Research on Medical Image Processing Method Based on Human Visual Properties

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Abstract: With the development of science and technology, especially electronic technology and computer technology, medical image acquisition and processing technology has made great progress. At the same time, there have been many medical image enhancement technologies. Medical images are an important basis for modern medical diagnosis and medical research. However, due to the limitations of hardware such as medical image imaging equipment, the commonly obtained medical images may have unclear details and low contrast, which cannot meet the requirements of medical workers. Medical image enhancement technology plays a vital role in medical images. Therefore, in order for medical workers to be able to make correct analysis and diagnosis of medical images, we need to focus on medical image enhancement technology.

1. Introduction

The digital X-ray imager is a medical device that digitally collects, displays, and processes X-ray images. Compared with the traditional X-ray machine, the digital X-ray imager has a low radiation dose (only 20% of the original), has the image post-processing function and is easy for doctors to diagnose, can be stored by computer, etc., and can be combined with existing X-ray equipment. Compatible, easy to popularize, and has broad prospects. The X-ray is imaged on the IP board through the human body, and the image is displayed on the computer screen through the laser scanning IP board, and the doctor diagnoses the patient through the image. Here, the ultimate recipient of the information is human, and the image transmits information to the brain through the eyes. Therefore, the visual characteristics of the human eye should be fully considered in the image processing, so that the image information obtained by the human eye is more clear and accurate. The traditional medical image enhancement method only starts from the overall and local characteristics of the image itself, but does not fully consider the visual characteristics of the observer (doctor). The final effect of the X-ray medical image enhancement is the doctor's perception of the resulting image on the display. It is understood to be based on diagnosis. Therefore, the X-ray medical image enhancement method should fully consider the human visual characteristics, and enhance the medical image according to the visual characteristics of the human eye, so that the enhanced X-ray image has good visual effect and no pseudo- Like the advantages produced, and works well in noise suppression, edge retention and enhanced detail.

2. Research on Human Visual Characteristics

Vision is a complex physiological and psychological process. The external light is focused on the retina through the cornea, iris, and lens, stimulating the photoreceptor cells to emit nerve impulses, which are transmitted to the brain through the optic nerve to produce vision. According to this visual characteristic of the human eye, the image can be processed accordingly. In the low gray level and high gray level areas, the gray level interval (defined as one half of the gray level and the half of the adjacent two gray level distances) can be stretched to make the human eye better. In the medium-low gray level region, for an image with an excessively large gray level interval, the gray level interval can be appropriately compressed, and the remaining gray level number is assigned to the low gray level and the high gray level area. In the test of human visual characteristics, we found that when the gray level difference is large enough, the human eye can easily distinguish it, and

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then increase the gray level interval to improve the resolution of the human eye. The ability does not mean much, but instead compresses the interval of other gray levels, which reduces the overall quality of the image.

It can be seen from the visual and human psychological characteristics of the human eye that the range of change is large, and the area with rich details is likely to attract the attention of the human eye, while the area with flat changes is not easy to pay attention to. In the study of vision, the following experiments were carried out: Two images were placed in the field of view of the tester at the same time, one of which had black lines and the other of which was all white. Using the instrument to record the time when the eyes were looking at the two images, the results showed that the human eye was 70% of the time looking at the line with the line. This shows that the images with sharp changes are more attractive. For grayscale images, the human eye will focus on areas where the gray value changes greatly. According to this visual characteristic of the human eye, an X-ray image can be divided into two parts: the background area and the target area. The X-rays imaged in the background area do not pass through the human body, the intensity is high, and the exposure of the imaging plate is sufficient, so the area is The gray value is low; and the target area is attenuated due to the X-ray passing through the human body, so the gray value is high. The information contained in the image is mainly located in the target area, and we hope that the human eye will focus on the target area so that the required information can be fully obtained. Therefore, it is necessary to adjust the distribution of gray levels, reduce the gray level interval occupied by the background area, increase the gray level interval occupied by the target area, and make the gray value of the target area vary widely, which is beneficial to the image representation. The details, while the changes in the background area are flat, so as to fully highlight the target area to attract attention. In order to achieve the above purpose, the background area and the target area are first determined. The human eye can recognize the background area and the target area, but it is difficult for the computer to accurately separate the two. The X-ray image is measured and counted. According to the related concepts of fuzzy mathematics, the membership function is used to define the background area and the target area.

3. Traditional Medical Image Processing Methods

In practical applications, medical images are easily limited by hardware or the environment, and the resulting images tend to have blurring and noise effects, which makes it difficult for medical workers to identify the lesion area and the normal area, resulting in missed diagnosis or misdiagnosis. Therefore, medical images must be enhanced to improve the quality of medical images for medical research and medical diagnosis. Compared with other general images, medical images have their own characteristics: Medical images have high requirements on the edge of the lesion. When a doctor observes a medical image, he observes the lesion area of the image, such as the judgment of the vascular condition, the judgment of the condition between the brain and the meninges, etc., all of which require us to obtain a sharply defined image. However, images obtained through medical imaging devices often fail to meet the requirements of volunteers, resulting in an inability to make accurate judgments on the lesion area. This requires us to focus on the enhancement of image edges when processing medical images. Medical image clarity requirements are high. For example, some CT images of the brain and images of important organs such as internal organs may be blurred, unclear, etc., which may affect the judgment of medical workers, and delays in the patient's condition are misdiagnosed. Medical images have a higher requirement for noise reduction. These noises are difficult to eliminate due to noise that may be introduced under different conditions (including different locations, temperature and humidity conditions, and different imaging device operators), as well as mechanical noise, thermal noise, and the like inherent to medical imaging devices. This requires us to take into account the effects of noise and minimize the effects of these noises when processing medical images. Common noises are: salt and pepper noise in X-ray images, Gaussian noise in CT images, and so on.

4. Medical Image Processing Method Based on Human Visual Characteristics

The pre-processing of medical images yields the images we need that contain most of the important information. Its benefits mainly have two aspects: First, it removes the unimportant part that may introduce noise, reduces the influence of noise on medical image quality; Second, it reduces the influence of unimportant part of information on decomposition filtering, which is beneficial to decomposition filtering. The normal implementation. Threshold segmentation is achieved by using the Otsu method threshold binarization. The largest inter-class variance method (also known as the Otsu method) was proposed by the Japanese scholar Otsu, and is an adaptive threshold determination method derived from the principle of decision analysis or least squares, referred to as OTSU. Use Opencv to calculate the maximum area closed contour of binarized medical images. The area here refers to the area of the closed portion formed by the line connecting the contour portion and the starting point. Use the function cvContourArea in Opencv. Calculate the maximum area closed contour of the binarized image and perform calculations on the original image. It can be seen from the analysis of the gray-scale mapping function and the corresponding graph that the gray-scale mapping function we construct not only conforms to the contrast sensitivity characteristics of the human eye, but also enhances the contrast of the medical image through this gray-scale mapping function. In theory, it laid the foundation for the smooth implementation of the experiment. Combining the edge sensitivity of the human eye on the basis of the decomposition filtering can greatly enhance the influence of noise on the medical image while greatly enhancing the edge of the medical image. In addition, medical images mostly have irregular shapes, and Laplacian operators can be approximated as an elliptic operator. Laplacian operators can effectively detect the edges of medical images. Achieve edge enhancement of medical images.

A medical image enhancement method based on human visual characteristics is to enhance medical images according to an enhancement function. This enhancement function mainly consists of two parts: one is to construct a gray-scale mapping function based on the contrast sensitivity characteristics of the human eye to enhance the contrast of medical images; secondly, the Laplacian operator is introduced into the decomposition filter for different regions. Perform segmentation enhancement to achieve edge enhancement of medical images and reduce the effects of noise in decomposition filtering. Because medical images have high requirements on the edge of the lesion area, high contrast requirements and high requirements for reducing noise, our experimental results show that the medical image enhancement method based on the visual characteristics of the human eye enhances the edge of the medical image significantly, and the contrast The enhancement is obvious and reduces the influence of noise on medical images, is more suitable for human eye acceptance, realizes the enhancement of medical images, and is more suitable for medical diagnosis and treatment.

5. Conclusion

The variety of images is ever-changing, resulting in a wide variety of image processing methods, and the quality of images is not measured by a uniform standard, which requires us to increase the research on image processing. Due to the increasing requirements for medical image quality, a single medical image enhancement method is often difficult to meet the actual needs. Therefore, the combination of several methods, complementing each other and complementing each other is an inevitable trend in the development of medical image enhancement methods. In this paper, a new medical image enhancement method is proposed based on the visual characteristics of the human eye. Finally, the medical image is enhanced, and the image with large contrast, clear and more detailed details is obtained. And for medical images, we can adjust the threshold of the division at any time, which can enhance the parts we need, and the effect is better. Therefore, the proposed method is more acceptable in the near future. In this paper, due to the correlation of the gray level of medical images, the application of the region of interest of the human eye is mainly applied to preprocess the medical image. Because the medical image has the ambiguity of gray scale, we use the enhancement method based on human visual characteristics. The medical image is processed to

mainly enhance the edge and contrast of the medical image, while reducing the influence of noise, thereby obtaining a visually better image.

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References

[1] Liu Hengshu, Huang Lianqing. Medical Image Processing Method Based on Human Visual Properties [J]. Optoelectronic Engineering, 2001(04): 39-42.

[2] Shi Shujuan, Fu Jun. A Medical Image Enhancement Method Based on Human Visual Properties [J]. Journal of Xi'an University of Engineering Science and Technology, 2005, 19(3):342-345.

[3] Yang Yinyin. Research on Mathematical X-ray Medical Image Enhancement Method Based on Human Visual Properties [J]. 2003.

[4] Wu Wei, Li Bo, Qian Wei, et al. Method of image clarity of substation based on human visual characteristics [J]. Electric Power Information and Communication Technology, 2017(01): 5-11.

[5] Ding Xuxing, Zhu Rihong, Li Jianxin. An Image Quality Evaluation Based on Human Visual Properties [J]. Journal of Image and Graphics, 2004(02): 65-69.