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SUPERVISED LEARNING BASED ON SUPPORT VECTOR MACHINE TO SEGMENT THE LIVER IN MRI.

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Background: Identifing the liver in magnetic resonance images is crucial for measuring the liver volume or developing surgical planning and navigation systems. However, MRI liver segmentation is a complicated task due to the noise level of these images, the variations of gray levels and the similarity of the liver to other structures. Therefore, this paper proposes a method for semiautomatic segmentation of the liver in 2D images.
Method: In this work, the Support Vector Machine classifier (SVM) described by Cortes and Vapnik (1) has been used to segment the liver. Initially, a training of the SVM for each of the images included in the study was performed. Therefore, three features of the image were selected to train the classifier: the gray level of the pixel in the original image, the gray level after application of an anisotropic diffusion filter and the position of the pixel in the image. To improve the results of the classifier, a multi-band image was generated and used as input to the classifier. Eight MR images of the liver of a pig were used to validate the method. The results of the segmentation obtained by the proposed method were compared with the ground truth, which was defined by an expert, who manually identified the liver in all images used in the study.
Results: To quantitatively validate the obtained results, the true positive (TP), the false positive (FP) and the false negative (FN) rates were analyzed in all images. The mean true positive rate for the eight images analyzed was equal to 97,65%, the mean rate of false positives of 1,2% and the mean rate of false negative of 2,3%.
Conclusion: The liver image segmentation is a common task among different medical applications. In light of these preliminary results, the proposed method accurately segments the liver semi-automatically in 2D magnetic resonance images. Therefore, this method avoids that the expert manually segments the liver.

References

[1] Cortes, C., Vapnik, V. (1995). Support vector networks. *Machine Learning*, 20:1-25.