Purpose: To develop a new method for automatic localization of prostate cancer using multispectral MRI data.

Methods: Multispectral MRI including MR spectroscopic imaging (MRSI), T2 weighted MRI, diffusion weighted imaging (DWI) and dynamic contrast-enhanced (DCE) MRI, has been used for cancer target localization. The combination of multiple MRI imaging technologies provides more useful information than one single technology alone about prostate cancer and has advantages for target definition in radiotherapy treatment and quantitative evaluation of tumor response. However, manual cancer localization using multispectral MRI dataset is a tedious task and prone to inter-/intra-observer variability. Automatic localization methods using multispectral MRI data is highly desired.

In this paper, a fuzzy fusion framework for automatically localizing prostate cancer with multispectral MRI data is presented. Firstly, for each kind of MRI images, a membership function is created to calculate the membership-degrees of image elements belonging to cancer region. Secondly, a fuzzy fusion operator is used to fuse different membership-degrees corresponding to the same regions. Lastly, the result of fusion is further adjusted with fuzzy region growing process, leading to the final membership-degree map. And cancer volume is finally defined by setting up a threshold on the map.

Results: The new method was tested with one multispectral MRI patient dataset and results from our experimental study are compared with the one obtained from a manual method performed by an experienced pathologist. Quantitative analysis shows that the specificity is 98.89%, sensitivity is 62.85% and accuracy is 95.42%, respectively. It illustrates the feasibility of utilizing this framework in the clinical application.

Conclusions: The feasibility study shows the new method reported in this paper achieves automatic localization for prostate cancer and can be easily implemented in clinical applications.

We are currently conducting a clinical study for testing the effectiveness and reliability, and further developing this method.

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