. The recent evolution of the CDS services is presented. Navigation between the CDS services, SIMBAD, the catalogue service, the VizieR catalogue browser and the Dictionary of nomenclature is developed, as well as graphic and image-based functionalities (SIMBAD, ALADIN). Links are also developed with the electronic astronomical library, from CDS, ADS and the Journal editors, together with innovative 'textual' information retrieval services, on one side, and with data archives from observatories and disciplinary data centers on the other, paving the way towards a fully linked astronomy information system, in close collaboration with the other actors in the field.

The CDS develops information retrieval services which are widely used by the worldwide astronomy community (e.g., Egret et al. 1995; Genova et al. 1996). The two main ones are SIMBAD, the reference database for the identification and bibliography of astronomical objects, which contains nearly 1,550,000 objects, 4,400,000 object names and more than 95,000 references (in November 1997), and the catalogue service, with ftp retrieval of whole catalogues and the VizieR catalogue Browser (Ochsenbein 1997). The CDS WWW service[1] gives access to SIMBAD and the catalogue service/VizieR, and also to other information such as the *Dictionary of Nomenclature of celestial objects*, developed for many years by M.–C. Lortet and her collaborators (Lortet et al. 1994), now fully maintained by CDS in collaboration with the Paris Observatory (DASGAL), the StarPages, maintained by A. Heck (1997), or AstroWeb (Jackson et al. 1994). Moreover, the CDS develops the ALADIN interactive sky atlas, with a dedicated XWindow interface (e.g., Bonnarel et al. 1997).

The CDS services are evolving continuously, taking advantage of new technical possibilities, and taking into account the evolution of astronomy itself, with new domains, new object types, etc, and also new large projects.

From the point of view of the database contents, a particular effort has been made in recent years to improve the multiwavelength coverage of SIMBAD, with for instance the inclusion of the IRAS catalogue and of the IUE log, and the 'cleaning' of the high energy data, from the earlier satellites to Einstein, to be ready for the next generation of X-ray observatories. In parallel, about 90 jour-

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[1] http://cdsweb.u-strasbg.fr/CDS.html

nals are regularly scanned, in collaboration with the Institut d'Astrophysique de Paris and the Paris (DASGAL) and Bordeaux Observatories: for instance, more than 70 lists of objects observed by ROSAT published in journals have been included in the database from this bibliography scanning. A large amount of work over several years has also been devoted to the inclusion of new reference stellar catalogues, PPM, CCDM, and the Hipparcos input and final catalogues, in the context of the Hipparcos project, and to prepare the transition to a J2000.0 reference for object positions. In addition, the on–line distribution of the Hipparcos final catalogues was implemented through VizieR, by agreement with ESA, in May 1997.

The evolution towards electronic publication of journals has added an important new function to the catalogue service : it is now the depository of large tables from papers, these tables being very often published in electronic form only and accessible from the data centers (and on CD-ROMs for the *American Astronomical Society* journals). In this context, the CDS builds the electronic tables for *Astronomy and Astrophysics*, as part of the journal publication process, and installs on line the tables published on CD–ROMs by the *American Astronomical Society*, by agreement with the editor. These tables are then shared with the other Data Centers (ADC/GSFC, INASAN/Moscow, NAOJ/Tokyo, the Observatory of Beijing, UICAA/Pune). The key feature for this collaboration between data centers, and with the journal editors, is a common standard description of tables, first proposed by CDS, and now shared with the other data centers and the editors for their electronic tables. This byte–per–byte description of tables, allows an automated check of the quality of the table contents (in addition to verification by the referee), on–line format change (e.g., ASCII to FITS), etc.

From the technical point of view, the major evolution in the last years has been the very rapid development of the WWW, which opens in particular remarkable capabilities for navigation. The CDS has taken advantage of the WWW, first, of course, to develop WWW versions of its services : SIMBAD (1996), the catalogue service (1993), the Dictionary of Nomenclature. VizieR has been directly designed for the WWW, and a detailed description of its recent evolution is given in the companion paper by Ochsenbein (1997).

Navigation between the CDS services, and with external resources, has been implemented. The aim is to complete the evolution from a set of several different CDS services, each with its own contents, user interface and method of access, to an integrated CDS service giving access to the set of CDS information retrieval tools, in a transparent way for the user (keeping however advanced functionalities in dedicated interfaces if necessary).

A few examples:

- from object names in SIMBAD, to the corresponding *Dictionary of nomenclature* entry, which gives information about the origin of the name, access to bibliographic information about the original paper, and to the list in the catalogue service if it is there;

- from bibliography in SIMBAD, to the CDS bibliographic information, with links to the Dictionary of Nomenclature, and/or to the CDS catalogue ser-

vice, when applicable, to the full electronic paper when available from the journal editor, and also to the ADS services for this reference (e.g., Eichhorn 1997) – reciprocally, ADS implements links to several CDS services, the list of SIMBAD objects for one reference, or the tables in VizieR and in the catalogue service;

- from table to table in the new version of VizieR;

- ...

Another important possibility with the WWW, is to implement relatively easily graphics functionality. For instance, clickable charts are in a prototype phase for SIMBAD, and will be developed in the future for VizieR. On the other hand, a WWW version of ALADIN will progressively be implemented, as a first step to allow the users to get an image of the sky from the other CDS services, SIMBAD, VizieR, and also from the objects cited in texts (e.g., in abstracts), and then with additional functionalities such as SIMBAD or catalogue overlay on the images.

Links to external resources will certainly develop rapidly in the future. On one hand, the first links between the CDS databases and distributed observatory archives have been implemented in September/October 1997 : from SIMBAD to HEASARC, for the objects having a 'high–energy designation', and from VizieR to the FIRST radio database. More links with other data archives will be installed soon. On the other hand, as explained earlier, navigation between the CDS databases and on–line bibliographic resources, the ADS and electronic journals, is already well developed. This has certainly been facilitated by the existence of a *de facto* standard for the description of bibliographic reference, the bibcode, first defined by NED and SIMBAD and now widely used by the ADS (Schmitz et al. 1995). Moreover, the implementation of the European mirror copy of ADS at CDS, thanks to the support of the French Space Agency CNES, together with that of a mirror copy of SIMBAD at CfA, has certainly helped towards better integration of the CDS services and the ADS. In parallel, the European mirror copy of the electronic *Astrophysical Journal* has also been installed at CDS in June 1997. In this domain, innovative services are certainly ahead, for instance new methods to retrieve 'textual' information, such as the Kohonen map method (Lestven et al. 1996), and also more links between the text of articles and databases. For instance, links can be foreseen between object names in the papers, and information about the object in SIMBAD or NED, or images, for instance from the future ALADIN WWW service.

To maintain the set of links between the CDS services, and with external services, a generic tool, the GLU (Fernique 1998), has been developed. This tool is being tested in one of the AstroBrowse prototypes, as discussed in the AstroBrowse BOF during the ADASS'97 meeting.

References

Bonnarel, F., Ziaeepour, H., Bartlett, J. G., Bienaymé, O., Crézé, M., Egret, D., Florsch, J., Genova, F., Ochsenbein, F., Raclot, V., Louys, M., & Paillou,

Ph. 1997, in IAU Symp. 179, New Horizons from Multi-Wavelength Sky Surveys, in press

Egret, D., Crézé, M., Bonnarel, F., Dubois, P., Genova, F., Jasniewicz, G., Heck, A., Lesteven, S., Ochsenbein, F., & Wenger, M. 1995, in Information & On–line Data in Astronomy, ed. D.Egret & M.Albrecht (Kluwer), 163

Genova, F., Bartlett, J. G., Bienaymé, O., Bonnarel, F., Dubois, P., Egret, D., Fernique, P., Jasniewicz, G., Lesteven, S., Monier, R., Ochsenbein, F., & Wenger, M. 1996, Vistas in Astron., 40, 429

Heck, A. 1997, in Electronic Publishing for Physics and Astronomy, ed. A. Heck (Kluwer), 211

Eichhorn, G. 1998, this volume

Fernique, P. 1998, this volume

Jackson, R., Wells, D., Adorf, H. M., Egret, D., Heck, A., Koekemoer, A., & Murtagh, F. 1994, Astron. Astrophys. Suppl., 108, 235

Lesteven, S., Poinçot, P., & Murtagh, F. 1996, Vistas in Astron., 40, 395

Lortet, M.C., Borde, S., & Ochsenbein, F. 1994, Astron. Astrophys. Suppl, 107,193

Ochsenbein, F. 1998, this volume

Schmitz, M., Helou, G., Dubois, P., LaGue, C., Madore, B., Corwin, H.G. Jr, & Lesteven, S. 1995, in Information & On–line Data in Astronomy, ed. D.Egret & M.Albrecht (Kluwer), 259