PUBLISHING HTML AND LaTeX ON-LINE DOCUMENTS

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Abstract: *Scriptrunner is a program for remote execution of your programs written in various programming languages and mathematic tools and publishing of interactive documents, like online books, manuals etc. It is a Web application based on the client/server technology, so only browser is needed for work in a user-friendly environment. Besides using HTML editor, writing of books, textbooks, scripts and similar is possible in LaTeX (MathML) form which is converted into pdf document. LaTeX toolbar has a standard LaTeX tags for matrices, fields, bullets etc. and a pop-up window for a number of required symbols. Desired string is entered in the place of the cursor by clicking on its symbol. Source code is transferred into PDF document, which appears in the browser window and can be printed or saved on a local computer.*
Scriptrunner is an educational tool intended for all courses that use mathematics and computer programs, so the possibility of its usage is fairly wide.

Keywords: *LaTeX on-line, mathematics publishing.*

1. INTRODUCTION

The World Wide Web has given educators unprecedented opportunities to provide information to students both within their own classes and around the globe. This paper describes the development and implementation of the interactive learning tools which should be used in courses of mathematics, informatics and automatic control at our Faculty [3]. The need to provide students with both a strong theoretical base and engineering ability is a major challenge for education. Theoretical issues, typically related to mathematical techniques, can be well taught in the ordinary classroom style. Engineering ability, on the other hand, requires insight and intuition, which are not so easy to convey. To join these two requirements and make learning math and engineering technics easy to students, we have developed Scriptrunner computer program, which can be accessed through the Intranet or Internet.

Scriptrunner [2] is a Web application that enables editing and remote execution of the computer programs written in various programming languages. It also enables creation of the interactive e-books that can contain ready-to-run programming examples. These examples can be displayed either as an editable source code or as an executable file in such e-books. It is possible to change the input parameters of programs, thus creating the opportunity for the users to experiment. The e-books can also include images, equations, tables, etc. with automatic renumeration support.

Scriptrunner supports writing and execution of programs written in standard programming languages: C/C++, Pascal, Fortran, Java, JavaScript and PHP which are all executed using open source (GNU) compilers. It also supports programs for a variety of professional mathematic tools, both open source

(Octave and Scilab) and commercial (Matlab and WRI Mathematica). You can run a program written in source code in your browser by selecting an appropriate compiler and clicking on a 'Run' button.

Scriptrunner is built using PHP/MySQL programming languages, and also uses JavaScript in the graphics interface. It is designed to run on Linux system.

Since Scriptrunner is a Web application built on client/server technology it is surprisingly easy to use - all you need to have is a Web browser. Every user has his/her own work environment and all settings and files created during on-line session remain on the server for the next session. There is also a 'Public Files' folder where users can publish their files for others to see and execute.

The administrator has the privileges that enable him/her to create or remove users, administer user's permissions and published documents. This is also done through web graphics interface.

The primary purpose of the Scriptrunner is in the field of distance learning, especially for courses in which supported programming languages are used. It can also be used for creating the databases of computer programs, collecting the interactive on-line textbooks and tutorial etc.

2. THE REMOTE FILE SYSTEM

Your programs and interactive documents are stored on a remote computer (server) on a built, specially developed, remote filesystem. The user interface is similar to that of the MS Windows Explorer program (see Figure 1).

Folder tree structure enables marking, renaming, deleting and moving (with all subbranches). Besides folder action frame in the GUI, also rightclicking the folder can be used for the most common actions.

In Scriptrunner there are two folder types and two file types. Their understanding is very important for proper use of Scriptrunner.
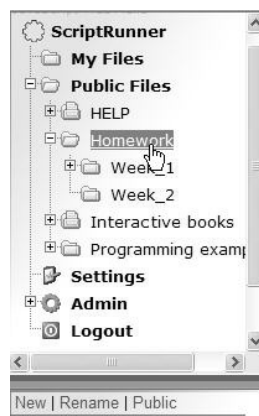

Figure 1. The remote file system

2.1 FOLDER TYPES

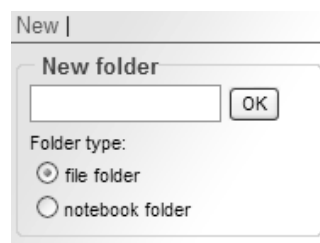When making a new folder (see Figure 2), the type is selected in the Folder actions frame.

Figure 2. Folder type selection when opening a new folder

- *File* folder contains only the folders of various formats and types. Within it, the operations which involve files can be performed, i.e. file making, erasing, starting, etc.

- *Notebook* folder has all properties of the *File* type folder, with addition of text; therefore it is primarily used for writing of on-line interactive documents, like books, scripts, tutorials, helps, etc.

The folders are also distinguished for the icon in *Tree frame*. The file folder always has an icon , while a *notebook* folder has an icon or some other, as per user's preference.

2.2 FILE TYPES

In Scriptrunner there are two file types:
- *Disk file* is a file which is in some of the folders on the server where Scriptrunner is installed. It is an ordinary file which can be any type, e.g. picture (.jpg, .gif, .bmp), text file (.txt, .doc, .pdf) or archive (.zip, .rar), for which the rules and restrictions of the operating systems where Scriptrunner is installed (in our case it is Linux) are valid.

- *Source file* is a file which is not placed in some of the folders on the disk, but is stored in MySQL base. Description of the file-program, command line parameters, program language used for starting can be stored along with any of the files which are stored in the above described way. In this case, there are no restrictions related to the file names and more files having the same name can be stored in the same folder. The reason for it is the fact that each *Source file* has its own identification number. It will be particularly useful property for writing of interactive books where such the files can be called.

When working in Scriptrunner it is recommended to use Source files as much as possible, as work in them is simpler and faster. Disk files can be used in cases when the finished solutions which can be used are already available, where all conversions in Source file would be difficult and long-lasting. In the file list within some folder, Disk files are grey-shaded.

3. ON-LINE HTML DOCUMENTS

A very interesting possibility provided by Scriptrunner is writing and publishing of the digital books [1]. That possibility spreads usage of Scriptrunner to a much wider range than program running and working in program languages. Moreover, each such book becomes 'live' because the programs with the preferred, regularly different, input data can be called from it.

As Scriptrunner is a new program (although we have been developing it since 2000), only two books with it have been written by now (for PMF and FSB, Zagreb). However, the interest for it is ever growing, not only in, but also out of Croatia (the conference in Lugano [1], Switzerland and presentation at FernUniversität in Hagen support this standpoint) and there is an option for using Scriptrunner at several universities. Now, development of the 4th program version is underway.

The document (book, script, handbook) in Scriptrunner has numeration of tables, figures, equations, expressions or other objects together with their assigned references (references to objects). When the final document is created or published, re-numeration of titles and quoted objects and their references is also possible.

It is usual to split a book or a document into chapters and subchapters. The same way, each chapter and subchapter in Scriptrunner are wholes.

Organization of the document can be performed by means of the notebook folder which, besides the files, contains the text as well. That text matches the text of the chapter of a certain book, while the folder matches a document chapter. A document structure is made using a tree frame. Each branch represents one (sub)chapter.

Figure 3. Organization of a document

Each document can have one or more folders, i.e. (sub)chapters. The folder arrangement can be tailor-made; the user can make the document at his convenience. Any folder action can be applied to the notebook folder, i.e. move, delete, rename etc, which enables later restructuring and modifying of the document.

Writing of books, textbooks, scripts and similar is possible using two on-line ways:
- in LaTeX (MathML) form which is converted into pdf document
- in HTML form, which can have interactive (live) programming examples.

3.3 BEGINING OF THE BOOK

A book structure begins with the highest element in the folder tree. On Figure 3 it would be a folder with the name «knjiga 1». The user himself specifies what a whole in Scriptrunner is. He declares a branch to be a root, i.e. the document title, where there are all chapter sub branches with the related subchapters.

3.4 CONTENT INPUT

The left click on any *Notebook* folder will open that map in *working frame* (see Figure 4). The text is entered into the frame which is opened by the editor.
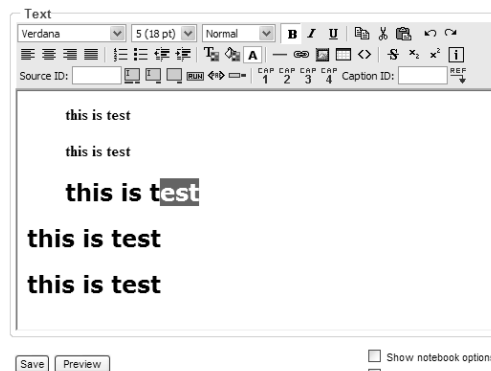

Figure 4. Editor for text entering in the notebook

In the editor head there are standard buttons like those in Microsoft Word. It are: selection of the font size, font type, standard style, font appearance (bold, italic, underline), copy, paste, undo, redo, text alignment, listing, letter color, superscript, subscript, table drawing, etc.

As it is a HTML editor, the entered content is formatted by HTML code.
In front of the editor there are *Save* and *Preview* buttons.
- *Save* saves the changes

- *Preview* only displays how the document will appear to other users if it is published in *Public files* folder. The presentation is different, as the references and designations will not have real values and, if there is a reference to the designation which is not in the currently opened folder, it will not have any value.

User's documents are always opened in the editor, but if they are published (in the *Public files* folder); they are opened as read-only.

The documents written in Scriptrunner can be interactive. In this case it means that the forms with a program code which can be executed from a document itself can be inserted in the documents (books, scripts…). Also, if allowed, the reader can enter his/her code or change program code in these forms. That possibility spreads usage of Scriptrunner to a much wider range than program running and working in program languages.

In the published documents all captions objects and their references are given exact marks, depending on the number of the chapter and subchapter.

In case of erasing the particular chapter or inserting an additional chapter, all the objects are automatically re-numerated. This is a major feature of dynamic workbooks.

The personal settings are set in the *Settings* folder. Each Scriptrunner user can adjust certain properties related to appearance of the user interface, in accordance with his needs.

It is recommended that all the data which are used in the text of a chapter, i.e. in a *notebook* folder, are in that folder. This is not a must, but is a practical advice for publishing of the final document (book) and for performing of the possible later changes

4. ON-LINE LaTeX DOCUMENTS

LaTeX toolbar (see Figure 5) has a standard LaTeX tags for matrices, fields, counts etc. and a pop-up window (see Figure 6) for a number of required symbols. Desired string is entered in the place of the cursor by clicking on its symbol.
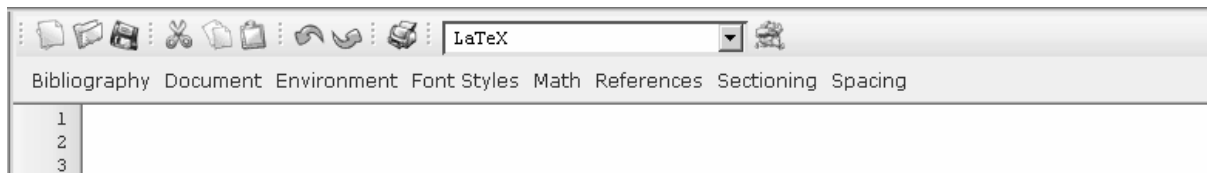

Figure 5. LaTeX toolbar

LaTeX documents are saved on the database named as the file. By choosing LaTeX-pdf option in the drop-down menu, source code is transferred into pdf document, which appears in the browser window. Pdf document can be printed or saved on a local computer.
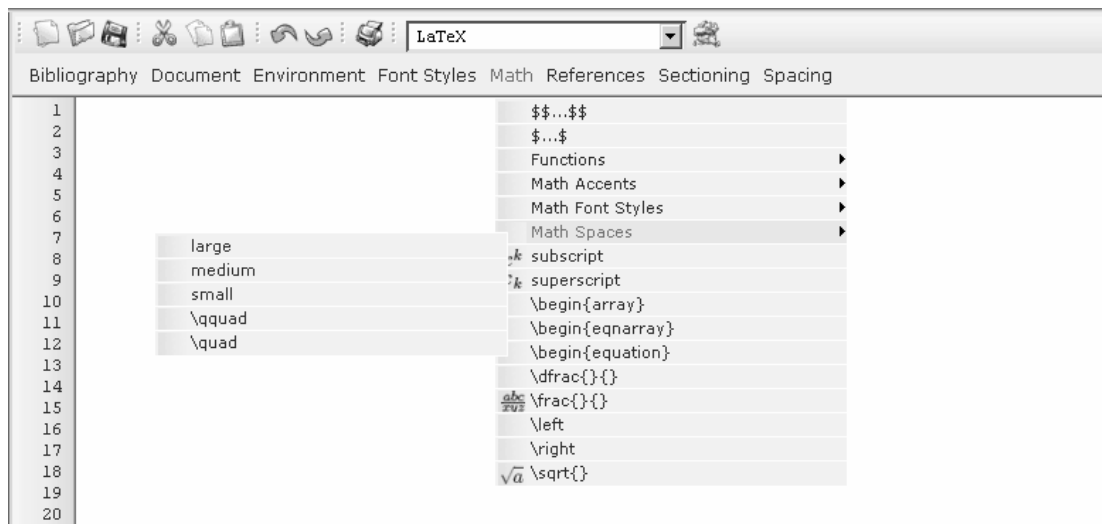

Figure 6. Drop-down menu

5. DOCUMENT PUBLISHING

As already mentioned, document publishing is performed in *Folder actions frame* by clicking to *Public*.

Figure 7. Folder publishing

When the document is ready for publishing (all options in the document maps are set, all text is entered, etc.), the procedure is following:

- As first, the main document folder shall be opened (root, root folder), so that it is a currently open folder.
- Then, the user shall in *Folder actions frame* select *public* frame which he/she considers to be the best match to the document content.
- Switch on the option *include all subfolders* if the document for publishing contains the subfolders. At the end the user should click on the button *OK* (see Figure 7).

After publishing, there will be a message in the status line saying that the folder has been sent to an administrator in order to approve its displaying in the *public files* folder. The administrator shall estimate whether the folder is suitable for publishing. The administrator can prior to publishing change the folder which the customer intended to use for publishing of the document, as well as change some settings within the document, if he considers it to be necessary.

The user which is an author of the published document has no further authorizations for its changing. The published document in the *Public files* folder is actually a copy and is fully independent of the original document in the user folder *My files*.

6. CONCLUSION

We believe that the Internet will completely change present learning methods: reading, learning and exercising. The new distance learning will be based on interactive, self-paced learning with self-examinations. Internet is a wonderful medium for these requirements. Therefore, we have implemented these ideas developing the Scriptrunner program http://coma.fsb.hr/scriptrunner3/ on our Web site. It shows the full power of all three keywords: hypertextual, live & interactive.

In this article, only one, among numerous features of Scriptrunner program, is described – the feature for on-line generating of the mathematical script. The user has an opportunity to do it in easy way through Internet, not using commercial programs, like WinEdt, ScientificNotepad, MathType, MuPad etc. A novelty in the Internet world is that Scriptrunner enables importing of any computer program, written in any program language, into the mathematical document. Reader of the document can run the program and modify its input parameters. It gives a new dimension to writing and publishing of the handbooks and scientific papers today.

7. REFERENCES

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