

IRRISOFT- A World Wide Web Database on Irrigation and Hydrology Software⁽¹⁾

**IRRISOFT-
Eine World Wide Web Datenbank für Bewässerungs-
und Hydrologie-Software⁽¹⁾**

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1. Introduction

The "information world" is dramatically changing as electronic means of accessing information are rapidly gaining importance. Not only has the desktop PC revolutionised information processing and handling, but the enormous growth of the Internet has increased the speed of international and intercontinental information exchange. The Internet, often called the Network of the networks, is growing exponentially. According to LOGAN (1995), it is estimated to reach 100 million users by the year 1998. The World Wide Web especially, with its user-friendly interface, forms an important base of information in the Internet. According to LYCOS (1996) approximately 18 million unique URLs (URL stands for "Uniform Resource Locator") have been registered and indexed according to their type and context (January 5, 1996 catalogue). LYCOS holds the largest Internet catalogue and is claimed to include 91 % of the World Wide Web sources.

The latest figures published by GRAY (1995) demonstrate the exponential growth of web sites in the world. As shown in **Figure 1**, the numbers of World Wide Web servers have nearly quadrupled from 23 500 to 90 000 during the last seven months.

The Internet and its powerful tools cannot be ignored anymore. Especially during the last two years, the World Wide Web has established itself as an important

⁽¹⁾ Presented at the Workshop on Irrigation Software and Database held at CEMAGREF in Montpellier, France.-22.01.-24.01.1996.

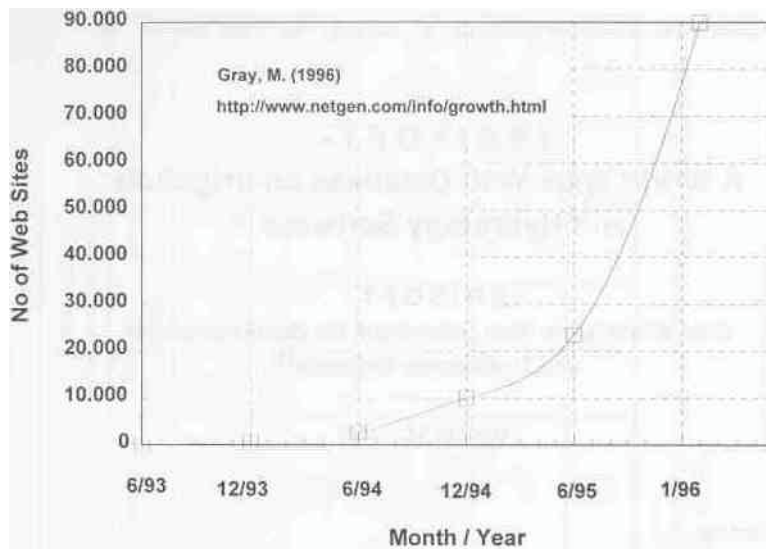


Figure 1: The world wide growth of web sites from June 1993 till January 1996. Graph created with data published by GRAY (1996)

means of information providence. Together with the other Internet services (Email, ftp, gopher and telnet), they form an important base for scientific and practical discussions and exchanges.

The possibilities of using these modern technologies to bring information on irrigation and hydrology software to the end-user and its potentials as a discussion and information platform are discussed below.

2. The IRRISOFT Database

IRRISOFT is an Irrigation and Hydrology Software Database which provides information on irrigation and hydrology software. In addition, metalinks to servers containing the software packages and further information are included (STEIN, 1996). As a World Wide Web Database, it extends the traditional sources of information and incorporates other Internet services, which together form a broad base for efficient information exchange and discussions.

The objectives of IRRISOFT are to give an overview of irrigation and hydrology programs available and to facilitate the retrieval and distribution of the software by establishing download or e-mail order facilities via the World Wide Web. Numerous irrigation and hydrology programs have been written by individuals, groups or companies and are available as public domain, shareware or commercial software. However, there is still a lack of easy and efficient information exchange facilities about new developments and products. This situation will be improved by the IRRISOFT - System. Beside information and software retrieval, IRRISOFT extends the traditional forms of information exchange and aims at the incorporation of discussion and feedback mechanisms. Besides this maintenance and support service, IRRISOFT allows the inclusion of knowledge and experiences of a broad group of practitioners and scientists working in the area of irrigation and hydrology. This may be achieved by discussions through e-mail postings on World Wide Web bulletin boards and discussion lists like IRRIGATION-L.

3. The Development of IRRISOFT

IRRISOFT was launched on the web in summer 1995. It was announced in the major technical Internet discussion lists like IRRIGATION-L, TRICKLE-L and AGRIC-L. Since then, links have been included in several technically-related servers like AGRIGATOR, DAINet, the Virtual Library IRRIGATION, and other government and commercial servers. Also the information on IRRISOFT is included in several general world Internet catalogues like YAHOO or LYCOS.

The IRRISOFT System is located at the University of Kassel and is maintained by the Department of Rural Engineering and Natural Resource Protection. It started with a few software description pages (SDP). Since then it has been steadily growing, reaching more than 75 software or model descriptions at the end of 1995. The service has been extended to include download facilities by the addition of the IRRISOFT aFTP-server (aFTP). A news section, an irrigation and hydrology software bibliography and a section on other related servers have been created and opened to the public.

IRRISOFT is frequently being accessed, reaching more than 100 different external servers (clients) per day. Every server accessing IRRISOFT generally reads between four and eight pages, which means that the information from approximately 400 to 800 pages is being transferred per day.

4. Structure of IRRISOFT

4.1 IRRISOFT Servers and Services

The IRRISOFT System is basically structured into three main servers or services which are graphically shown in **Figure 2**.

The HTTP-Server or World Wide Web server forms the base of IRRISOFT holding the main database information and interconnecting the three systems via a single user interface. It also forms the main gateway between IRRISOFT and the external world. The IRRISOFT-Server may be reached through the following URL:

<http://www.wiz.uni-kassel.de/kww/imsoft/imsoft.J.html>

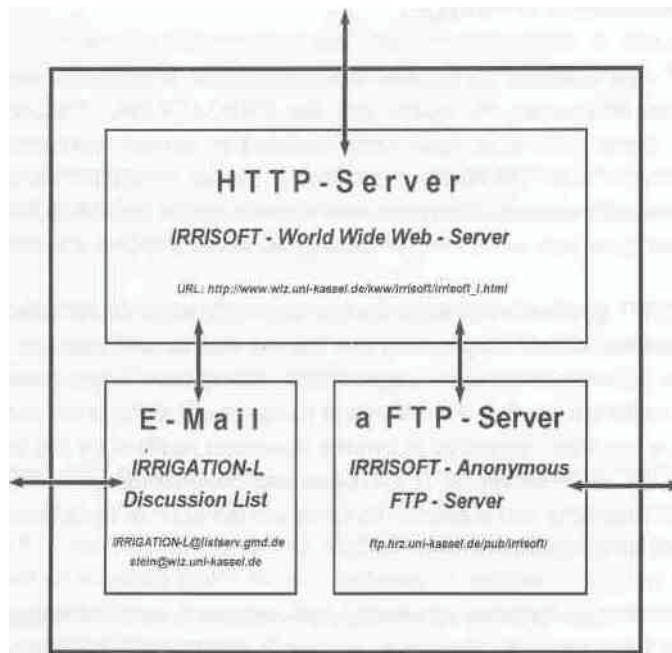


Figure 2: IRRISOFT structure in relation to the server and services provided. Main direction of access and information flow into, out of and inside IRRISOFT.

The IRRISOFT - aFTP- Server is used to store software packages and demonstration programs, which have been released to the public by the authors of the programs. Additional information, like documentation, stored in a non-html-format may be grouped with the corresponding software packages. All entries are directly accessible through the main IRRISOFT-WWW-Server. In Addition the aFTP-Serv-er may be reached by regular ftp (file transmission protocol). This is the only way of uploading software. Downloading known programs may be done by ftp or by using a World Wide Web browser through the IRRISOFT pages. The address of the aFTP-Server is:

ftp.hrz.uni-kassel.de/pub/irrisoft/

The third IRRISOFT component is the information exchange and discussion component based on e-mail facilities (named "E-Mail" in **Figure 2**). This has been implemented by adding "mailing buttons" to every information source, which allows a user to contact the responsible person or support service of the corresponding software package. Furthermore, direct links are provided to contact the IR-RISOFT-Administration from every page in IRRISOFT. A special bulletin section has been implemented to allow the posting of questions or information on the World Wide Web page via the IRRISOFT-Administration. A direct automatic posting in the World Wide Web, similar to that implemented in "news groups", will be implemented in the future. This will supplement the already existing e-mail discussion list IRRIGATION-L on irrigation and hydrology related topics. Links for direct subscription to IRRIGATION-L have already been implemented.

4.2 Database Structure and Information Flow

IRRISOFT is a World Wide Web hypertext and hypermedia-based database, which allows the combination and linking of different types of information (like documents, graphics, demos etc.) from different sources into one document. Since it is permanently linked to the Internet and its different resources, the information provided does not necessarily have to be physically stored on the same server and type of server (http, gopher, ftp etc.). This has the great advantage of allowing diverse types of information to be accessed and also allows the major part of the information to be stored where it is produced and maintained. Information can be updated as and when necessary. This ensures a high degree of actuality and minimum time delay in the presentation of new results and updates in the database. The database structure is therefore dynamic, steadily changing and

modifying its sources and appearance according to the actual needs and developments.

The main source of information of IRRISOFT are the Software Description Pages (SDP), which exist for every software package and include INFORMATION and LINKS to the corresponding local or external servers (where available). These SDP have been elaborated to give the maximum information in a compiled form, which allow a good overview and supports purchasing decisions. SDP are designed to be an open system allowing the inclusion of additional information and links. This extra information may be stored locally on the IRRISOFT-Servers (www, ftp) and/or externally on other providers' servers (www, gopher, ftp).

Storing information and programs locally on the IRRISOFT Servers as well as on external servers may seem to duplicate effort. But experience has shown that it is useful to keep information stored locally as well as information available from external sources. External servers may be down and inaccessible or the information transfer across continents may take a long time during busy hours. Splitting and partly doubling (mirroring) information and software download facilities improves the accessibility of information.

Once having "dialed" into IRRISOFT the user may stay on that server getting all the basic information they need and may then switch to the corresponding external server for extra or more detailed information or contacts. Even in the case of an external server failure, IRRISOFT should still hold enough information to allow informed decisions to be made by users and to provide traditional contact information (mail, fax, phone) as well as Email addresses and facilities.

Besides the pure information retrieval software, download facilities play a major role in the IRRISOFT concept. Establishing download facilities has the great advantage of supplying irrigation and hydrology software in a convenient, fast and cost effective way. Not only the time saved by directly downloading software should be taken into account, but also possible difficulties of transferring software on floppy disks across continents (for example into developing countries) should be considered. Offering downloadable software may turn out to be more cost effective, because packing, copying and handling costs are reduced to a minimum. Time saved may be invested in support and updates.

The IRRISOFT Database is generally accessed through the IRRISOFT Main Page which contains all relevant starting information and links to different information and services provided. The general IRRISOFT structure including the main

information sources and directions of information flow is shown in **Figure 3**.. Only the main and most important sources and directions of links have been listed. The hypertext based structure of the world wide web server allows numerous external and internal cross links to any document. Secondary and less important links and information have been suppressed in the graphical presentation of **Figure 3** in order to emphasise the main structure.

The Main Page is roughly divided into **six sections** - structured according to the type of information stored.

— **The 'General Information' Section**

containing all relevant information on IRRISOFT, its administration, objectives and descriptions of how the information sources have been collected and compiled.

— **The 'Irrigation and Hydrology Software NEWS' Section**

which holds information and links on subject related events like congresses, conferences or workshops or other important news like software updates, new developments etc.

— **The 'Software Index' Section**

is a thematically structured index of the main data sources stored in IRRISOFT. The index presently leads to eleven different pages which contain alphabetical lists of programs stored under their respective categories. Every software's name is included with a brief description to allow better pre selection. The main software categories of IRRISOFT are:

- Irrigation Systems Programs
- Surface Irrigation Programs
- Sprinkler Irrigation Programs
- Drip/Trickle Irrigation Programs
- Canals and Canal Network Programs
- Pipes, Pipe Network and Pumping Programs
- Hydraulic Structure Programs
- Irrigation Management Programs
- Drainage Programs
- Other Irrigation Programs
- Hydrology Programs

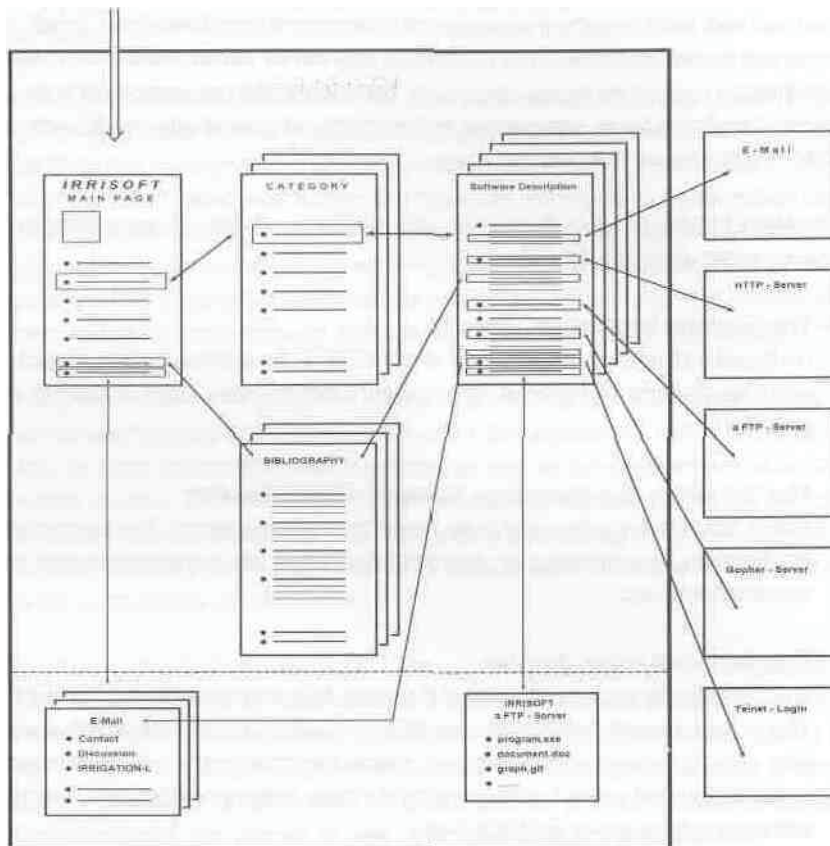


Figure 3: IRRISOFT information structure including primary links and interactions to internal and external sources and services.

These categories are dynamic as they may be **supplemented and modified** in response to future developments and needs.

— **The 'Additional Software Information' Section**

leads to information and links related to the database development. It allows a user to read lists of programs under development and to get information on submission of new programs to IRRISOFT. Furthermore, it leads to a locally stored Irrigation and Hydrology Software Bibliography.

The 'Other Servers with related information' Section

allows users to contact other servers holding thematically related information or to access the IRRISOFT aFTP Server.

-The 'Discussion' Section

forms the IRRISOFT discussion platform allowing the direct exchange of information between users. Questions, problems and experiences related to irrigation and hydrology software may be posted and discussed on the IRRISOFT pages or through linked mail discussion services. This section has been partly implemented already, allowing the subscription to the discussion list IRRIGATION-L and the posting of messages on the web through e-mail directed to the IRRISOFT administration.

4.3 Software Categories

The software has been categorised according to its purpose into eleven categories, listed under **4.2**. Taking into account the structure of the world wide web, and expected user preferences, the categories have not been strictly hierarchically implemented. A "flatter" structural model has been favoured by putting categories on the same level rather than adding "deep" structured "trees". Additional sub classifications have therefore deliberately been omitted preventing the users from "getting lost" in the links, back links and cross links of a world wide web server. This allows a reduction in the numbers of pages to be loaded before reaching the final Software Description Page.

Different structural systems may have to be implemented with growing numbers of software packages listed. BENZ and VOIGHT (1995a, 1995b) have shown effective ways of indexing file systems for the implementation of search interfaces on World Wide Web databases.

4.4 Structure of the Software Description Pages (SDP)

The IRRISOFT software information is based on Software Description Pages (SDP) which have been compiled for every program listed. They have been elaborated to give the maximum information in a compiled form. Besides traditional types of printable information, additional meta-information like links to local and external server, mailing "buttons", download facilities have been included. A graphical overview of possible and implemented links are shown in **Figure 2**.

The structure of the Software Description Pages has been undergoing gradual modification to improve the presentation of information. The following information structure potentially allows for the provision of large amounts of information, while still allowing for local and external extensions. The actual structure including a short description of every topic is shown in **Table 1**.

5. Conclusions and outlook

There is a considerable interest all over the world in sharing information on irrigation and hydrology software through the World Wide Web. IRRISOFT has shown the potential of offering this service by combining traditional types of information with web specific meta-information. It, therefore, may become a turntable for information and software exchange by bringing together the software providers and end-user in a time- and cost-effective way.

Looking at possible future developments, IRRISOFT will surely undergo structural, management and informational changes brought about by rapid changes on **the** Internet scene. This probably means that IRRISOFT will have to adopt other retrieval systems based on searchable indices. Generally speaking, the workload will increase with the growing acceptance of the new database. Other management and co-operation strategies will have to be introduced.

From the software developers' point of view changes will be necessary in the way products are marketed and distributed. The software development industry has to adapt to new methods of software distribution and management, which are already quite common in other parts of the software scene. This may be done, for example, by implementing software keys, which allow a free distribution of "locked-up" software packages over the net. After free testing of restricted versions, users can register with the software producer and the software may be unlocked to its full functionality by purchasing a software key.

6. Summary

The tremendous growth of the Internet, spreading all over the world, has opened up possibilities of fast and cost-effective ways of exchanging data and information over long distances. The user-friendly World Wide Web has revolutionised the handling of information and has created an ideal platform for the implementation of Internet databases. This paper shows the development of IRRISOFT - the World

Table 1: Structure of the Software Description Page for programs listed in IR-RISOFT

Topic	Topic Description
1. Name	SOFTWARE NAME
2. Keywords	Keywords describing the software package like: <i>Irrigation, design, management, etc.</i>
3. Categories	Main- and Sub-Categories <i>for the classification of the software packages. This section is mainly for future developments in the implementation of searchable indices.</i>
4. Contact	Contact Person: <i>Name, Mail Address, Telephone, Facsimile, Telex, E-Mail and URL.</i>
5. Abstract	Abstract: <i>A clear and precise description of the software functions and abilities. This section may contain further information by incorporating linked pages for explanatory notes.</i> Author of the Abstract: <i>Name, Institute or Company, Email.</i>
6. On-line Information, Purchase, Download	All additional available on-line information including internal and external links: <i>Features, Functions, Screen shots.</i> <i>Software price list.</i> <i>Software purchase.</i> <i>Software download facilities.</i>
7. Model Description	A model description verification.
8. Application Criteria	Target Group: <i>For whom this program is designed.</i> User Application Level / Knowledge: <i>Background information needed to run this program.</i> Program / Application Limitations: <i>This program is not meant to be used for / by ...</i>
9. System Requirements	Software
	Hardware
10. Source-code	Source code used: <i>Programming language used.</i> <i>Availability of source code.</i>
11. Price	Price and Maintenance
12. Other	Other types of information: <i>Time scale.</i> <i>Software use.</i> <i>Software environment.</i> <i>Unit system.</i> <i>Date of current version.</i> <i>Working language.</i> <i>The program contains.</i> <i>On-line help and functions.</i>
13. Documentation / Literature	Documentation accompanying the program and references describing the software package or its model sources.

Wide Web Database on Irrigation and Hydrology Software. It describes its structure and information flow and demonstrates how different Internet services may be combined to form a discussion and information exchange platform which will serve the irrigation and hydrology software user and provider.

7. Zusammenfassung

Das sich weltweit ausbreitende und exponentiell wachsende Internet eröffnet neue Möglichkeiten, schnell und effizient Daten und Informationen auch über große Entfernungen auszutauschen. Das World Wide Web mit seiner einheitlichen anwenderfreundlichen Benutzerschnittstelle hat hierbei die Handhabung von Informationen revolutioniert. Es bildet somit eine ideale Plattform, um weltweit allgemein zugängliche Datenbanken im Internet leicht verfügbar anzubieten. Dieser Artikel befaßt sich mit der Entwicklung von IRRISOFT, einer World Wide Web Datenbank für Bewässerungs- und Hydrologie-Software, die im Sommer 1995 im Internet eingerichtet und bekanntgegeben wurde. Neben der Datenbankstruktur und dem Aufbau der gleich strukturierten Informationen zu den einzelnen Softwareprodukten, wird auch auf die internen und externen Informationsflüsse eingegangen. Es wird aufgezeigt, daß durch die Integration unterschiedlicher weiterer Internet-Dienste IRRISOFT die Informationsform traditioneller Datenbanken erweitert und zur Informations- und Diskussionsdrehscheibe zwischen den Softwareanbietern und dem Endverbraucher wird.

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