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Databases for physical magnitudes

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Abstract

The construction of database for physical magnitudes is shown. The architecture of the client-server type is used. The Linux Red Hat 8.0 system is exploited as the software platform. The Apache server, served by PHP programming language and cooperating with database MySQL type is used.

The created database is accessible by Internet and makes possible access to information about the global properties of atomic nuclei.

1. Introduction

Quick obtaining of information became possible because of wide development of computer techniques and with appearing of Internet. It is possible by using only personal computer connected with World Wide Web. Nowadays man has an access to a large range of information existing in modern science. Present times require delivering those all information from the source to the computer users. It must be done without errors and as quick as it is possible. The essential aspect is the method of the data presentation, which must be interesting and encouraging for the user of the net for further research of problems. Modern databases are featured by foregoing properties and the example of this kind of database is the one described in this article.

Well ordered set of information and software, which is able to operate on it, we are called database. Depending on the places of existing and the manner of reaching its files, we favor three kinds of databases:

- Local – databases and applications which are making the access to the database possible are only on the one host. For example MS Access
- With shared file database – those databases work as local ones except that several hosts are accessed to its files. For example a few computers connected with the Ethernet network in one corporation

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- Client/server architecture - like the above; database exists on the server and we can get the access from the whole World Wide Web. Users (in further parts of article called clients) have access to the database by web browser so it is not necessary to operate directly on its files. From here all discussions in this article will concern databases in this kind of architecture.

Today requirements in information delivering from the Internet are very high. So the most popular model of databases is a relation model. In its theory basic database magnitude, such as: table, records, fields and relations between them are defined. Structure of activity and obtaining the results are dependent on organizations and environment where servers and web browsers work.

The most important aspects of databases theory are presented in the first part. In the second one the author considers two most popular operation systems, and problem of choice of one of them. The last part contains description of database for physical magnitudes, which is the example of the way of creating that kind of applications.

2. Organization of relational database

The most essential element in the database projecting process is determining the aim of existing of this kind of application and the manner of using it. Correct organization will assure safe activity. In time of creation process programmers must use normalization forms. These are theoretical rules that determine all standards that must be used in each database. We can find them in many publications concerning the database theory [1].

In physical uses except textual information also mathematical elements appear, counting and sending the information from the server to the web browser. So to operate on client-server architecture we use advanced programatic techniques, which make possible for us to create the professional applications. Those are languages able to service web browsers, making connection with the database possible and letting modification of database. Those languages also let us receive answers to the questions. Preventing making changes in important files by users is prevented. Also particular safely created files structure exclude appearing of errors.

In Polish conditions the crucial factor of choosing the operating system are costs. Two most popular operating systems are MS Windows [2] and the Linux [3]. All science servers are based on Linux system, because it is free and many programmers say it is better than Microsoft Windows. Only big corporations are rich enough to buy Microsoft Systems and other Microsoft applications to keep the system in good condition.

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3. The choice of environment for working with database

Windows and Linux platforms are equipped with the components that make working with database in the client-server architecture possible.

Table 1. The most popular database components

Databases	Servers	Languages
PostgreSQL	Apache	PHP
MySQL	IIS	Perl
mSQL		Java Script
Oracle		VB Script
Sybase		

The choice of the software is each programmer's individual problem. Acquaintance of created database, application and particular language should be taken into consideration. The author chose Apache server [4], served by PHP [5] and cooperating with database MySQL type [6]. It works with the Linux Red Hat 8.0 system. All software is delivered free and made available in the Red Hat Linux distribution. This is the reason why many programmers work with this system and there is much precious advice describing the use of Apache, PHP and MySQL in the Internet.

In the above application the basic language for creating web sides called HTML [7], cascade style sheets CSS [8] formatting appearance of sides, and the Java Script [9] (for many interesting effects) are used. Thanks to connecting HTML files with PHP and the Java Script [9] instructions, visual interesting application was obtained.

During installation of the Linux (Red Hat 8.0) system, the best solution is to choose all database components because we don't want to have a problem with inexplicable errors appearing in the application compiling process.

The situation when even in spite of possessing necessary programs working with database can take place. The administrator should do himself configuration process himself. That's why servers Apache and PHP should be configured correctly. Server must recognize the used language and create the possibility of servicing the databases with the webside started in the web browser.

Unfortunately, installing Red Hat 8.0 system doesn't guarantee any effect and depending on the versions of database system or language the administrator must configure the system. An important fact to remember is that each change of configuration must be ended with restarting the server. Restarting system is not necessary.

The best test of system is to write and execute the short file: index.php:

<? php phpinfo();? >

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If the configuration process is carried out correctly, the information table about PHP should appear. But if instead of the assumed web side the announcement about impossibility of connecting with the side or the source code will be shown, it will mean failures in configuration or installation of the Apache and PHP server.

It's worth knowing that the contact between the WWW side and the database is possible by using CGI (Common Gateway Interface), which allows for access to databases placed on the server side and sends the results of query to the web browser [10].

The next step in creating database application is MySQL base service. It is also possible by using the client programs [11]. With their support we can do any changes which also the SQL language makes possible. Comfortable graphic interface makes working with database easier.

4. Creating the database

The aim of our work was to create the database for all experimentally known nuclei, which would work in the client-server architecture. Such database exemplifies a reliable source of information for the persons who are professionally busy the nuclear physics. In particular, the database would be an excellent data source for physicists, and simultaneously the "visiting-card" of the scientific researches of our Institute.

In the created application all norms and laws concerning the problem of creating the databases are taken into consideration. On the server site the tables containing users of database, and those with physical properties of atomic nuclei are placed.

In the first stage of the creation of database the tables describing the global features of nuclei and relations between them were created. We want to place in database the following properties of nuclei:

- atomic number Z and neutron number N
- masses of nuclei in different models,
- spin of nuclei in the ground state
- parity of nuclei
- experimental and theoretical estimations of the mean square radii <R2>
- experimental and theoretical estimations of the lifetime of nuclei with respect to spontaneous fission, α-decay and electron emission and capture

The largest problem was placing about three thousand records, because that's the number of present known nuclides. The data about the nuclei were taken from many experimental sources and from the Audi - Wapstra tables [12].

Additionally, the client who uses the application which makes mathematical operations can receive the values of binding energy, β - disintegration energy,

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separation energy of the last proton and neutron and the heat of particular reactions.

With the aid of the Internet explorer every user can extend his own participation if he wants to be able to use the databases. Next after getting down to the main page and loging in, the user reaches the form (fig. 1) which enables sending questions.

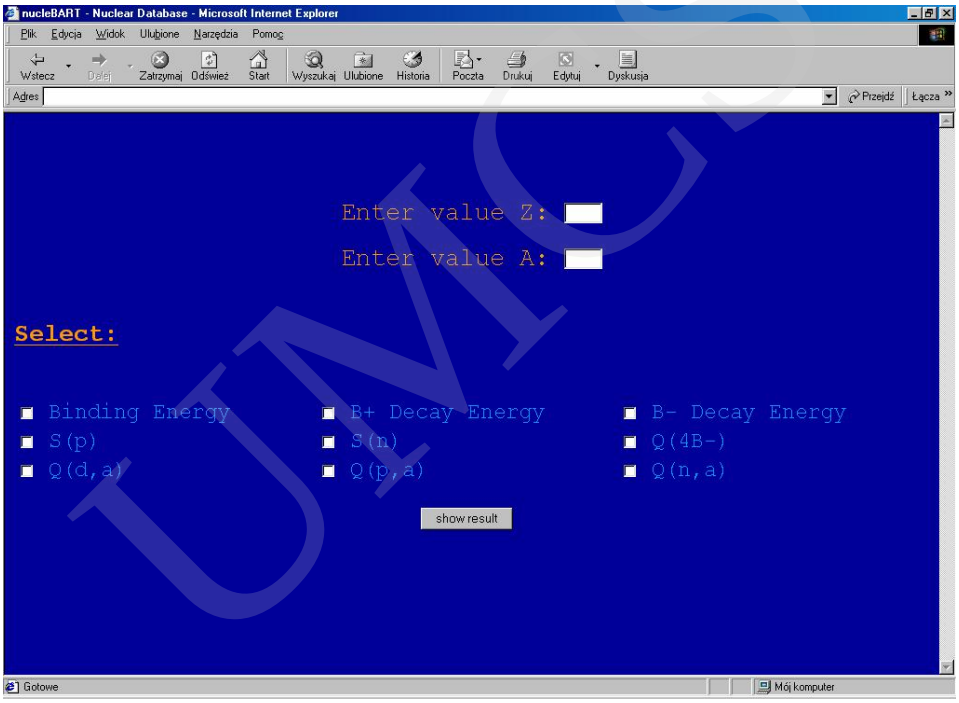

Fig. 1. The form designate to sending a question

The forms are created clearly and filling them doesn't pose a problem even for the novice users.

The registration to read all information from the file in turn and choose the necessary ones to place them in database was introduced. The important fact is that the database will be successively developed. The most current experimental data and nuclei features will be placed there. In another stage the application was created in the way, where the client is able to receive results of the problems asked by himself.

It's necessary to remember that the pages of the access must be correctly visible in each sort of Internet explorers. The standards of fonts for the most popular explorers like 'The Internet Explorer' and 'The Netscape' (in Linux – Mizilla system) are different. One file in HTML format can possess a different

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view in those two programs. The returning function of the sort of used explorer was applied and suitable programmatic procedures caused that the differences in the two mentioned operation systems are missing.

The next crucial thing is to create the process of authentication of the users. Thanks to this the administrator has a full right to inspect into the users' activities. He is also able to block the count or make the tables of database to edition available. At nucleBART administrator will be also equipped with the form, which characterizes users' abilities. The following functions will be included:

isotopes addition
remove of isotopes
modification of existing isotopes
users' addition
users' removing
users' edition
informing about the changes in database
making mathematical computations
printing results

By selecting foregoing functions the access level to database of the particular user will be characterized. The aim is to prevent the operations in tables by unwelcome persons.

The users' activities will be possible to follow by cookies [5], the application of which will be stocked in, in the future. Thanks to them the administrator will specify the date and the time of passage of tables using abilities and the user will be able to set up a bigger font or change the color of desktop. He can of course expect that those arrangements will stay with him through the following part of the trip in the server. Assuming that the different possibilities were ascribed to different persons caused increase of applications. Each activity must be equipped in a particular form connected with the base which increases the rich of arising failures. It also makes the application more professional.

Making calculations on the data which are included in the database is possible by using particular language (e.g. PHP4). It creates the possibilities of introducing fewer less data to the tables – only those necessary. For example to count the binding energy of nuclei, the last neutron and proton separation energy we only need the A and Z values and so-called mass defect. So it's unnecessary to place the above mentioned values. If the user is interested in those values than the application will return the energy values counting them earlier of course and taking from the same database only the values A, Z and the mass defect.

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5. Conclusions

In the above publication the aspect of creating databases for use of physics was shown. Connecting many programming languages and Linux system allows to create the program nucleBART available to address www.nuclebart.pl. Wide possibilities resulting from connecting features of client – server application and languages enable all application with access to database possess real big practical value and it is a fast and comfortable information source. The presented base is created in the way that enables its permanent development and refinement. Thanks to this it will use new programming techniques.

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