

Virtual Observatory - India : Information Support For Remote Users

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Abstract. A Virtual Observatory (VO) seeks to provide a single virtual platform which will provide astronomers easy access to large astronomical data over many different wavelengths. The data are gathered from space-based missions and from ground-based telescopes. VO related projects are being started in India also, and Virtual Observatory-India is the brain child of IUCAA as a collaboration between astronomers and software developers in the country. Specific programs are being developed, and mirror sites of databases are being created. They have received funding from the government. Astronomical Libraries in India will play a major role in this project in the form of Virtual Information Support. The Virtual Information Support (VIS) will serve as a tool for meeting the information needs of the astronomical community in the country, from anywhere at anytime. It will be a major source of support to provide seamless access to the resources held in the astronomy libraries, including the online interactive services. FORSA (Forum for Resource Sharing in Astronomy & Astrophysics) is an informal cohesive group of astronomy libraries in India, which will be the force behind this Virtual Library to share resources and services. The major VIS initiative in 2002 will be the design and implementation of a web site - with features such as newsletter, an integrated library database of all the libraries of the FORSA members, and an online interactive form to facilitate the interlibrary exchange.

1. Introduction

Astronomy has a tradition of surveying and discovery. Most of the time astronomers search for the recorded information of these traditional activities to enhance their observations. In addition to the archival data available in the form of catalogs and charts, the published work of individuals in various journals, books and gray literature also supplement the requirements of astronomers. Efforts have already been made to organise this information into various interactive databases which are accessible internationally. In India, the VO project has been proposed to establish a network of astronomical activities spread out in various parts of the country. The information support from the astronomical libraries will be integrated and will be included in the VO-India project.

2. Virtual Observatory in India

A Virtual Observatory seeks to provide a single virtual platform which will provide easy access to large astronomical data archives over many different wavelengths. The data are gathered from space based missions and from ground based telescopes. The data can consist of observations of a large number of specific targets, as well as surveys which cover the whole sky or portions of it. The data can be in the form of images, catalogues derived from the images, spectra and timing data.

VO related projects are being taken up mainly in the United States, but significant work is being started in France, Germany, Japan and India. At the present time the projects are in the planning stage, and issues like the virtues of spreading the data over a large number of sites, or keeping it in just a few locations with high speed access, are being discussed. The quantity of data and the complexity of software are bringing in wholly new concepts and paradigms.

A project called Virtual Observatory - India has started at IUCAA in India, as a collaboration between astronomers and software developers, and this has received funding from the government. Specific programs are being developed and mirror sites of databases are being created. Astronomical libraries in India will play a major role in distributing the data, as well as information about it to various users, including professional astronomers, other scientists, amateur astronomers, and interested members of the public:

<http://vo.iucaa.ernet.in/~voi/html/infopage.html>

The aims and general tasks to be performed are summed up in the “White Paper” on the National Virtual Observatory being established in the USA and are as follows:

VO Tasks

- Establishment of a common system approach to data pipelining, archiving, and retrieval that will ensure easy access by a large and diverse community of users quickly and at minimum cost;

- Enabling the distributed development of a suite of commonly usable new software tools to make possible querying, correlation, visualization and statistical comparisons of data;
- Co-ordinating the establishment of high speed data transfer networks that are essential to providing the connectivity among the archives, terascale computing facilities and the widespread community of users;
- Facilitating productive collaborations among astronomical centres and major academic institutions, both national and international, in order to maximize productivity and minimize infrastructure costs;
- Ensuring communication and possible collaboration with scientists in other disciplines facing similar problems, as well as with the private sector;
- Maintaining a continuing program of public and educational outreach that capitalizes upon the unique resources, in both data and software, of the VO to provide a unique window into astronomy and scientific methodology.

3. VO in other countries

Virtual observatory projects are well established in some countries. The versatile capabilities of the WWW have been explored and utilized to meet the challenges of the astronomers in this project. The following collaborations have been formed in support of the VO vision.

In the UK the Astrogrid Consortium consists of: the Institute of Astronomy, University of Edinburgh; the Institute of Astronomy, University of Cambridge; the Department of Physics and Astronomy, University of Leicester; the School of Computer Science, Queen's University Belfast; the Space Data Division, Rutherford Appleton Laboratory; the Mullard Space Science Laboratory of University College of London; and Jodrell Bank Observatory of the University of Manchester.

In Europe, the Astrophysical Virtual Observatory (AVO) membership is: the European Southern Observatory (ESO), the Centre de Données de Strasbourg (CDS), the Space Telescope European Coordinating Facility (ST-ECF), the TERAPIX project at the Institut d'Astrophysique de Paris, the Jodrell Bank Observatory of the University of Manchester, and the Astrogrid Consortium.

In the USA, the National Virtual Observatory (NVO) is the corresponding project, involving its leading data archive centres, who are bidding for funds from NASA and the NSF (Page, 2002).

ATNF AVO (Australian Virtual Observatory) is a recently established facility in Australia.

4. Information Support for VO - India

Information support for the Virtual Observatory in India will be provided by the eight libraries which are part of FORSA (Forum for Resource Sharing in Astronomy and Astrophysics). All eight libraries have fairly large collections of resources in astronomy and astrophysics. The eight libraries are, The Indian Institute of Astrophysics (IIA), Inter-University Centre for Astronomy & Astrophysics (IUCAA), National Centre for Radio Astrophysics (NCRA), Nizamiah Observatory (NIZ), Uttar Pradesh State Observatory (UPSO), Physical Research Laboratory (PRL), Raman Research Institute (RRI) and Tata Institute of Fundamental Research (TIFR). The Information centres will offer many services to the astronomy community through the VO - India Project.

The library and information centres will strive to integrate their book and journal databases. The integrated database will have around one hundred and fifty thousand books and one hundred sixty thousand journal holdings (the numbers include the total collection, and there may be duplicate books and journal volumes). These libraries together subscribe to one thousand journals. All these libraries also have large collections of microfilm, microfiche, slides, CD-ROMs and photographs. These resources will be made available to the users through the VO.

A preprint service similar to astro-ph can be initiated within the country to facilitate our Indian astronomers and physicists accessing electronically all the papers originating from different observatories and universities in the country.

5. Role of Information Professionals in VIS

Information professionals have an important task to organize different information sets which are created electronically. They can develop pointers to relevant astronomical information available on the web page. The traditional keyword indexing can be very useful in designing the tools for navigation. Guides and manuals can be introduced as links as and when required. Since the users are from various backgrounds, care should be taken to keep these links alive and updated. Maintenance of the guides and electronic pointers are also important.

The VO-India web page can include an interactive reference page containing FAQs and What's New? columns.

Documentation of the FAQs will be very useful as far as the VO - Interactive facility is concerned. The archive, when created, will help in answering future queries and also will be helpful in updating the information.

The required training, by way of short courses and workshops to the information professionals, is very important for professional support to the VO - India project.

6. Digital Library Initiatives

The information centres are also moving toward a digital environment. As a first step in this venture all the theses available in India in astronomy and astrophysics will be digitized. The home page of INFLIBNET (Information and Library Network Centre, Ahmedabad) shows that in the last thirty years there have been about 500 theses in this area. These can be digitized and made available to the students and researchers. Other documents, which can be made available in the full text form, would be the annual reports of the important astronomical institutions, newsletters and other institute publications such as telescope documentation manuals, occasional monographs, and technical reports. These are unique publications and are not likely to be available anywhere else. At a later time this database will also have old and rare books which may be beyond the purview of the copyright act.

7. Different Users and their Requirement

VO - India web page will be accessed by various users at different levels. Hence it needs to be multifaceted to cater to every individual.

7.1. Universities

In order to support research activities in the universities, it will be necessary to provide the university academics with the periodical literature in astronomy and astrophysics. The services rendered through the virtual observatory in terms of the information support by the FORSA libraries would play a significant role towards the dissemination of information in the universities.

The Inter-University Centre for Astronomy and Astrophysics (IUCAA) is the second Inter-University Centre (IUC) established by the University Grants Commission in the year 1988 in Pune as an autonomous institute of excellence under the purview of the University Grants Commission. The centre aims to promote research in astronomy and astrophysics in the universities by providing access to advanced research and development facilities to the universities on a shared basis.

Four IUCAA Reference Centres established at the following locations in India, viz. Darjeeling, Raipur, Delhi, and Cochin have been provided electronic access to the journals being subscribed to by the IUCAA library.

Due to the sharp rise in the subscription costs of research journals very few are presently available even in major university libraries. The University Grants Commission has initiated the possibility of e-subscriptions for the universities, in which the Information Library Network (INFLIBNET) will act as the nodal point. Electronic access to periodical literature is critical to the universities and colleges. Such a project will be a welcome service to the university academics. At present article delivery service, interlibrary loan, and long and short range reference service are being provided to the university academics (Bawdekar, 2002).

7.2. Astronomers and Researchers

Mirror sites of the Astrophysics Data System (ADS) and the CDS/SIMBAD data base in IUCAA are the major data facilities available to the astronomers in India through VO-India project. In addition, astronomers and research scholars will require updated bibliographic information support for their research.

FORSA Libraries subscribe to many important journals in astronomy and astrophysics in both print and electronic format. Electronic access to these journals has an added advantage for the remote information seekers. The recently formed consortium of astronomy libraries facilitates the astronomical community getting access to additional electronic journals within their campuses (Birdie and Vagiswari, 2002).

VIS will also include the list of ongoing scheduled observational projects of the various telescopes in the country.

7.3. Students and Teachers

The creation of a VO will offer an excellent opportunity for those who belong to small institutions but express a great interest in astronomical research. This portal will help them to participate in a greater depth of astronomical research by providing them a variety of information. They will be exposed to large quantities of real data which they will be able to use it in their work. This is an exciting project for many students who currently face difficulties in searching for information. They will be able to access both a large quantity and variety of bibliographical data at one source. Such a facility will not only help the students but also the teachers. Teachers can now largely depend on the Virtual Observatory for material to teach.

7.4. Science Museums and Planetaria

Science museums and planetaria will be important customers of the VO. There are 28 science museums in India and 18 planetaria with 200,000 visitors per year per center. These museums need a constant source of information to keep the interest of general public, the students, and the amateur astronomers alive. As mentioned by Liu (2001), “we cannot merely attach education and outreach efforts on the VO as an after thought, we must integrate education and public outreach (E/PO) capability into the VO at the very stage of design, development and implementation.”

Some areas where Science Museums and Planetaria will look to VO for information

- Information on the latest astronomical events such as comets, meteor showers, eclipses, and planetary conjunctions.
- Night Sky on any given day

- Innovative ways of explaining the astronomical phenomena. The planetaria or the science museums would like the visitor to have a memorable experience, so it is necessary to make the public participate interactively in the event. This would mean the VO has to provide an active learning experience.
- VO should be dynamic and provide the public and management with the latest astronomical news through Newsletters.
- VO should create a strong image library taken from various Indian Observatories and also from other observatories in the world.
- VO should also be a repository of a large collection of historical notes, astronomical photographs and paintings, and other material which help in creating planetaria shows
- VO should provide topics and data for projects taken up by undergraduate students.

8. Conclusion

VO will not only provide access to data which are scattered all over but also provide the software meant for collecting and using these data efficiently without one having to know a great deal about computing.

VO will have data and software but the structure will be much enriched by building into it access to the literature.

Library staffs also need to participate in spreading knowledge about the VO among the students, teachers, and public. The facilities available on the VO will be changing rapidly, and someone is needed to keep track of this and to spread awareness in a continuous fashion. This can be carried out most suitably by the libraries/library professionals.

VO - India can facilitate functioning of the International Virtual Observatory.

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