**THESIS INFORMATION**

Thesis title: computational intelligence approach for liver and liver damage extraction from 3D abdominal MR images

Speciality: Computer Science

Mã số: 62480104

PhD Student: Le Trong Ngoc

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Supervisor: Asso. Prof. Huynh Trung Hieu, Asso. Prof. Pham The Bao

At: UNIVERSITY OF SCIENCE – VNU.HCMC

1. SUMMARY:

* The early detection and the treatment response evaluation of patients with the liver cancer are very important to improve the survival rate. The basic criterion to evaluate liver cancer patients is liver and tumor (or damage) volume. The liver and liver tumor volumetry require the liver and liver tumor segmentation. Traditionally, this task can be performed by manually tracing the liver and tumor regions on slices of abdominal CT or MR images. It’s tedious, time consuming and subjective. So, it’s crucial to investigate in the computerized scheme for liver and liver tumor segmentation.
* The objective of the thesis is to develop computerized schemes for liver and liver tumor segmentation in abdominal MR images.

2. CONTRIBUTION:

* A fully automatic liver segmentation scheme in 3D abdominal MR images based on thresholding method and geodesic active contour segmentation. The histogram of the 3D image was determined, and the second-to-last peak of the histogram was calculated using extreme learning machine. Thresholds, which are determined based upon the second-to-last peak, were used to generate a thresholding image. This thresholding image was refined using gradient magnitude image, morphological and connected component operations to generate the rough shape of the liver. A 3D geodesic active contour segmentation algorithm refined the rough face in order to more precisely determine the liver boundary.
* A fully automatic liver segmentation scheme in 3D abdominal MR images. The rough liver shape was revealed fully automatically by using watershed segmentation, thresholding segmentation, thresholding transform, morphological operations and statistical properties of the liver. An active contour model was applied to refine the rough liver shape to precisely obtain the liver boundaries.
* A liver segmentation scheme in 3D abdominal MR images using the fast marching method and improved geodesic active contour. The boundary-enhanced image was used as a speed function for a 3D fast marching algorithm to generate an initial surface that roughly approximated the shape of the liver. An improved geodesic active contour segmentation algorithm refined the initial surface to precisely determine the liver boundaries.
* A liver tumor segmentation scheme in 3D abdominal MR images using 3D fast marching algorithm and extreme learning machine. A 3D fast marching algorithm as applied to generate the initial labeled regions which are considered as teacher regions. The extreme learning machine was employed to classify the unlabeled voxels. The post processing stage was applied to extract and refine the liver tumor boundaries

3. APPLICATIONS AND FUTURE WORK

* The proposed schemes were evaluated in many different datasets. Experimental results have shown that the proposed schemes are accurate and efficient when compared to manual ground-truth segmentation. The time required for segmentation is reduced significantly. So, it can be useful for radiologists for the liver and liver tumor analysis on MR image.
* The proposed schemes have several parameters, these parameters were determined based on experiments. Further research is needed in order to optimize the selection of parameters. In addition, the proposed schemes need to experiment on lager data sets to improve accuracy.

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