

## “INFO1” – a File-Based Management Information System

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**Abstract:** *The paper presents a management information system for the research and development activity of the Institute of Information Technologies (IIT). The system is developed by means of a Java-technology and uses a file-based data structure following the annual reports of IIT in the period 1996-2001. The system interface, main functions and modes of operation are described.*

**Keywords:** *management information system, Java technology, file-based structure.*

### I. Introduction

It is impossible to imagine organization management without provision of many different kinds of information. The well-known solution for management decision support is the use of some computer management information system (MIS). The first computerized MIS are developed in the mid 1950's [1-3]. Until now the information needs and the computer technology breakthroughs influenced the development of many approaches to MIS among which the database approach is dominating [6]. The advantages of that approach are widely discussed but there are also some disadvantages that should be taken in consideration when a developing MIS solution is to be made. The flexibility and universality of the databases are paid with the high complexity of their developing, maintaining and using. The many years of practice in databases application show that their complexity could be frustrating for a typical manager not to mention the overall cost for developing and maintaining of the typical database. Special trained personnel should be used through all database life cycle, which means breaking the direct connection between information and its user. The database technology is probably the only solution for large corporations but let us remember that there exist middle and small organizations where that technology is not quite justified. For such organizations, the file-based approach to MIS could be more appropriate. This is particularly true for organizations with known and constant types of information needs. In those cases,

some specific file structures can be designed and implemented in software applications that can be directly used by the users through simple and intuitive menu-type interface. For example, management of research organizations needs a constant type of information about published papers and developed projects. That type of information can be well structured and stored in a deterministic file system.

Following these considerations an effective file-based MIS was designed and developed for the Institute of Information Technologies (IIT) of Bulgarian Academy of Sciences . The system was named “INFO1” and its capabilities reflected the needs of IIT to make proper decisions about middle and long-term scientific activities strategic planning and to supply Bulgarian Academy of Sciences headquarters with the different kinds of information slices reports they are periodically asking for.

The system “INFO1” was developed using tools of the file-based technology with implementation of original file structure, original search algorithm, original cripting algorithm and Java-technology. Requirements for portability through different computer platforms, for connection to global network Internet and for future expanding as a distributed information system using Internet as communication environment, influenced the choice of Java-technology.

**File structure** – it closely resembles the data structure. The file-based approach unlike the database approach has the advantage to follow the natural structure of the data. That results to some hierarchical tree (Fig. 1) which speeds up significantly the searching algorithm. The disadvantage is that the information system could not be used for applications with different data structure. The careful investigation of the end goals should be made and proper decisions should be taken. For the purpose of scientific management of the institution, the chosen file structure has proven its functionality.

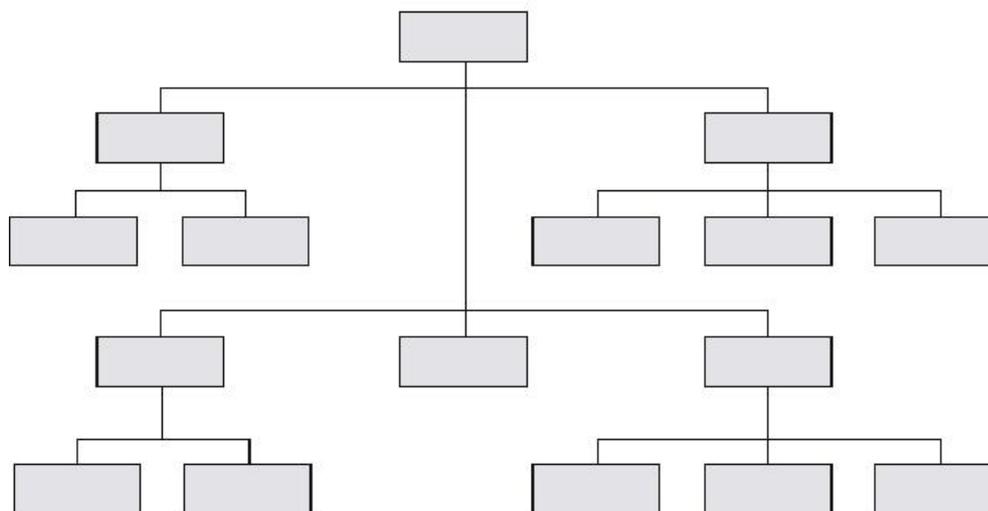


Fig. 1. Hierarchical Data Structure

**Search algorithm** – searching is going on after buffering the data and is based on character search, not on keyword search. That gives the advantage of searching any text up to some chosen number (up to 4048 characters in current application). The character limitation number can be as big as it is reasonable needed.

**Cripting algorithm** – the cripting uses stochastic and deterministic schemes which give a quite high degree of safeties of the stored data.

## II. Purpose and functional specifications

The information system “INFO1” realizes the following functions:

1. Storing of the available information for all scientific activities of IIT during the last 6 years (1996-2001) with the possibility to add information for the next years. Structuring the data according to the requirements of the Bulgarian Academy of Sciences headquarters.

2. Referring to the data stored by searching for any text up to 4048 characters. The system searches for references concerning an individual person, a department of IIT, or the institute as a whole with respect to different kinds of activity (publications, research projects, educational activity, etc.) for a fixed time-period (year or an interval of years). It is also possible to search in the resulted references without a limitation of the number of consecutive levels of searching.

3. Saving the search results in a user's file. The user can save search results in a specific system file format for subsequent work with it. Another alternative is to save the search results in common text format appropriate for word processing and creating reports and documents.

4. Printing the search results on the active user printer with current page and date information.

The system “INFO1” supports the following additional functions as well:

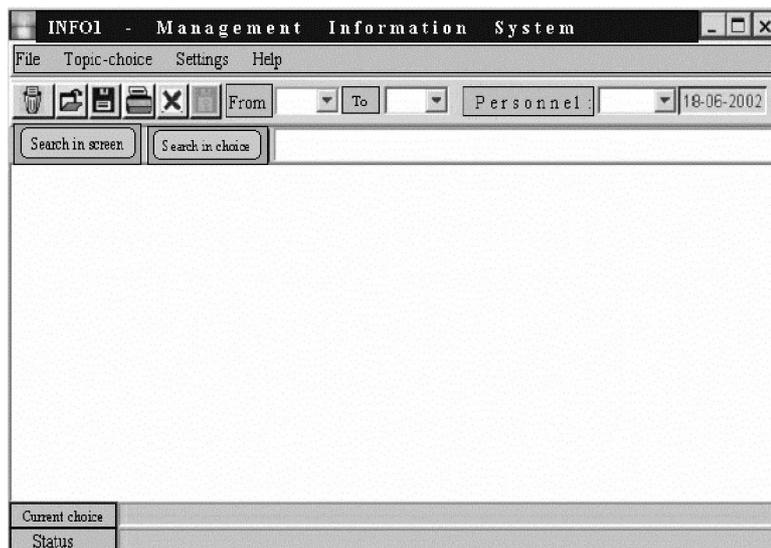
1. Storing of personnel information (lists of staff working at the departments and a complete personnel list of IIT for each year) and making personnel references.

2. Connection with the IIT Internet-home page using the default user's browser and connection to existing user's e-mail client.

3. Possibilities to change the size and color of the fonts used and the background color of the screen, according to the user preferences.

In order to protect the information, the system data are crypted and new data entering requires a special access to the system protected by a password.

## III. System's interface



The **Main Menu** is implemented as a standard “MS-WINDOWS” (all versions) window. It is shown in Fig. 2.

Fig. 2

The main functions of “INFO1” are activated by the following menus.

Menu “**File**”

- **Open of Info1-file:** opens a working file in system format that contains results from a previous search.
- **Save as Info1-file:** saves the text on the screen in a working file coded in system format. The user gives the filename and the system automatically adds the filename extension “.info”.
- **Save as text file:** saves the text on the screen in a working file coded in standard text format appropriate for any text editor. The user gives the filename and the system automatically adds the filename extension “.txt”.
- **Print:** prints the text on the screen on the activated printer.
- **Exit:** quits the system.

Menu “**Topic Choice**”

The user can select one of the following topics included in the annual reports of IIT:

- **Research projects**
- **Publications**
- **Scientific products**
- **Educational activity**
- **Experts**
- **International activity**
- **Contributions**
- **Scientific board**
- **Editorial boards**

Most of the above choices have submenus that follow the structure of the IIT’s annual reports.

Menu “**Settings**”

- **Font:** the user can change the size of the font used to show the text on the screen.
- **Color of the font:** the user can change the color of the font used to show the text on the screen.
- **Background color:** the user can change the background color of the screen.
- **Password:** required to change the system data or the password.

Menu “**Help**”

- **Help information:** opens a window with help instructions.
- **About:** shows information about “INFO1” and a link to the home page of IIT.

The following “combo-boxes” enable the user to select a year or an interval of years, and to search for some personnel information.

Box “**From**”

- It shows a list of years for which information is available in the system. The user can choose a starting year for search.

Box “**To**”

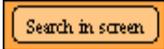
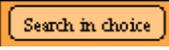
- It shows a list of years for which information is available in the system. The user can choose an ending year for search.

If the starting and ending years chosen in boxes “**From**” and “**To**” are different, the system will search in the data stored for the entire interval of years. In the case of searching for information within a single year, one of the choices is sufficient.

#### Box “**Personnel**”

- This box shows a list of departments and administrative units of IIT for a chosen year.

The most frequent operations can be activated by buttons:

- **Button**  clears the screen.
- **Button**  opens an INFO1-file (the same as the corresponding option form menu “**File**”)
- **Button**  saves an INFO1-file (the same as the corresponding option form menu “**File**”)
- **Button**  prints the text on the screen (the same as the corresponding option form menu “**File**”)
- **Button**  indicates non-accumulating search - only the results from the last search are shown. Clicking it changes the mode of search (see below).
- **Button**  indicates accumulating search – each search result is added at the end of the text on the screen. Clicking it changes the mode of search (see above).
- **Button**  starts searching in the text on the screen.
- **Button**  starts searching in the data corresponding to the selected topic.

The system enables the user to search for any text in a selected topic. The text to be searched should be written in the text field next to the search buttons. A text-bar “**Selected topic,**” indicates the current selection and the search results are shown on the screen. The “**Status**” bar below displays system and error messages.

## IV. Working with “INFO1”

### 1. Where to search?

“INFO1” gives the user three possibilities to choose where to search:

- a) To search in scientific activities, using the menu “**Topic-Choice**”, or
- b) To search in “**Personnel**” data, or
- c) To search in the text on the screen.

In all the cases the string of symbols, a word, a name or whatever is needed, is typed in the text-field next to the searching buttons. Searching in the data chosen by the menus is realized by pushing the button “**Search in choice**”. Searching in the data on the screen is realized by the button “**Search in screen**”. The result found is shown on the text-area below. If there is no entered text for searching, the all-stored data corresponding to the choice is shown.

## 2. How to search?

There exist two searching modes – searching **WITHOUT** or **WITH** accumulation of the results.

Searching **WITHOUT** accumulation is the default mode. In this mode, the new search result replaces the existing text on the screen. If there are not any records containing the searched text, the screen is just cleared. The corresponding mode-search-button is animated as .

Changing the default mode to searching **WITH** accumulation is set by click on the  button. As indication for the accumulation mode the button animation changes to . In that mode, each new search result is added to the text on the screen. The next click on the button changes the mode back to the search **WITHOUT** accumulation indicated by .

## V. Conclusion

The developed technology for information systems design could be used in any areas [4-5], where the information structure is known and is relatively stable, and the simplicity of using, maintaining and actualization is required. The easiness of using makes it a good choice for small or middle size organizations and for individual persons also. The technology is adoptable and extensible to any specific requirements where database approach is not necessarily needed. The example of its implementing as system “INFO1” shows that it fully satisfies the stated requirements and meets the management expectations. Currently, the system “INFO1” is in regular use in the Institute of Information Technologies, BAS and a new version of the system is developed for the Central Laboratory of Higher Geodesy, BAS.

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## “INFO1” – файлово базирана мениджърска информационна система

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### (Р е з ю м е)

Статията представя разработената в Института по информационни технологии – БАН, информационна система за научно-изследователската и развойната дейност на института. Системата е изградена със средствата на Java-технология и се базира на файлова структура на данните от годишните отчети на института за периода 1996–2001 г. Описани са системният интерфейс, главните функции и режими на работа на системата.