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Medical Digital Image Processing Methods Based on Graph Theory

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ABSTRACT

Image provides an important way for medical studies. The objective of the paper is to delineate the imaging process from graph theory with computer. The aim of digital image processing is to seek for the better methods and technologies on image process by noise riding, strengthening, restoring, dividing, extracting and so on based on computer. The main facts including the development of computer science, mathematics science and the increasing of application requirements on medical science, environmental science, industry and so on. Graph theory of computer provides a basic method and process for imaging process.

Introduction

Digital image processing is the computing image processing, it is the process changing the image information to digital information so as to the computer can process. In the past years, the imaging process by people themselves, when the development of computer get given level, the image process can be processed by computer. In the beginning, the process is to make the image better by visual sense, with the development of computer hardware and software, the function and requirement of image processing is not the simple visual effect, but the high quality output, such as the color, characters of image itself, also the process of strengthening, extracting, decoding, compressing and so on. Meanwhile, we want to use the image processing the life requirements, such as imaging recognizing in space science, imaging extracting in medical science, imaging compressing in computer science.

Scientists had made such researches on different fields. In aerospace field, large number of pictures need to process on the basic image, such as geometric correction, grey level transformation, noise removal, after a series of operations, the image can be demonstrated for us.

In medical science, the imaging process became more and more import from the invention of Computer Tomograph (CT), by computer imaging process, the patient image can be rebuilt. With time goes on, more and more medical images appear, such as Magnetic Resonance Imaging (MRI), Diffusion Spectrum Imaging (DSI), Electroencephalography (EEG), Magnetoencephalography (MEG), functional Magnetic Resonance Imaging (fMRI) and so on, so the computer process become more and more important to improve the image quality.

Methods

The custom methods in image process include several classes, the first is orthogonal transformation and image filtering, by this way, the images were changed to another domain to process, and returned back to the original domain. The second is the mathematical methods, by this way the images were processed in the space domain by all kinds of mathematical handlings, such as statistics, differential equation. The third is mathematical morphology, by this way the images can be operated by integral geometry and random set theory. Except that, there are many other methods to process image combing above custom methods.

For medical image processing, the custom methods are the basic operations. If we want get more information inside of the image, we need to make deep research on image itself combing the custom methods, especially, we need to take the medical factors about the image into account. So in this paper, we put forward some new ideas on medical image processing based on computer technology.

Firstly, we can use graph theory to make study on image. In the medical image processing, they have their technical software to handle the image, the software can get the basic and professional requirements in medical researches, it is not the results that can stand for the effect in the clinical applications, so it is necessary to make deep mining from the expensive and valuable image data. In graph theory, network is an import form and structure, many useful characters can got by network analysis and computation, so we can extract the basic information from image to form the network, and make research by the network. For the image, if use the network to simulate or describe, we need to abstract the node and edge to form network, then to compute the network topology. For the medical image, whether the time series or the space series, all the image information can extract to set up the network.

Secondly, we can use the algorithm to make study on image, whether in the custom methods or the other methods, the algorithm is a critical factor to process image, so we need to set up the useful algorithm to improve the image processing from the time complicity and space complicity. The algorithm is an effective way to compute and mine the information in images. For the images, there are many algorithms in processing, for example, the strengthening algorithm, rebuilding algorithm, restoring algorithm and so on, due to the huge storage space of image, the medical image processing need effective algorithm to grantee the computing time. Combing the medical real requirements, we can design the different algorithms to handle the different imaging operations.

Thirdly, we can use programming to help the study on image operations. In computer science, programming can help us to realize many repetitive and time costly operations,

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especially for the large number of data. So we can design the relevant program to compute the image information. By program, the processing can run by itself. Meanwhile, the program is designed combing the graph theory and algorithm, especially the algorithm, we can test it by program on the feasibility and validity.

Of course, any method is not single to implement the function. Almost all the methods need to process the common operations, that is, the general methods, including image transformation, image coding and compression, image enhancement and recovery, image segmentation, image description, image classification and recognition.

Conclusion

In this paper, we put emphasis on the medical image processing methods discussion based on graph theory. From the real world requirements, we put forward new methods to make research on the medical image processing combing the custom methods to handle the image operations.

By the methods, the main aim of the paper is to achieve the better and more image information, including the image quality, image character and image storage and output. Based on the new methods, we can improve the visual quality, such as the image brightness, color transformation, image enhancement, geometric transformation, and can extract some special characters or information, such as frequency domain feature, topological characters, gray feature, boundary feature, texture feature and shape feature. At last, the methods facilitate the image transformation, decoding and compression, and more suitable to storage and transmission.

The medical image digital image processing methods provide a new view to explore the image processing, and can provides the reference on the clinical data processing.

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