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DIFFUSION DATA OF MAGNETIC RESONANCE TOMOGRAPHY FOR DIAGNOSTICS AND STEREOTACTIC RADIOTHERAPY OF INTRACRANIAL PATHOLOGY

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In clinical practice, and especially in stereotactic radiosurgery planning, the significance of diffusion-weighted imaging (DWI) [1] is growing. This makes the existence of software capable of quickly processing and reliably visualizing diffusion data, as well as equipped with tools for their analysis in terms of different tasks.
We are developing the «MRDiffusionImaging» software on the standard C++ language. The subject part has been moved to separate class libraries and can be used on various platforms. The user interface is Windows WPF (Windows Presentation Foundation), which is a technology for managed Windows applications with access to all components of the .NET 5 or .NET Framework platform ecosystem. One of the important features is the use of a declarative markup language XAML (eXtensible Application Markup Language), with which you can conveniently create, initialize and set properties of objects with hierarchical relationships. Graphics are generated using the DirecX environment.
The «MRDiffusionImaging» software was implemented, equipped with a unique set of tools for working with diffusion images. An algorithm for "masking" diffusion MRI series based on T2-wieghted images was developed using a deformable surface model to exclude tissues that are not related to the area of interest from the analysis. A tool for calculating the various diffusion coefficients [2] has been created, on the basis of which it is possible to build quantitative maps for solving various clinical tasks. Clustering and segmenting images functionality based on the k-means clustering method has been created to individualize the clinical target volume and further assessment of response to the treatment [3]. White matter tracts [4] of the brain were visualized using two algorithms: deterministic (fiber assignment by continuous tracking) and probabilistic using the Hough transform [5]. The proposed algorithms tests candidate curves in the voxel, assigning to each one a score computed from the diffusion data, and then selects the curves with the highest scores as the potential anatomical connections. Tractography data can be used to optimize the dose received by critical structures in irradiated areas.

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The speaker is a student or young scientist

Yes

Section

1. Nuclear technology and methods in medicine, radioecology

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