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Expert System for Histological Diagnosis of Prostate Cancer

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Annotation

The paper is dedicated to the development of expert system for histological prostate cancer diagnosis. The developed system allows to fill the knowledge base and then to use this knowledge base to support physician decision on the histological diagnosis of prostate disease.

Keywords: pattern recognition, prostate cancer diagnosis, decision making, decision support system

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1. Introduction

Prostate cancer is a malignant neoplasm arising from the epithelium of the alveolar cellular elements of the prostate. This is one of the most common types of cancer: in some countries prostate cancer takes 2-3 place, in Russia – 7-8 place. The main problem is its late detection (already at stage 3-4), because in the first stages of prostate cancer are asymptomatic [1].

There are problems of prostate cancer diagnosis. It is noted in scientific publications: lack of accuracy of traditional diagnostic methods; the difficulty in unambiguous diagnosis; even the slightest error in the interpretation of histological studies data immediately change the prognosis [2].

Therefore, the creation of an automated, fast and objective method to aid pathologists in the evaluation of tumors of the prostate may improve the diagnosis of prostate cancer [3].

The aim of the work was development of expert system for histological prostate cancer diagnosis [4-13].

2. Materials and methods

The system is based on obtaining a digital image of the histological samples of prostate cancer. When training the system, the resulting image is described by an expert physician with an indication of informative signs and diagnosis (doctor notes the characteristic features of certain diseases, then the image data and layout information are stored in the knowledge base). On the basis of the data stored in the expert system statistical analysis is performed, on the results of which recommendations for diagnosis are generated (Figure 1) [9,11-13].

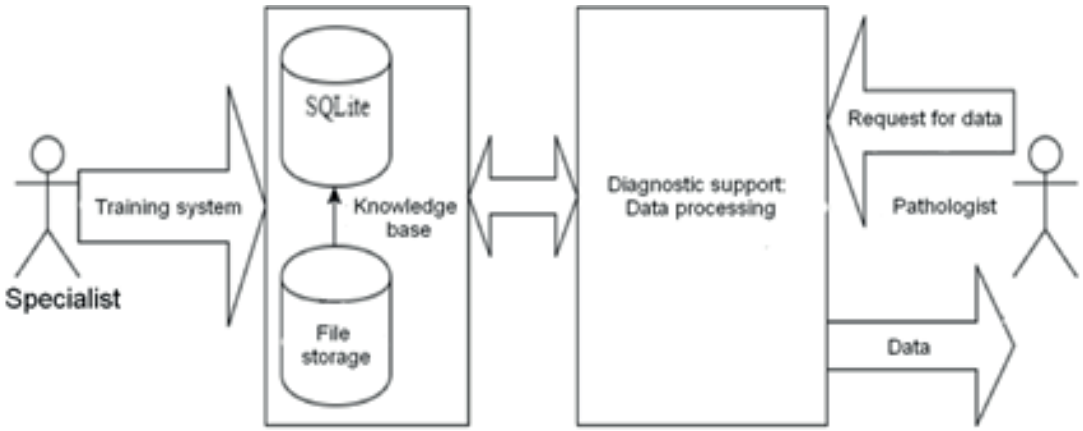

Figure 1: The system architecture.

3. Results and discussion

The expert system was implemented as a computer program developed in the QT environment for C++. As a database management system (DBMS) was chosen SQLite. The system supports two modes of operation: training mode and diagnostics decision-making support mode. In the training mode, experienced specialist loads the images of histological samples in the system, lays out their pointing specific to certain disease symptoms. The program interface is shown in Figure 2

Entered by the specialist information is stored in the knowledge base and is used for diagnostics decision-making support mode.

In the diagnostics decision-making support mode at the request of the pathologist, having before him the image of the histological sample, relevant images in the knowledge base are searched for, the pathologist notes the ones, that, in his opinion, are similar to the image of his histological sample, carries out an additional request to the system, and based on the knowledge base, the system displays the rating of the

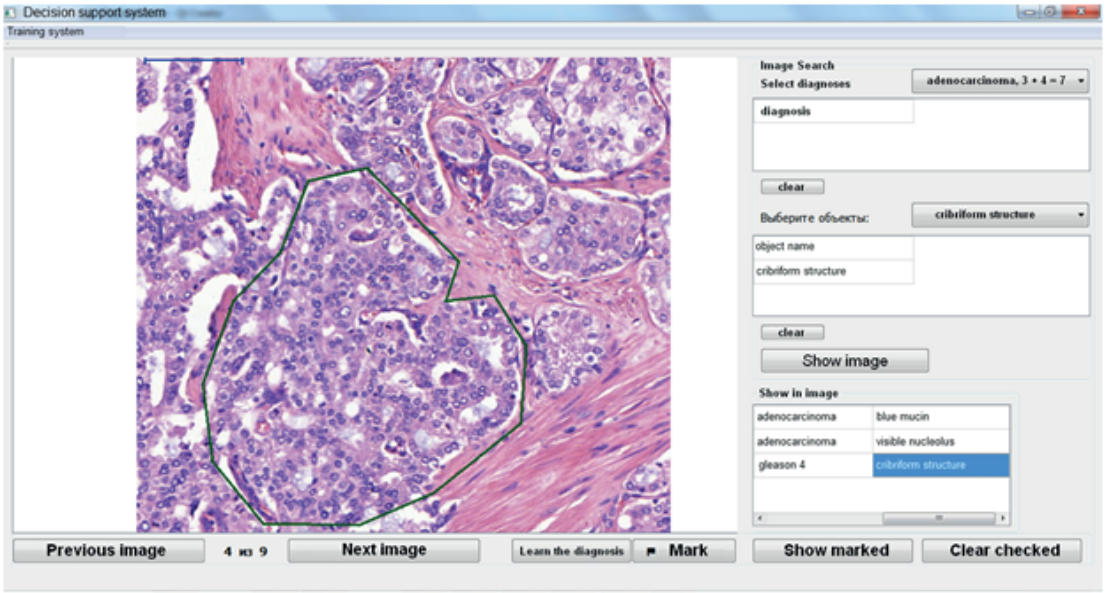

Figure 2: The main program window.

recommended diagnoses depending on the share of the corresponding objects in the sample images.

In addition to decision-making support in the diagnosis, the system can be used for training purposes, since it is possible to view all images of the reference knowledge base with the group the diagnosis with symptom.

4. Conclusions

The developed system is versatile and allows you to provide support in the diagnosis of prostate cancer and the histological diagnosis of other diseases when filling the reference database with data about other diseases.

At this stage, the expert system is ready to train and use in training medical personnel and to support medical decisions for histological diagnosis. Further development of this development possible in the direction of automating of the process of object recognition.

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