بسم الله الرحمن الرحيم

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها

علي هذه الأفلام قد أعدت دون أية تغيرات

يجب أن

تحفظ هذه الأفلام بعيدا عن الغبار

في درجة حرارة من ١٥-٢٥ مئوية ورطوبة نسبية من ٢٠-٤٠%

To be Kept away from Dust in Dry Cool place of 15-25- c and relative humidity 20-40%

بعض الوثائـــــق الاصليــــة تالفــة

بالرسالة صفحات

لم ترد بالاصل

AIN SHAMS UNIVERSITY
Faculty of Computer
& Information Science
Department of Scientific Computing

MEDICAL IMAGE SEGMENTATION AND VISUALIZATION

A Thesis submitted to the Department of Scientiefic Computing, Faculty of Computer and Information Sciences, Ain Shams University, in partial fulfillment of the requirements for the degree of Master of Computer and Information Sciences

BY

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Summary

SUMMARY

Image segmentation is an essential step in many advanced imaging applications, e.g., object tracking, pattern recognition, volume measurements, medical image analysis, and 3D rendering. Accurate image segmentation is required in most of the medical imaging applications; for volume measurements, medical diagnosis, and in the image guided procedures. Medical image analysis is a fast growing research area in the image processing community due to the importance of its application in the field of medicine.

Among the several types of images, magnetic resonance images (MRI), which represent the intensity variation of radio waves generated by biological systems when exposed to radio frequency pulses, have proved to be the most effective imaging modality for imaging the inner tissues of the human. For that, the image processing community has extensively developing algorithms for analyzing those images, in order to achieve accurate segmentation that may facilitate the detection of various pathological conditions affecting brain parenchyma, radiotherapy treatment and planning, surgical planning and simulations, and three-dimensional (3D) visualization of brain matter for diagnosis and abnormality detection. The principal goal of the work in this thesis is to produce an offline system for the accurate segmentation of the medical images.

In this thesis, we have developed two new multiresolution algorithms for image segmentation that extend the well-known Expectation Maximization (EM) algorithm. These are, the Gaussian Multiresolution EM algorithm, GMEM, and the Wavelet Multiresolution EM algorithm, WMEM. The conventional EM algorithm has prevailed many other segmentation algorithms because of its simplicity and performance. However, it is found to be highly sensitive to noise. We used multiresolution analysis in order to take into account the effect of neighborhood pixels in the classification process, which minimizes the sensitivity to noise. The proposed algorithms are based on generating scaled versions of the image to be segmented at lower resolutions and use this scaled images to utilize the pixel neighboring dependency to overcome the drawbacks found in the conventional EM algorithm. In the GMEM algorithm, a Gaussian filter with two different window sizes is used to generate the parent and grandparent images, while in the WMEM algorithm, a wavelet analysis are used to produce the different image resolutions. The use of the wavelet analysis is found to be superior to the use of the Gaussian filters.

We used different data sets to measure the performance of the proposed algorithms and to compare it with the performance of EM, The results of the synthetic images show that the performance of the proposed multiresolution algorithms has much increased over the conventional one, where an increase in the segmentation accuracy of about %16 for a high noised images (variance = 400) is obtained when the WMEM algorithm is used, and 15% is obtained with the GMEM algorithm. Moreover, we also applied the proposed algorithms on a manually segmented MRI of human brain, in order to show quantitatively the performance of the algorithms. Gaussian noises, with different variances are added to the image. An Increase in the segmentation overall accuracy of about 9% is obtained with the GMEM algorithm, and about 10.5% is obtained with the WMEM algorithm for a high noised images.

Other results and comparisons are introduced statistically and graphically to give deep understanding, and have been discussed to show the advantages and disadvantages of each algorithm to give a fair evaluations under many test parameters. We finally conclude that our new algorithms provide superior segmentations of synthetic images as well as Magnetic Resonance Images (MRI) of the human brain under various types of noise levels, and in the same time are computationally efficient.