

APPLICATION OF NETWORK TECHNOLOGIES FOR DEVELOPMENT OF MEDICAL DATA-ADVISORY CLINIC "MED-HEALTH"

Anatoly Bykh, Elena Visotska, Tatjana Zhemchuzhkina,
Andrey Porvan, Alexander Zhook

Abstract: *In this article the medical data-advisory web-resource developed by authors is considered. This resource allows carrying out information interchange between consumers of medical services and the medical establishments which give these services, and firms-manufacturers of medical equipment and medicaments. Main sections of this web-site, their purposes and capabilities are considered in this article.*

Keywords: *web-resource, information interchange, medical advice.*

ACM Classification Keywords: *J.3 Life and medical sciences: Medical information systems*

Introduction

Since electronic global networks appeared it is possible to watch the tendency of the Internet-technologies applications in different fields of human activity. However, application of such technologies in medicine remained aloof until recently. It is bound with following: not any information can be transferred to a network, and the transmitted information not always corresponds to the general requirements to the data transfer.

One of the guidelines in modern Internet-technology applications is development of medical data-advisory resources which allow getting a different medical information, as well as remote advice of the expert in certain field of medicine. We can refer to these progressive guidelines basic medical sites, different municipal information portals, specialized sites of the medical services, sites of firms-manufacturers of medical equipment or their trade representatives, etc.

Advanced technologies are of invaluable help for the medical and healthcare industry. There are really many possibilities and ways to use the information technologies in the healthcare, research and development areas. Computer systems and networks help scientists to perform experiments with greater accuracy, collect and analyze huge amounts of medical information, develop and create new medical tools and drugs.

Urgency of the problem

Among known web-resources in Ukraine we can mark sites of private clinics "Dr. Alex" [1], "Nebosvod" [2], and specialized sites "Mednet", "Doctor-home" [3]. These sites give the information about departments of these medical establishments, medical personnel, the lists of services with prices and medical equipment which is available there. However, these sites contain information concerning only certain medical establishment, and guest of these sites often can't get complete information about necessary question in one place, and this takes expense of time and means. Besides, many institutions save on information about other medical establishments and their services with aim to reduce costs for site making. That's why we can't say about working efficiency of these sites.

In that way, making of the medical data-advisory resource which takes into account all noted above lacks, gives interest and is actual problem.

Working up of the medical data-advisory resource

If to consider medical web-resources (sites) as integrated data-advisory system it is necessary to distinguish key components of this system [4]. It is offered to consider this system as integration of representatives of purposeful groups. Regarding these groups the medical institution has or can have communicative aims. Traditionally distinguish external and internal web-resource environments (fig. 1).

In case of medical data-advisory web-resource external environment contains:

- clients-consumers of services, proposed by medical institutions (population, physicians, pharmacologists, medical establishments of different types);
- clients-providers, giving the information for allocation in web-resource (medical establishments, drugstores, firms-manufacturers of medical equipment and pharmaceutical preparations, etc.).

The internal environment of medical data-advisory web-resource is essentially information resource, containing information of the following contents:

- the index of medical establishments; parts selected in structure of these establishments; existing medical cabinets; medical private offices;
- the personnel of medical establishment (personal data of treating and advising doctors, attendants, etc.);
- the medical equipment (diagnostic and therapeutic equipment, which is available there, capabilities of this equipment, the list of the procedures spent with this equipment; the advertising information of firms-manufacturers of the medical equipment);
- services given by medical establishments (consultations of doctors, diagnostic and therapeutic procedures, etc.).

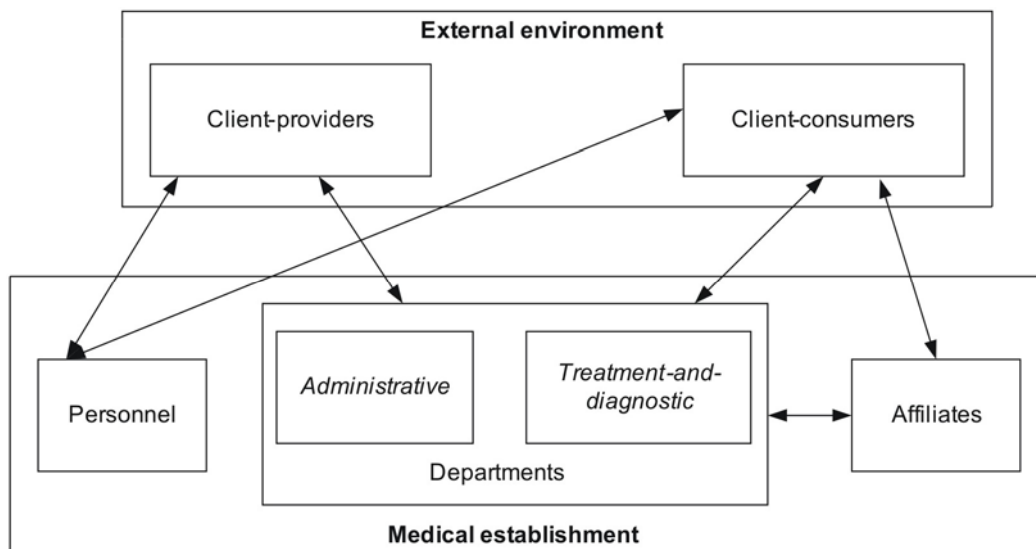


Figure 1 - External and internal web-resource environments

It is possible to allocate three base functions of an offered Web-resource:

1. Information function - realization of information and advertising activity of the Web-resource (giving of the information about the medical institutions, given services, consultations, the diagnostic and therapeutic equipment, medical preparations, etc.),
2. Communicative function - function of information interchange between clients and a resource (this resource is the information intermediary between consumers of medical services and establishments, which these services give);
3. Service function - giving of advisory services both in on-line and off-line mode, giving of the information about capabilities of diagnostics and treatment in different medical institutions, function of electronic payments and an electronic drugstore.

Web-site "Med-Health" suggested in this work based on the structure of a medical data-advisory Web-resource considered above. This web-resource has joined a plenty of ideas which in individual variants have been realized repeatedly, but together and in such volume is realized for the first time. The general block diagram of this web-resource is given on fig. 2. The block diagram contains all elements of a medical infrastructure and logically coordinates them in uniform cooperating structure.

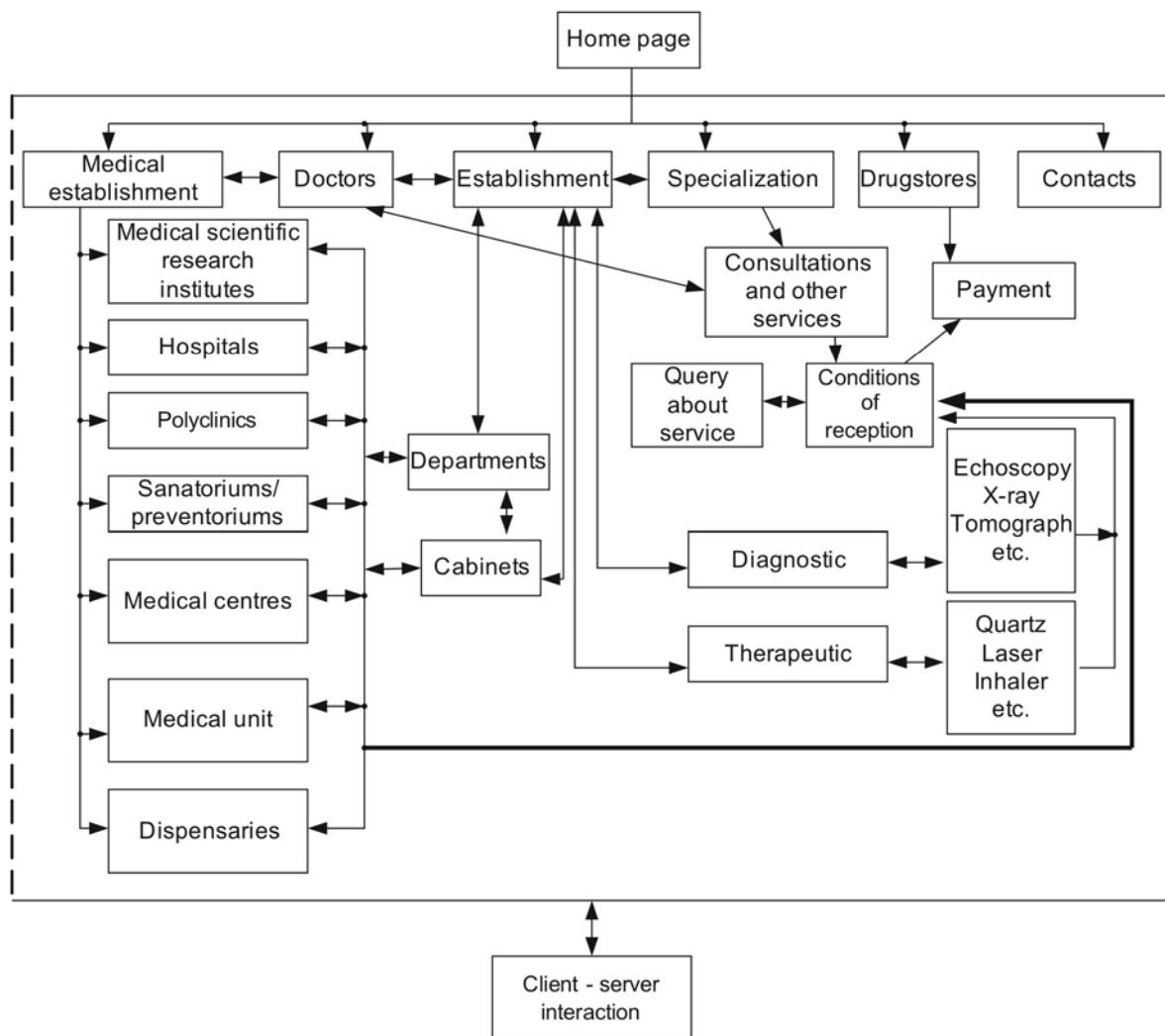


Figure 2 - The block diagram of the medical data-advisory web-resource “”

The site consists of six basic sections (fig. 2):

- medical establishments,
- doctors,
- medical equipment,
- medical specialization,
- drugstores,
- contacts.

The section “Medical establishments” comprises the information about all existent medical institutions (medical scientific research institutes; hospitals; polyclinics; sanatoriums / preventoriums; the medical centers; medical units; dispensaries. This section contains the information about a type of the establishment, its personnel; the contact information; the other help information concerning the medical establishment.

The section “Doctors” contains the personal information about doctors, a place of job, their medical specializations, the experience of job, the achievements, used methods of treatment, the contact information. The opportunity to find out about consultations and other kinds of the services offered by the doctor, including services online is given in this section.

The section “Medical specialization” includes the basic directions of diagnostics and the therapies selected in activity of medical establishments and doctors (for example, cardiology, surgery, ophthalmology, etc.).

The section "Medical equipment" contains the information about the equipment contained in concrete medical establishments, with the description of its capabilities and services given with this equipment; the information of firms-manufacturers about the medical equipment produced by them.

The section "Drugstore" includes all assortments of the goods of medical purpose offered by drugstores, as the information about an address of the drugstore. The opportunity of orders of the goods through the Internet with home delivery is given.

The section "Contacts" contains the information for communication with administration of the site at occurrence of questions or offers.

The connections shown on the block diagram of a resource (fig. 2) are entered for universality of a resource. The site is based on a unique universal database which allows to create inquiries with any logic interrelations, and not only what were projected originally, but also anyone additional which have arisen after designing a database. This provides flexibility and universality of database. The logic structure of a database is not defined by physically existing connections. The information is stored in a plenty of the interconnected tables with the maximal fragmentation for maintenance of flexibility of a database. The relevant database provides the multiuser access to this resource with differentiation of the rights of access [5-7].

The developed database consists of set of tables. Sets of the structured data are stored in these tables. For tables the indexes facilitating search of the necessary lines are created. The declarative restrictions providing reference integrity and, hence, a coordination of the interconnected data in various tables are added to tables. Storage in a database of the procedures intended for performance of some actions with a database for preservation of representations, providing the specialized access to the data of the table is stipulated also.

Network relations between a database and a Web-resource are under construction on the basis of architecture a client - server. The distributed structure of servers is more preferred as the fail of one of servers does not result in the termination of functioning of all Web-resource. Other reason for the decision of the organizational structure consisting of several servers is geographical separation of medical institutions. As consequence, the main server it is not attached rigidly to server stations of the basic level and can be established practically on any of existing operational systems on removed enough distance.

Filling of a database with the information is carried out as follows. Representatives of medical institutions of various type fill in specially developed questionnaires: the questionnaire of medical establishment, the questionnaire of department, the questionnaire of the doctor. The information from these questionnaires is placed in the certain sections of a database on which the site is based.

Access to the information of medical character which can be chosen by different criteria, building inquiries in a database, allows to receive instant answers to the put questions. The web-resource is multilanguage, that means, that a segment of users of the web-resource are users from all world. A resource is dynamical, that allows to update, change and correct its contents at any time.

Segmentation of users of a suggested web-resource:

- first of all it is people which activity is directly connected to medicine - doctors, medical science officers, manufacturers of the medical equipment and medical products;
- people who need the information on where is possible to pass diagnostic examination, treatment or to find out more information on this or that disease, methods of treatment, medicines, a way of their application and where this or that preparation can be got, how to register for the surgery, what is necessary for this purpose, or to carry out appointment or consultation on-line.

The resource contains huge volume of the information of medical character. These are medical articles, abstracts, researches of doctors, the description of various medical products, diseases and ways of their treatment. The information on a plenty of medical establishments of a various types is collected.

The web-resource allows, except for information search, to carry out medical teleconferences, to carry out consultations, register for the surgery, register for the examination.

The big attention in the resource is given to the friendly interface that the visitor who has got for the first time on the web-resource, could without problems understand navigation and easily find that information which is necessary for him.

For convenience of dialogue and safety of the confidential information a lot of measures and means is used [8,9]. First of all - differentiation of the rights of access of users. Enciphering of the data of the information which transfer or is received by users.

For a realization of monitoring, storage of the information on a state of health, results of examination, diagnoses and the other medical information the separate database which is based on relevant database Cache which has been initially conceived as base for storage, enciphering and processing of the medical information is used.

Access to the closed sections of this resource can be received with the help of a key which can be received only after accreditation [10]. The key has a binding to the person, to the IP-address of a computer, from which it comes, and to other parameters as much as possible to protect the web-site and the confidential information from the non-authorized access.

On a portal there is a separate line of consultations which it is possible to receive on-line. Constantly there is an on duty expert who can competently answer an interesting and exciting question.

The created Web-resource is designed as for those who cares of the health and interests in novelties in the field of medicine and for experts of a medical structure and other visitors. The user of a web-resource who is the consumer of the services given by medical institutions with the help of the offered web-site can receive if necessary the information about what medical institutions accessible to this user renders service required to him (service of diagnostic, therapeutic or advisory type), what conditions of rendering of this service, what type of the equipment is used there. Due to complete volume of the necessary information, the consumer chooses service optimally suitable for him on quality and availability. Medical institutions receive an opportunity to illuminate all spectrums of the services rendered by these establishments for a wide range of consumers of these services. Besides as on the same site firms-manufacturers of the medical equipment place advertising of their production, medical institutions get access to the information on the newest medical technologies, that allows to improve quality of medical services.

Conclusion

The offered medical information resource provides two-way contact between consumers of medical services and the establishments giving these services, and also manufacturers of the equipment and medical preparations. Complete resource of this kind is interest for various groups of users, first of all for those who wish to choose necessary and optimally accessible medical service among great number of the services given by different medical institutions. Besides this, resource enables medical institutions to give the information about them. Firms-manufacturers of the medical equipment and of the pharmacological preparations also receive an opportunity to acquaint the broad audience of consumers and experts with produced production that enables medical institutions to have the information on the newest medical technologies. The resource provides general infrastructure and basic components for research and development of medical and healthcare information systems with remote access. One of the main advantages of the web-resource "Med-Health" over miscellaneous other resources of such kind, is that the "Med-Health" is interesting both doctors and patients, and for manufacturers and researchers.

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Authors' Information

A. I. Bykh – Doctor of Physics and Mathematics, professor, Head of Biomedical Electronics sub-faculty of Kharkov National University of Radio Electronics

E. V. Visotska – PhD, associate professor of Biomedical Electronics sub-faculty of Kharkov National University of Radio Electronics

T. V. Zhemchuzhkina – PhD, senior lecturer of Biomedical Electronics sub-faculty of Kharkov National University of Radio Electronics

A. P. Porvan – engineer of Biomedical Electronics sub-faculty of Kharkov National University of Radio Electronics

A. V. Zhook – student of Biomedical Electronics sub-faculty of Kharkov National University of Radio Electronics

Kharkov National University of Radio Electronics, Ukraine, 61166, Lenin Avenue, 14, Biomedical Electronics sub-faculty, e-mail: diagnost@kture.kharkov.ua

OPEN SOURCE INFORMATION TECHNOLOGIES APPROACH FOR MODELING OF ANKLE-FOOT ORTHOSIS

Slavyana Milusheva, Stefan Karastanev, Yuli Toshev

Abstract: *Computer modeling is a perspective method for optimal design of prosthesis and orthoses. The study is oriented to develop modular ankle foot orthosis (MAFO) to assist the very frequently observed gait abnormalities relating the human ankle-foot complex using CAD modeling. The main goal is to assist the ankle-foot flexors and extensors during the gait cycle (stance and swing) using torsion spring.*

Utilizing 3D modeling and animating open source software (Blender 3D), it is possible to generate artificially different kind of normal and abnormal gaits and investigate and adjust the assistive modular spring driven ankle foot orthosis.

Keywords: *biomechanics; 3D computer modeling, ankle-foot orthosis*

ACM Classification Keywords: *1.3.7 Three-Dimensional Graphics and Realism, 1.6.5 Model Development*

Introduction

Open source software refers to computer software available with its source code and under an open source license. Such a license permits anyone to study, change, and improve the software, and to distribute the unmodified or modified software. It is the most prominent example of open source development. This software gives an outstanding flexibility in terms of extensibility and modularity.

The study is based of 3D modeling technology provided by one of the most advanced open source software – Blender. Blender is a free 3D modeler program. It is used for modeling and rendering three-dimensional graphics and animations. Blender is available for several operating systems, including FreeBSD, IRIX, GNU/Linux, Microsoft Windows, Mac OS X, Solaris, SkyOS, and MorphOS. In addition, Blender's recent burst of new features in the last few versions has actually brought it close in feature set comparison to high-end 3D software such as 3D Studio Max and Maya. Among these features and user interface ideas are, for example, complex fluid and cloth effects, a comprehensive and well-thought out hotkey program, which rivals that of most higher end applications, and a wide range of easily accessible and creatable extensions using Python scripting. Regardless