A103 Comparison of Different Segmentation Methods in OLIG2 Stained Low-Grade Glioma Images

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Introduction: The advances in digital pathology permit the usage of computer vision tools and Machine Learning applications in pathology images. Image segmentation is an important part of this process to select the related areas of the images effectively and in a reasonable time. It is crucial to select the best segmentation method for the purpose to get the correct results and interpretation of the data. It has been showed that nuclear morphology has important features for the prediction of grade in gliomas. Nuclear morphology can also be important for the differentiation of glioma types. For this purpose, we compared different segmentation methods to select the best method for the extraction of features from nuclei in OLIG2 stained images. **Methods:** We selected 5 astrocytoma and 5 oligodendroglioma images for the analyses. We compared 4 different segmentation methods: color deconvolution, CCC (cut-cluster-classify) method, k-means clustering, and weka segmentation. We used accuracy, IoU (intersection over union), processing time, and the resistance to the different noises (0%, 5%, 10%, 15%, 20%, 25%, 50%, 75%, 90%) as parameters of efficiency. We made a ground truth with manual annotations using GIMP software and R for the calculation of accuracy and IoU. We used R for color deconvolution and k-means clustering, Python for CCC, and Fiji for trainable weka segmentation. **Results:** The deconvolution method has the highest average pixel accuracy (98.2%) and IoU (74.8%). Processing time is the longest in CCC (272 sec) and the shortest in color deconvolution (1.75 sec). Color deconvolution has a high resistance to noise up to 25% and then its accuracy decreases dramatically. We could not evaluate the whole resistance trend of CCC and weka segmentation to the noises because they give an error at 20% and 75% of noise, respectively. K-means clustering has an almost linear trend for pixel accuracy, although IoU decreases dramatically with the noise. **Conclusion:** The color deconvolution method is the overall best method for the segmentation of nuclei in OLIG2 stained glioma images. This study was supported by NIHR01HL132355.