

Web-based encyclopedia on physical effects

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ABSTRACT

Web-based learning applications open new horizons for educators. In this work we present the computer encyclopedia designed to overcome drawbacks of traditional paper information sources such as awkward search, low update rate, limited copies count and high cost. As well we intended to improve access and search functions in comparison with some Internet sources in order to do it more convenient. The system is developed using modern Java technologies (Java Servlets, Java Server Pages) and contains systemized information about most important and explored physical effects. It also may be used in other fields of science. The system is accessible via Intranet/Internet networks by means of any up-to-date Internet browser. It may be used for general learning purposes as well as a study guide or tutorial for performing laboratory works.

Keywords: web-based learning, Java technologies, physical effects.

1. INTRODUCTION

Nowadays the role of information technologies in education process increases significantly. Increase of computer amount in educational institutions and wide spread of local and global networks may explain it. Traditional information sources (handbooks, text books, manuals) have a number of drawbacks, such as complicated and prolonged search, low update rate, limited number of copies, rather high cost.

By use of Internet a learning process can be improved and transferred to the new level. Web-based systems make learning more convenient and flexible as they may be used from anywhere at any time. Many people turn to online learning to maintain their job skills and employability [1]. Web-based tools have provided educators with an opportunity to incorporate new technologies into their courses. There are examples of Web-based learning systems from mechanical and electrical engineering [2–3].

However, Internet systems have their own shortcomings, such as difficulties of relevant search, different material quality. Moreover, the fact that often information from one field of science is located on different sites results in additional problems of systematization and comprehension.

Our aim was to create an application that contains and provides access to systemized information on most important and explored physical effects that is free of described problems. The system must provide its user with comprehensive information, fast search and convenient interface.

In this work we present two complete systems and currently developing project, their features and appliances.

2. DEVELOPMENT HISTORY

The first version of system was Delphi-coded application. It runs on single computer and therefore needs no network connection. The application provides textual information about effect accompanied with bitmap images. The information on every effect is divided in number of categories, such as effect definition, explanation, physical conditions, parameters, technical characteristics, links, formulas. Each category is represented as tab, so user can easily view only necessary part of information on effect. Every effect is accompanied with up to two bitmap images that contain various plans, diagrams or graphs.

The application has built-in tool for database editing. Users may change content of each tab as well as add/edit/replace attached images. There are a few dozens of physical effects currently in database. The application runs under Windows95/98/NT/2000/XP. The minimum RAM is 16 Mb, however 32 Mb RAM is recommended. Screenshot of first version's user interface is presented at Fig. 1.

The next generation of project was web-based system. It has some advantages in comparison with local application. The system uses client-server architecture and is accessible via Intranet/Internet networks, thus providing wide audience of users with necessary information. This fact also significantly extends opportunities of data verification and operative information update.

For development, the cross-platform PHP programming technology was chosen. We use MySQL database, as it is fast enough and free for non-commercial projects. The system consists of administrator and client parts.

The administrator part is used for database management and system maintenance and client part is used for getting the information on physical effects.

A user can access the administrator part via authentication process (entering login and password). If the user is recognized by system, the user session starts. User session is a process that runs of server side for the certain time, after which it automatically closes. The session contains some variables required to validate user's requests to system pages. Thus, the user who tries to get a direct access to controlling resources will be rejected. Each administrator page includes the file that verifies if the user is authorized to access that page.

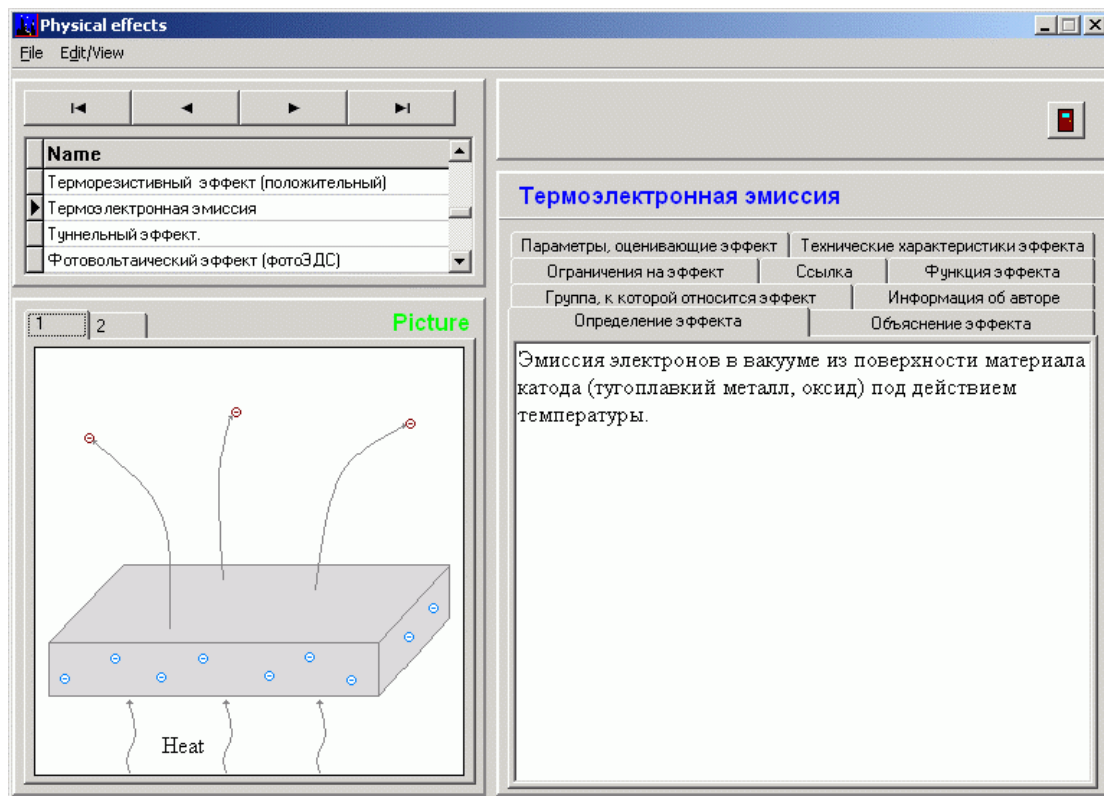


Fig. 1. First version of program

One of the most important feature that administrator can use is data input. The information in the system is structured, i.e. the section to put physical effect in must be defined before actual input of data. Sections are managed by administrator.

If the section does not exist, you have to create it. Then you can fill effect data fields. All fields are in the single standard. Each effect has: name (title); definition; explanation; characteristics; parameters; limits; bibliography; function; author. Some fields may be left empty.

The system allows entering not only text but also images for effect definition and characteristics.

Besides that, the administrator can edit section names and effect descriptions. In the system, there are functions for section and effect removal. If deleting non-empty section, all contained effect descriptions are removed too.

The client part provides following features:

- View all effect descriptions in a sorted order
- View sections
- Fast search on all fields
- Quick jump to effect description

The system was successfully tested on Windows- and Linux-running computers. It is used in the learning process at the Radio Physics and Electronics faculty of Belarusian State University. The testing performed has shown that the system is flexible enough and is not critical to computer's hardware.

3. CURRENT PROJECT

New system, called Edia, has a number of enhancements in comparison with previous version.

First, the system is designed as a universal one. That means it is not limited to physical effects only. For example, the system is also intended for use at the Faculty of Applied Mathematics and Informatics of Belarusian State University.

Database records are no longer restricted to predefined set of fields. Instead, we use the concept of article as basic informational element of the system.

The structure of information stored in the article is flexible and not strictly predefined. As it was in previous system, articles are arranged in sections that make up a hierarchical structure. Each article has: title, keywords, author info, last update date and contains one or more tabs. Tabs represent the article structure in a convenient way and thus improve its comprehensibility. It is the article author who specifies tab names and count. Tabs may be edited after the article is added to the system.

Textual material of article is stored in HTML format instead of plain text. This provides authors with wide range of formatting available to represent information in the best way.

The system supports file attachments to each article. That is, tutor may upload not only textual data but also a set of images, other multimedia data or any other file. It is possible to refer attached files in the article's HTML code. This provides an opportunity to display articles with inline images, video and audio clips and considerably improves material perception.

All attached files are stored in database and are accessible via servlet that performs security check. Any uploaded file may be referenced by a simple URL (like <http://edia.by/files/FileName.jpg>). The article that file concerns to is identified by article's identification number stored in the user session.

The next feature is the comments subsystem. Any registered user can leave his/her comments on article or view other users' comments. That may be questions, answers, suggestions or whatsoever. Those allows establishing of a discussion and further material improvement.

The structure of system's page is at *Fig. 2*.


		Article title
<u>Main</u> <u>menu</u> <u>items</u>		
<u>Context</u>	<u>Tab names</u>	
<u>menu</u> <u>items</u>	Current tab content: html-formatted text and images	

Fig.2. The structure of Edia page

The search system allows finding required material by its title, keywords or by author name.

Keywords of all articles contained in the database are collected in glossary. Every keyword is a hyperlink to corresponding articles. Having clicked a keyword in the glossary, the user gets a list of articles that contain that keyword. Then he/she can click the article required and view it. Thus, needed article may be easily found in two clicks only.

The system provides an interface that allows user to perform following actions:

- register in the system;
- remind password;
- view informational articles;
- view, add or delete article comments;
- search with glossary;
- find an article by title, keywords or author;
- view/add/edit/delete sections and articles;
- manage users of the system.

There are four user groups that have different rights.

- Guest (unregistered user). He/she can register or logon in the system.

- Student (registered user). He/she can search and view articles, add and view comments on the articles and change own profile.
- Tutor (registered user). He/she can add new articles into selected section and edit own articles.
- Administrator. He/she carries out user and section management and performs tutors registration. An administrator can add, edit or delete any data contained in the encyclopedia.

The system was designed in Rational Rose 2000 using modern object-oriented technologies. For development, we use up-to-date Java technologies such as Java Servlets 2.3 and Java Server Pages 1.2. Database structure was created in ErWin 4.0 and MySQL 3.23 database is used as data storage. The use of these development tools provides easy porting to various operating systems and reduces installation and deployment time.

The system is currently under construction. User and security management subsystems are already implemented and work. Project will be complete by the end of September 2003.

To take advantage of the system a user must have only conventional Internet browser (e.g. Internet Explorer or Opera) that may be easily found on any modern computer.

The system is intended for use by pupils, students and tutors. It may be used as study guide or tutorial and for general learning purposes as well.

4. CONCLUSION

In this paper we presented the history of development of the "Physical effects" encyclopedia and described its last version. There are two currently working systems and the last version is under construction now.

The current version of the system is universal and may be used in many other fields of science. The system is intended for work in Intranet/Internet networks. It may be used by means of any up-to-date Internet browser for general learning purposes and as a study guide or tutorial for laboratory works as well.

The system is to be used at the Radiophysics and Electronics faculty, and the faculty of Applied Mathematics and Informatics of Belarusian State University.

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