Classification of CT-brain slices based on local histograms

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ABSTRACT

Neurosurgical intervention is a very complicated process. Modern operating procedures based on data such as CT, MRI, etc. Automated analysis of these data is an important task for researchers. Some modern methods of brain-slice segmentation use additional data to process these images. Classification can be used to obtain this information. To classify the CT images of the brain, we suggest using local histogram and features extracted from them. The paper shows the process of feature extraction and classification CT-slices of the brain. The process of feature extraction is specialized for axial cross-section of the brain. The work can be applied to medical neurosurgical systems.

Keywords: image processing, computed tomography, image classification, DICOM, axial slices, logistic regression, feature extraction.

1. INTRODUCTION

Successful stereotactic intervention provided by a number of factors. The choice of surgical path at the stage of pre-planning is one of these reasons, which should provide the least invasiveness. Therefore, the development of methods and tools used in preoperative planning is an important task. Process of preoperative planning of the stereotactic interventions on the human brain, at the moment, based on the tomographic studies of the brain. Determination of the least traumatic surgical approach, according to the tomographic study, include the process of segmentation of the study with the construction of a chain of correspondences: pixel – the structure – the risk of intervention. Thus, the development and construction methods for segmentation of tomographic studies should provide acceleration of the process of pre-planning. But the segmentation of tomographic studies of the human brain is not a trivial process. On this basis, we must include the step of classification of tomographic images. This is due to the fact that knowing the class of image we can use specific procedures for segmenting the slices, because each class has a specific structural composition, as well as the specific anatomical structure, which should be used for segmentation of anatomical slice. The solution of this problem may solve the problem of segmentation of slices at a higher level.

2. REVIEW OF THE STATE OF THE ART

Classification is often used for identification of unknown shape of interface in electrical impedance tomography [1], in many cases multidimensional and multicriteria classification is used [2,12]. Problems of classification of tomographic slices vary depending on the desired result, namely the classes that divide images. In the world big forces are applied to research and development of the methods of marking images to normal and, accordingly, on abnormal. Solution of the problem in this approach using the method to the immediate neighbors, with regard to Haralik's textures features presented in the work [3]. The paper [4] describes the process of classification of slices of magnetic resonance study in modality T1 to normal slices and abnormal slices. This paper uses a classifier with the teacher, respectively, and described two phases, namely training and classification. As a classifier utilize a two-tier classification with methods of fuzzy logic and neural networks. At the same time [5], focuses on the detection of a brain hemorrhage and subsequent classification (epidural hematoma, subdural hematoma, intraparenchymal hemorrhage). Detection of the brain tumors and their subsequent classification is the subject of many studies [6-7], and there also articles on automated detection of the disease of a variety of diseases of the brain. A completely different trend in this field is the classification sections in accordance with a certain anatomical level. That is, a subclass of tomographic assumed set of tomographic slices satisfies some conditions to the structural composition, as well as anatomy of the body. Thus, in [8] made ordering tomographic

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