

A System for Web-based Access to the HSOS Database

Ganghua Lin

*National Astronomical Observatories, Chinese Academy of Sciences,
Beijing, China*

Abstract. Huairou Solar Observing Station's (HSOS) magnetogram and dopplergram are world-class instruments. Access to their data has opened to the world. Web-based access to the data will provide a powerful, convenient tool for data searching and solar physics. It is necessary that our data be provided to users via the Web when it is opened to the world. In this presentation, the author describes general design and programming construction of the system. The system will be generated by PHP and MySQL. The author also introduces basic feature of PHP and MySQL.

1. Introduction

Huairou Solar Observing Station's (HSOS) magnetograph can simultaneously measure the solar 2-D magnetic field and velocity field with different spectral lines. The photospheric vector magnetograms and dopplergrams, chromospheric longitudinal magnetograms and dopplergrams, and corresponding filtergrams can be obtained by this system. So far, 13 years of observations have been obtained.

Because of the international character of astronomy, we are planning to develop software that is independent of the archive architecture and which provides users with Web access capabilities.

Given the large amount of data, and that the data is not only plain text but also image file, visual file, we select a relational database—MySQL—to build the database management system, and use PHP to build the database engine and user query interface.

The final system is expected to allow users to get good response time and easy browsing of the HSOS on-line database by the means of a Web-based user interface, display results graphically, and save them locally for further analysis.

In Figure 1, we give an overview of the architecture of the system:

- content of the database;
- the database structure being developed;
- the extensions we are developing to the database engine to support HSOS data and queries;
- access methods;
- access interfaces currently under development.

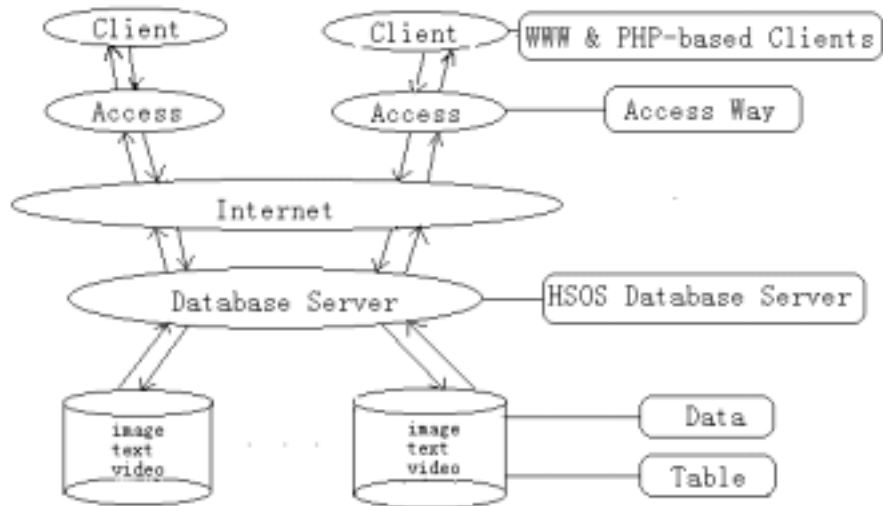


Figure 1. Architecture of the HSOS database on-line system.

In the following sections we briefly describe the items shown as rectangles in Figure 1.

2. Data

At present, only the data which are currently being used or built in the HSOS database project are foreseen to be included in the database. They are: photospheric longitudinal magnetic field data, photospheric filtergram image data and photospheric transverse magnetic field. Other data, for example, chromospheric longitudinal magnetic field, filtergram image, longitudinal velocity field data, etc., may be added in the future depending on users' requirements. Users can learn more about HSOS data through reading the the on-line README file.¹

3. Table

All data in the collection are described in a metadata structure we call the metadata table. All applications will access the database through the table, so that they will work independently of any data-specific structure. Using a table will also simplify the addition of new data to the collection. Metadata access has been developed in the PHP language.

¹<http://sun.bao.ac.cn/observation/datadir.html>

4. HSOS Database Server

All the data in the collection are managed by means of the MySQL² relational DBMS. The database engine can be extended by means of software modules that plug in to MySQL Dynamic Server and extend its capabilities in order to store, retrieve, and manipulate new data types, besides the primitive ones provided with the server. These modules are transaction manager, retrieve server, database manager, save server, and print server.

5. Access Methods

We are following the recent efforts directed at giving users direct access to HSOS database through the HSOS Web site. We will give users integrated access to world-wide distributed astronomical data collections. Our efforts will be directed to providing open access to the system by means of standard interfaces. In our view, this is the most effective way to maximize our system's utilization.

6. WWW & PHP-based Clients

We are currently prototyping simple WWW-based clients able to submit queries to the on-line system. These clients are implemented in PHP³. In this way, users are not required to install special client software and more interactivity is possible at the user workstation level. After this prototyping phase, we plan to design and build more sophisticated, intuitive interfaces to allow users to submit complete queries to the database, possibly in a graphical way.

7. PHP and MySQL

PHP has the following useful features:

- PHP is a server-side, cross-platform, HTML embedded scripting language;
- Much of its syntax is borrowed from C, Java, and Perl, with a couple of unique PHP-specific features thrown in. It has powerful database access functions. It is easy to learn;
- It has nearly all the features needed for building a Web site: designing objects, database access, network protocols, and security.

Its quick response time, multi-threaded nature, and transparency to the end user make it ideal for developing dynamic Web sites and applications.

The critical factors for a database management system are:

- Performance. A lot of clients can connect to the database server at the same time. Clients can use many databases simultaneously, and submit many queries;
- It should support SQL and ODBC;

²<http://www.mysql.com/information/index.html>

³<http://www.zend.com/zend/art/intro.php>

- Connectivity and security. Its database should can be accessible and shared by anyone on the Internet.

MySQL offers a rich and very useful set of functions. The performance, connectivity, speed and security make MySQL highly suited for accessing databases on the Internet. MySQL is a client/server system that consists of a multi-threaded SQL server that supports different backends, several different client programs and libraries, administrative tools, and a programming interface.

PHP and MySQL work with each other very well. Both PHP and MySQL are open source software. In combination with our Linux operating system, they form a ideal network database environment.