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ISAS Data Archive and Transmission System (DARTS)

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Abstract. The Data ARchive and Transmission System (DARTS) is developed and maintained by the PLAIN center (The Center for PLAnning and INformation Systems) at ISAS in cooperation with various ISAS satellite teams. We have started to release archival data from ASCA, an X-ray astronomy satellite, Yohkoh, a solar physics satellite, and Geotail, a magnetospheric satellite. We are now planning to release data from Ginga, a previous X-ray satellite, and Akebono, a magnetospheric satellite. In near future, we will release data of the forthcoming X-ray astronomy satellite, Astro-E. The data in the DARTS can be accessed via the Internet. The system provides: (1) storage of calibrated scientific database obtained by ISAS satellites; (2) facilities to search and transfer data via the Internet; (3) on-line data analysis capability under the high performance ISAS computer facility; and (4) supporting analysis tools.

[1]The Institute of Space and Astronautical Science

1. Introduction

The DARTS (Data ARchive and Transmission System)[1] at ISAS (The institute of Space and Astronautical Science) started in 1995 to convert telemetry data from ISAS scientific satellites, to calibrated scientific databases and to release the data for public use. Anyone can access the data in the DARTS via the Internet.

This system has been developed and maintained by the PLAIN Center (The Center for PLAnning and INformation Systems) at the Institute of Space and Astronautical Science (ISAS) in cooperation with various ISAS satellite teams.

DARTS now provides data via the Internet using four servers.

1. The file server contains the scientific data available to the public.
2. The WWW server runs CGIs for database users, and contains the manuals, FAQs, and other useful links relating to the data.
3. The proxy server combines the resources that the file server and the WWW server hold, and provides the GUI-based facilities for the users.
4. The analysis server provides basic analysis tools for those who need to analyze the data before downloading.

The block diagram of these components in DARTS is shown in Figure 1.

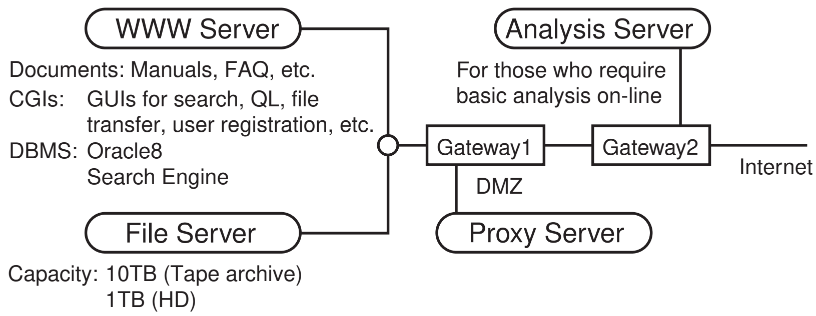

Figure 1. Block diagram of the DARTS system.

2. Common Gateway Interface (CGI)

DARTS provides CGI-based facilities as follows.

Search Anyone can search the data in the DARTS archive.

Quick Look (QL) To select their favorite data, users can select quick-look images for the searched datasets. QL images are previously formatted and stored in the file server so users can quickly preview the data.

File Transfer After the search, users can transfer the data to their local devices or to the analysis server.

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[1] `http://www.darts.isas.ac.jp/`

User Registration To use the analysis server, user registration is required. First, a user fills the registration form and sends a request for the registration. When the request is accepted, DARTS sends back a keyword to personalize the account for the user. The user then enters the keyword and the password to personalize the account.

3. Analysis

The analysis server provides basic analysis tools and some commands for file operations. Once the user registration is completed, users can login the server with terminal emulators and invoke the tools and commands to analyze the data which is transferred to the server using the CGI mentioned above.

The root directory of the analysis server is hidden from the users, so the system files and most of the libraries of the server are invisible to the users. Therefore, users' operations are restricted.

4. Data Sections

Currently, we have three data sections. The Astronomical Data Section provides the data from ASCA, an X-ray astronomy satellite. The Solar Physical Data Section provides the data from Yohkoh, a solar physics satellite, and the Space Plasma Data Section provides the data from Geotail, a magnetospheric satellite.

4.1. Astronomical Data Section

DARTS provides data from ISAS astronomical satellites. Our data retrieval system is based on the celestial coordinates with our original name resolver. On the analysis server, we provide standard software for analyzing X-ray astronomical data (e.g. `ftools` and `xspec` developed by NASA/GSFC).

Currently the DARTS astronomical data section is the public archive of the ASCA satellite (Tanaka et al. 1994), the fourth Japanese X-ray astronomy satellite launched in 1993. The ASCA archive has a dataset for each observation, which consists of: (1) telemetry data; (2) data products including event files, images, energy spectra, and light curves; and (3) calibration data. The data products are reproduced by NASA/GSFC in cooperation with ISAS. Users can also reproduce the data products with their own policy by using the software installed on the analysis server.

4.2. Solar Physical Data Section

Yohkoh, the second Japanese solar physical satellite launched by ISAS at the previous solar maximum of 1991 (Ogawara et al. 1991), has been observing the Sun over nearly one solar cycle. It provides the soft and hard X-ray images of flare events as well as quiet states.

All of archival data of Yohkoh, (1) raw and reprocessed data from all instruments aboard the Yohkoh satellite (2) housekeeping (HK) files; and (3) observation log and weekly images, can be accessed via DARTS. In the retrieval system, users can specify data sets by type of the data and date of the observation. In the analysis servers, users can browse and process the data sets in their own way with Solar Software[2], a standard processing software for solar physical satellites.

4.3. Space Plasma Data Section

The GEOTAIL satellite was launched on July 24, 1992. The primary purpose of this mission is to study the structure and dynamics of the tail region of the magnetosphere.

At present only the data obtained by the magnetometer (Kokubun et al. 1994) and the low energy particle instruments (Mukai et al. 1994) are published from DARTS. The magnetic field vector of 3 seconds sampling and the plasma moment (ion density, ion velocity, and temperature) of 12 seconds sampling are available. One can also get the orbit information. The data obtained before June 30, 1997 are in the public domain, and more recent data will be published as soon as the calibration is completed by each PI team. Three kinds of data (magnetic field, plasma moment, and orbit information) are downloadable in ASCII format or PostScript. One can freely select and get/see any data on a web browser.

5. Future Plan

From the Astronomical Data Section, we are preparing data from Ginga, a previous X-ray satellite. Also we are planning to release data from IRTS, an infrared satellite. In 2000, we will release data from the next X-ray astronomy satellite, Astro-E.

From the Space Plasma Data Section, we are planning to release data from Akebono, a magnetospheric satellite. We are also developing the databases of three-dimensional plasma velocity distribution functions and high time-resolution (1/16 second sampling) magnetic field data obtained from GEOTAIL, and it will be released in the near future. The total size of the GEOTAIL database, which is currently about 2GB, will expand to 300GB when the plasma distribution functions and high time resolution magnetic field data are included.

We are now planning to develop a mirror site for Japanese scientists of several useful astrophysical and geophysical databases that are widely used in the world.

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[2] `http://www.lmsal.com/eit/ssw_whatitis.html`