ARCHITECTURE OF DECISION SUPPORT SYSTEMS FOR DATA MINING

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The paper deals with problems relating to the development of decision-support systems in sports traumatology. A mathematical model is proposed. The model is based on ideas and methods of pattern recognition theory. The proposed structure of the intelligent computer system is described.

Keywords: Pattern Recognition, Decision-Support Systems, Sports Traumatology, Intelligent Computer System.

Introduction

Currently, a lot of knowledge and information about human medicine are distributed worldwide and are recorded by the different forms, from the traditional - books and magazines, and ends with a series of optional storage of electronic information. As with many new technologies, the implementation of a correct choice and the most appropriate for the patient more difficult. With the massive amount of information, the selection of such treatment even for many real experts is always a difficult problem, not to mention the young, inexperienced. There is also the problem of the structure, aggregation, synthesis, and update their knowledge to adapt to the actual process.

One of the possible solutions to solve these problems is the computerization of the process of preparation, storage and use of the information / knowledge related to the diagnosis and choice of treatment / rehabilitation function. This paper discusses the development of computer technology and the development of a decision support system in the field of Orthopedic Trauma sports.

The same systems are powerful tools to update and effective use of new knowledge to solve tough cases of trauma, orthopedics and rehabilitation. The computer technology and modern information processing can help experts to cope with the flow of information in choosing appropriate treatments, and to accelerate the process of collecting experience.

Analysis of the material showed that most decision support systems with modern applications in medicine can be divided into three major independent directions. The first direction relates to the development of the Telemedicine technology (telemedicine) [1–3]. The second direction focuses on clinical practice and it is so-called evidence-based medicine [1, 3, 6]. The third direction is based on the generation of ideas, but they are the foundation of expert systems [1, 4, 7]. The third direction is independent, less dependent on technology. Therefore, the proposed construction support decisions system is considered the most promising at this stage of the development of information technology, since it is based on logic models, the model identification [5–7], the integration of appropriate technologies,

with data manipulation tools / knowledge standards,.

This article includes description of computer technology, focusing on automating the process of preparation, storage and use of the information, the knowledge-related diagnosis and choice of treatment and recovery rehabilitation. And it is built on the basis of decision support systems in the field of his orthopedic injuries.

Mathematical model

Duties diagnosis and treatment can be done easily by using the results of the identification problem. The method of solving the problem is known to depend on the nature of priori information. Frequently the problem is identified with only two options for presenting such information and reasonable precedent. So technology is proposed in this paper based on the algorithms of two types – the deductive and inductive. Type of inference algorithm [4] is a popular algorithm and specified for use with the various common knowledge (description language).

As is known, the method of solving this kind of algorithms is based on rigorous mathematical rules. It is different from the kind of inductive inference (a technique commonly referred to as the attributes defined by a finite number of objects at infinity [6]). Flexible engineering based on that conclusion does not exist. Due to the need to solve the matching problem is technology solutions, problems develop inductive inference algorithms and justify the algorithm becomes very important in the context of determining the specifications of the knowledge in decision support systems. It can be done, for example, by using pattern recognition techniques.

Full description of the algorithm with valid proof of it can be found in [7]. We believe that the proposed algorithm has full features of flexibility. The algorithm can be basically described by the following two properties:

1) Monotone, understood in the sense of the usual implication: the monotone of information monotone in quantitative and qualitative assessments of properties.

2) Structural decomposition of information: any information represented in the form of independent parts, each of which is monotone of information about what is known. If it does not, then the object is not valid.

The scheme justification algorithm is simple and is based on the validity of deductive inference. Its meaning is as follows: if for each task is solved by a method of resolution with guaranteed results, you can specify a finite amount of information sufficient to match the results obtained by resolution method, and the method of inductive inference algorithm is also reasonable.

The composition and structure of computer system

Decision support system for trauma and rehabilitation is a software program includes three modules:

1) diagnostic module;
2) treatment module;
3) normal partition anatomy of the musculoskeletal system.

These modules can operate independently or together. System architecture is based on client-server technology, including the processing of distributed information. Server components of the system are designed to operate in a network server, providing the "internal" functions (such as, for example, database management and knowledge) (fig. 1). The server assumes the possibility of multiple users simultaneously.

In the client side, functioning on the network workstations includes features meant to work with the end user (fig. 2).

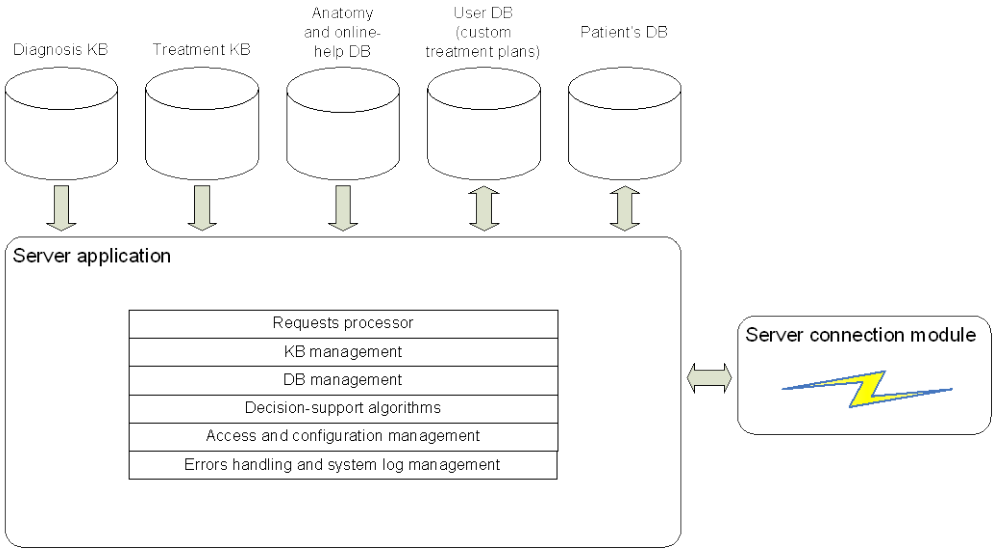

Fig. 1. System architecture of server part

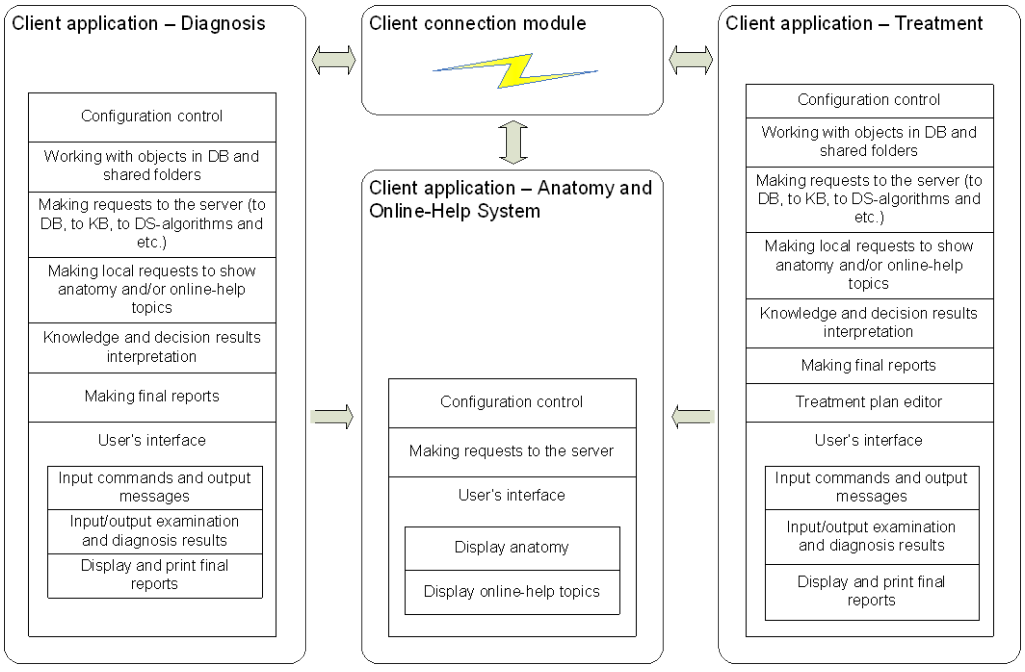

Fig. 2. System architecture of client part

Regarding the functional content of the system, we note the following:

1) some parameters of the system can be changed through the so-called configuration files, giving some flexibility to customize the system to the specific operating conditions;

2) the client communicates with the server through queries using the networking capabilities of the operating system;

3) the server can operate in open or secure mode, limiting the number of users and their rights. For a description of user groups the standard administration tools of operating system are used;

4) Subject area is divided into relatively independent subsystems - localization support

solutions which shall be conducted independently of each other;

5) Patient information with which user operates the system is stored in the patient file.

Depending on the system configuration, it can be stored in a database on a server or in a shared directory; user can access to shared directories on the client through a separate channel, bypassing the server.

Creating a system based on the original organized, structured ~~of~~ medical knowledge. The action of the system covers the entire process from the time of the survey to determine the treatment strategy. Its intellectual yield capability information of encyclopedic reference needed a specialist of any skill level throughout practice. Information on digital media and computer network may augmented by new knowledge at certain intervals.

The created software tools allow you to design a treatment program, combining standard methods with a personal experience. This is done through the formalization and modeling of individual treatment processes. Thus, model the behavior of the doctor has been created based on the construction of the scheme on the basis of treatment posindromnoy diagnostics. Background information in the system is diagnosed with a fixed one or several (alternative) treatment regimens.

Individualized treatment is realized through the use of experience and personal knowledge of experts in a specific specialized field, gathered from sources of health information. The user in sole discretion can adjust the nature of information and instructions. The doctor can also set diagram using treatment methods restore basic functionality available in the system. System program has been created with the involvement of medical professionals, has been successfully put into operation at the sports medicine center of Belarus, and it was began to be used in Hospital Orthopedics Trauma in Ho Chi Minh city, Vietnam.

Conclusion

Intelligent decision-support system in sports traumatology can be used in training, as well as in an advisory role. The system is designed to provide expert support for user information on every level of knowledge in general medicine and it offers solutions for every form of pathology in specialized treatments. The use of this system contributes to improve the conditions and quality of care in the medical center and orthopedic hospital.

Network version of the system allows standardization of treatment and rehabilitation, and referral care protocols, medical support for athletes. In addition, patients may experience exchange between the users and updated collection of scientific data to complete the system.

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