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Intelligent Screening for Diagnostic and Treatment of Cancer Diseases

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Abstract

Approach to the system's dynamic modeling and decision-making support development for specialist doctors based on intelligent mathematical models is proposed. Based on intelligence analysis of the content of a global database, the system will dynamically generate the inductive knowledge for different aspects of diagnosis and treatment of cancer. The system in essence will model the decision-making process to guide "a human operator", which in this case is a doctor who consciously or sub-consciously analyses the situation and makes decisions based on his or her professional knowledge and experience. However, even the most skilled doctor is unable to process the information volume of such proportions and do the multiple factor analysis as deep as his or her assistant - an intelligent computerized system, which is able to instantly focus on the specific developing situation while considering all prior history, and produce a model and a prognosis.

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1. Introduction

Today, according to the IARC (International Agency for Research on Cancer) and the World Health Organization in the world annually, at least 12 million new cases of cancer are recorded. Perhaps this number is lower than the actual number of cases even more, since not all countries have cancer registries and databases of cancer pathology.

A very important factor for the successful treatment of cancer is early detection of the tumor, as well as an adequate analysis and forecast of the dynamics of the disease, as well as the result of the use of certain methods and of prevention and treatment schemes.

Today, the statistical analysis of medical data is an integral part of the clinical examination of the patient. The aim of the statistical analysis is the substantiation of the adequacy and accuracy of the results of the study the relevant conclusions.

On the basis of mathematical modelling procedures that are adequate to the purpose of the study, the definition of statistical indicators is carried out, which allows to evaluate the correlation and mutual influence of analyzed factors and the reliability of their differences [1].

Depending on research purposes (such as the effectiveness of the selected treatment regimen, a particular drug efficacy in the treatment of the patient, etc.), different methods of statistical analysis can be applied. In medical practice, the greatest popularity has received the following methods.

- Methods of statistical hypothesis testing. Statistical hypothesis formulates the expected results, which are compared with the observed results.
- Parametric and nonparametric statistics
- Correlation and regression analysis
- Multivariate ("multi-factor") analysis - to assess the simultaneous influence of several factors on the result.

However, it is not always possible to determine which variable is an independent risk factor, and which have confounder, disturbing factor affecting the other variable.

Despite the fact that these methods are well developed, and applications created with the ability to use these techniques to medical personnel, in practice, the effect of their use can be significantly advanced, as well as expert system [2-4].

In the paper, a system of dynamic modelling and decision-making support for specialist doctors based on modern mathematical methods is proposed. Based on intelligence analysis of the content of a global database, the system will dynamically generate the inductive knowledge for different aspects of cancer diagnosis and treatment.

2. Intelligent system features

The system in essence will model the decision-making process to guide “a human operator”, which in this case is a doctor who consciously or sub-consciously analyses the situation and makes decisions based on his or her professional knowledge and experience.

However, even the most genius doctor is physically unable to process the information volume of such proportions

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