Tumor detection and segmentation on multimodal medical images

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The number of patients living with cancer is increasing from year to year. Therefore tumor detection and segmentation are important tasks in daily clinical practice. Due to large variety of tumors in localization, shape, size and heterogeneity the manual detection and quantification of tumors are hard and also time-consuming even for experienced physicians. Computer-assisted methods can improve these challenging tasks to help the physician's work in tumor detection, quantification and staging. For these purposes there are many published algorithms, each one's has advantages as well as limitations. Most of the methods are using only one image series however in clinical practice several image series and even more modalities are used simultaneously.

In this work we focused on using more than one image series and/or modalities to produce high accuracy tumor detection and segmentation. The automated detection is based on image series which gives functional information about the tumor (e.g. DWI, PET). The detection incorporates intensities and symmetrical analysis of the abnormal regions. The segmentation is based on image series which provide detailed anatomical and soft tissue information (e.g. MRI, CT). Due to large variety of tumor shapes a new boundary based method is used.

The proposed method enables fast and accurate detection and segmentation when more than one image series are incorporated. The generated result can be manually adjusted by the user based on the information from the input images. According to our preliminary tests involving few clinical cases higher segmentation accuracy obtainable using the complementary information. In the future more evaluations are needed incorporating gold standard segmentation defined manually by physicians.