Research and Implementation of Medical Image Edge Detection Algorithm

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Medical imaging has become an important reference for the diagnosis of various diseases, and the role of medical imaging will become more and more important in the future. The interpretation of medical images is of paramount importance. With the continuous development of medical imaging technology, image interpretation has become more and more important. At present, it is directly inferred by doctors that in order to solve problems more effectively and deal with fuzzy data, it is necessary to research and implement an algorithm-based medical image edge detection assistant system. The current mainstream algorithms for edge detection include: Roberts, Sobel, Prewitt, etc. Most of these algorithms construct operators for small neighborhood pixels of the original image. The problem is that the algorithm is relatively sensitive to noise in the image and does not automatically select the appropriate threshold, resulting in a result that is not as expected. This is a disadvantage of current algorithms. The thesis elaborates on the theory and algorithm of image edge detection. At the same time, from the perspective of the original edge detection algorithm, the Canny algorithm is mainly studied, and the optimized MTM algorithm and Ostu algorithm are combined to study and optimize in the filtering denoising research. Finally, the algorithm is implemented in C++ language, which realizes the automatic extraction of the edge function of medical images under noise conditions. The improved algorithm performs an edge replacement effect change compared to the conventional algorithm.

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INTRODUCTION

With the continuous development of computer science and technology, its application is more and more extensive, and the speed of medical imaging is also accelerating. Medical diagnosis has entered a new era, and at the same time it has made great progress. In the absence of these advanced technologies, ancient doctors consulted through "looking, smelling, asking, and diagnosing." Although these diagnostic methods still exist, they do not address more complex diseases. The application of medical imaging technology in modern medicine can improve the speed and accuracy of disease diagnosis, thus changing the current diagnostic methods.

Medical imaging [1] as a basic diagnosis and treatment of modern medicine [2] played a huge role in the modern diagnosis of the disease, therefore, how to view and understand the medical image [3] directly determines whether the diagnosis is correct. At the same time, due to the continuous advancement of medical imaging technology, medical images are also more complicated, and the knowledge requirements for image interpretation are also constantly increasing. Therefore, how to organize, preserve and impart such knowledge is essential.

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Status at Home and Abroad

The main problem currently facing is how to build a digital hospital. From the perspective of international development, the development of digital healthcare [4] can be summarized into three phases:

Phase 1 - Digital Management. The main purpose is to improve efficiency at work and assist in finance. Therefore, management digitization is undoubtedly one of the important indicators in the construction management process of information hospitals today and in the future.

Stage 2 - Digital Medicine. Here, we mainly emphasize that the construction of hospital information must cover all aspects of hospital management, such as diagnosis and treatment, medical expenses management, prescription drugs, hospitalization, etc. The most basic and important medical processes must be managed digitally. The most important of these is the digital management of medical care. The main focus is on the digital tracking and scanning of the patient's full medical name for the patient's fundamental interests. Digital management and integrated development applications.

Stage 3 - Regional medical care. In the process of hospital information construction, it is undoubtedly necessary to comprehensively utilize the advantages of network sharing, save all medical information of the hospital in the server, and realize network sharing. At the same time, this sharing is not limited to a small scope, and must be implemented across the province and across the country through the Internet, that is, to achieve global medical information sharing.

Digital medical technology in many foreign countries, especially relatively developed countries, is relatively mature. The implementation of hospital informationization and project research have been carried out. The research here mainly refers to how to make the informationized medical system more able to exert its potential advantages and advantages, thus filling the blank of medical management projects in the medical field [5]. Well, there is no doubt that this will be a key issue for many medical institutions. In contrast, the degree of informatization medical construction in China is relatively backward. The main reason is the lack of technology research and development, the unclear understanding of management construction, and the limitations of its own level. At present, the domestic digital medical level is basically in the first and second stages mentioned above. Therefore, hospital information construction still has a long way to go.

In recent years, through the in-depth study of edge detection technology, many mature algorithms have been formed, and these new theoretical new algorithms appear in the local promotion of image processing technology [6]:

First, the differential operator method

Most edge detection algorithms usually detect boundaries in an image, and differential operations have always been an important method of detection. For example, Roberts operator, Sobel operator, Prewitt operator, Laplacian operator, etc. It also includes some surface-based boundary detection methods. It mainly uses the surface to fit the gray value to the neighborhood around the point to be detected, and then passes the first or second derivative of the surface to obtain the required edge information.

Second, the optimal operator method

The optimal operator method is ultimately to obtain an optimal filter, which is mainly based on the signal-to-noise ratio of the image. The Marr_Hildreth operator is Marr and Hildreth applying the Gaussian function to smooth the image first, and then using the Laplacian operator to detect the edge based on the second derivative zero, also known as the LOG (Laplacian of Gaussian) operator. Canny uses the edge-detection operator's signal-to-noise ratio standard, positioning accuracy standard and unilateral response standard for comprehensive analysis. The Canny operator is studied, and the algorithm has obvious effect on the step edge.

Third, fuzzy edge detection algorithm

At present, in the field of image processing, the processing of fuzzy edges is also carried out. The detection algorithm of fuzzy edges studied by Pal and King is a good example. This method can effectively extract the boundary from the background, and has made great progress compared with the traditional detection result and efficiency. Therefore, it has also played a very good role in many areas of image processing.

Fourth, adaptive smoothing filter

The main idea of the algorithm is to set the operator so that the operator can adapt to the partial structure of the image information, and then use the operator to smooth the information. The adaptive edge detection method is better, for example, Geman's idea of using Simulated Nealing is the idea of the algorithm.

Fifth. Edge detection algorithm based on wavelet transform

French scientist Mallat converted H into discrete wavelets to transform the image by wavelet transform. Due to the characteristics of the wavelet transform, the edges of the resulting image can give good results.

Sixth, relaxation iteration method

The edge extraction of this algorithm is based on boundary enhancement. The method is performed in three steps: image smoothing, edge acquisition, and relaxation iteration.

Let us take a look at domestic development. From the digital construction of Daqing City Hospital in Heilongjiang Province, although Daqing City is not a developed city, from a national perspective, the per capita annual income is less than ten in the country. This is one of the living standards of the people of Daqing City, a powerful epitome. However, as far as the digital construction of hospitals is concerned, the construction of digital hospitals is not entirely due to shortage of funds, but there are many reasons. On the one hand, the hospital's high-level awareness is not in place. On the other hand, many important technologies have not been introduced in the field of hospital information management. Many managers are at the "simple transaction" level of the traditional second stage [7]. Although the People's Hospital has basically realized digital management, electronic medical records, drug supervision, real-time monitoring of inpatient wards, etc., the People's Hospital has not introduced high-level information management tools. This is also a portrayal of the status of most hospitals in the country [8].

At present, the digitization of hospitals has become the top priority of hospital construction in China. Therefore, in all projects, the digital construction of radiology is very high. Then medical digital image processing technology will undoubtedly play a decisive role in the field of radiology, and the digitization of radiology will reach the limit, which will effectively fill the gap in the field of medical digital research.

Incidentally, because China has a large geographical area and different cities or regions have different humanities and other characteristics, At a certain level, the system is tangible. If it is tangible, it must advance with the times and bring Chinese characteristics. The system should be suitable for different geographical features, and consider the integrity of the system in different regions and the feasibility of development [9], thus achieving the promotion of a wide range of related systems nationwide.

Current Problems with Edge Detection

The result of the ideal edge detection should be able to correctly determine the presence or absence of the edge, the correct edge and the wrong edge and the direction of the edge. A low false positive rate requires that the actual edge of the image cannot be missed and that the edge cannot be reported incorrectly. High-precision positioning requires that the width of the edge ≤ the width of the pixel be used as a reference for determining the actual position of the pixel. However, there are still significant difficulties in achieving this goal for the following reasons [10]:

First, noise is inevitably present in an actual image, and information such as distribution and variance is also unknown, and both noise and edges belong to a high frequency signal. Even with the smoothing method, most of the noise can be eliminated.

Second, since there are objective conditions such as physics and illumination, the edges in the actual image tend to exist in different proportions because the information of the pixel scale on each edge is generally unpredictable in characteristics. Therefore, it is obviously impossible to detect these edge information simultaneously by a single fixed scale edge detection operator [11].

Even with the Prewitt operator [12] and the Sobel operator [13], it can detect more edge information, but there is also a certain degree of false edge information, the detection result is relatively thick, and the noise is amplified. The Laplacian operator can greatly eliminate false edges and thus have a higher positioning accuracy ratio. However, this will make the edges very susceptible to noise, which may result in loss of some edge information, discontinuities and sensitivity to noise, and the inability to obtain the edge direction of the image.

Therefore, existing image edge detection algorithms still have many problems to be solved.

CLASSIC THEORY AND ALGORITHM OF EDGE DETECTION ALGORITHM

The edge of the image contains rich information on the image, so it not only becomes the basis of digital image processing content research, but also an indispensable part of digital image processing technology application.

First, image edge detection. Image edge detection has received extensive attention and application in many industries and even in many emerging industries. Images are used not only to convey visual information, but also to enable people to obtain visual effects from image displays. It is often necessary to extract the information contained in the image to provide a data basis for subsequent operations [14], and most images are inherent. Information is at the edge of the image, so studying image edge detection not only outlines the shape of the area we care about, it also allows people to more intuitively understand the areas they care about and allows people to get more information from the image.

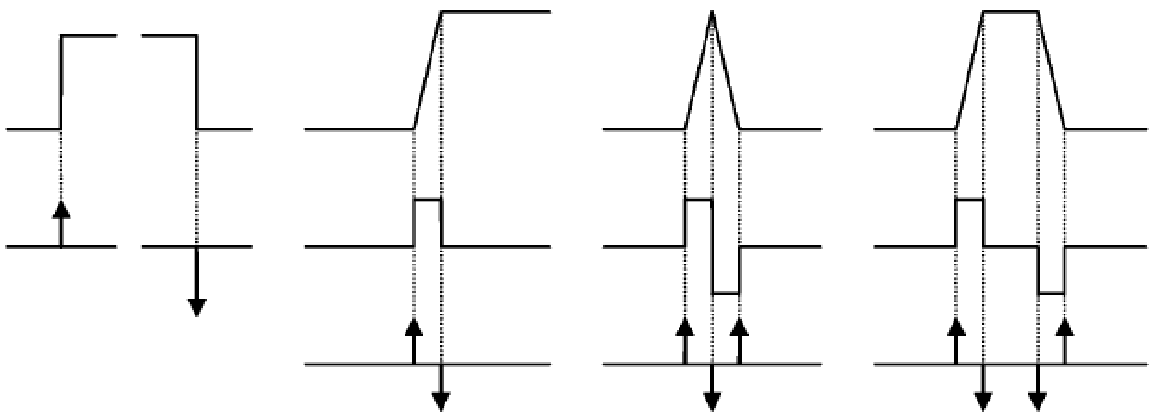
Second, graphic interactive editing. Most of the data processed by seismic images is measured in the field and then manually digitized. Due to the inevitable more or less errors in the field measurement and data digitization process, it is necessary to improve some graphics of the map due to the aesthetic requirements of the map display, which requires an editing tool.

Therefore, it is often necessary to further process these boundary information, such as changes in points in the boundary, additions, deletions, and the like. Such an operation, in order to fully prepare for subsequent processing, can improve the flexibility of interactive editing, and a convenient graphic data storage structure is an important basis for graphic editing.

Basic Theory of Edge Detection

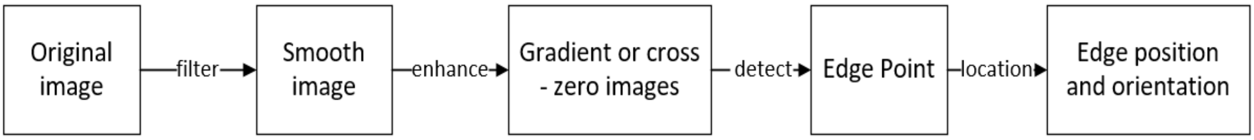
The edges are generally divided into four categories (as shown in Figure 1), where the step shape is caused by a significant change in grayscale on both sides [15]. As the intersection of gray scales increases and decreases, a roof-like boundary is formed.

Fig 1.
Four Edge Types



The basic process of edge detection is shown in Figure 2.

Fig 2.
Image edge detection process



Good edge detection algorithms and methods should have the correct detection of effective edges, high-precision edge positioning, no leak detection and noise insensitivity. Currently, more methods are used to make subjective judgments mainly through the human eye is it good or bad. In order to be able to quantitatively and accurately evaluate various edge detection methods, scientific and clear evaluation indicators should be sought. Therefore, in 1991, Pratt proposed an edge detection method called the mass factor formula:

$$F = \frac{1}{max\{N_1, N_A\}} \sum_{i=1}^{N_A} \frac{1}{1+\alpha d^2(k)}$$
(2.1)

N_1 and N_A in the formula represent the actual and detected edge points, $d(k)$ is the length between the detected edge and its corresponding actual edge, and α is a constant, mainly used to punish the wrong edge. Pratt sets the value of α to 1/9, and the range of F is [0,1]. When the value of F is larger, the higher the precision is, the better the performance is. The optimal value of F is 1 .

In several traditional boundary tracking algorithms, it is difficult to track each target individually for eight neighborhood boundaries. For some special images, such as images with noise points or unclosed curves, the above several tracking methods will greatly reduce the efficiency and accuracy of tracking by these tracking algorithms. At present, in many practical applications, it is very important to achieve independent tracking of multiple targets. Therefore, we need to design new algorithms according to the characteristics of actual images to meet the needs of practical applications.

Common Edge Detection Algorithms

Related terms:

Edge point: A point that is discontinuous in the image and a point where the gray level changes significantly.

Edge Detector: An algorithm that can obtain an edge set of an image in an image.

Outline: The boundary curve model of the area on the image.

Edge Join: Connects the set of boundary points detected by edge detection in sequence, and finally joins them into a complete sequence of points, generally in a clockwise connection.

Vectors can be used to represent the gradient of the continuous medical model f(x, y) at (x, y), for example:

$$G(x,y) = \begin{bmatrix} G_x \\ G_y \end{bmatrix} = \begin{bmatrix} \frac{\partial f}{\partial x} \\ \frac{\partial f}{\partial y} \end{bmatrix}$$
(2.2)

Also, the following three norms can be used to measure the magnitude of the gradient:

$|G(x,y)| = \sqrt{{G_x}^2 + {G_y}^2}$, 2 Norm gradient

$|G(x,y)| = |G_x| + |G_y|$, 1 Norm gradient

$|G(x,y)| \approx max\{|G_x|, |G_y|\}$, ∞ Norm gradient

The direction of the gradient and the maximum rate of change are consistent:

$$\phi(x,y) = arctan\left|\frac{G_y}{G_x}\right| = arctan\left|\frac{\partial f}{\partial y} \Big/ \frac{\partial f}{\partial x}\right| \quad (2.3)$$

Because the digital images themselves are discrete values, in order to facilitate the calculation, while the partial derivatives G_x and G_y are being used, the differential operations are often replaced by differential operations, and the small region template and image are selected for convolution operation to approximate Gradient value:

$$\begin{cases} G_x=[f(x-1,y+1)+2f(x,y+1)]-[f(x-1,y-1)+2f(x,y-1)+f(x+1,y-1)] \\ G_y=[f(x+1,y-1)+2f(x+1,y)]-[f(x-1,y-1)+2f(x-1,y)+f(x-1,y+1)] \end{cases} (2.4)$$

The ∞ norm is used to measure the amplitude. The size of the gradient is:

$$|G(x,y)| \approx max\{|G_x|,|G_y|\} (2.5)$$

The convolution templates for G_x and G_y are as follows. (Figure 3)

Fig 3.
Sobel operator template

-1	0	1
-2	0	2
-1	0	1

1	2	1
0	0	0
-1	-2	-1

When (x, y) is g(x, y) ⩾ T, it can be judged that the point is an edge point; otherwise, this is a non-edge point. This operator mainly consists of two 2×2 templates that calculate the partial derivatives of the x and y directions:

$$\begin{cases} G_x = |f(x+1,y+1) - f(x,y)| \\ G_y = |f(x+1,y) - f(x,y+1)| \end{cases}$$
(2.6)

Use the 1 Norm gradient to measure the magnitude of the gradient, the size is:

$$|G(x,y)| = |G_x| + |G_y| (2.7)$$

The convolution templates for G_x and G_y are as follows:

$$\begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}, \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$$

Applying the above template operation, the amplitude g(x, y) can be solved according to Equation 2.5, and then the appropriate threshold T is selected. When g(x, y) ⩾ T at (x, y), the change can be judged. It is the edge point; otherwise it is the non-edge point, so the noise in the image is lower, it is more appropriate to use Roberts.

IMPROVED MEDICAL IMAGE EDGE DETECTION ALGORITHM

In this chapter, based on the research of Canny and Otsu operators, the Canny operator is improved by combining with other methods, and then the CMO algorithm to be described in this chapter is obtained.

Canny Edge Detection Criteria

Based on the three criteria of signal-to-noise ratio criterion, positioning accuracy criterion and unilateral response criterion [16], Canny obtained the c~y edge detection operator. In 1986, Canny proposed a relatively good edge detection method:

This algorithm requires several criteria to be met:

(1) Signal-to-Noise Ratio Criterion: This criterion is mainly to detect the presence or absence of results at the edge of the image. And there can be no false edges.

(2) Accuracy positioning criteria: The edge position we mark must be similar to the center of other image edges.

(3) Unilateral response criteria: The response frequency of each edge is not too high and the parasitic edge response needs to be suppressed to the utmost extent.

The main process of Canny algorithm edge detection is as follows:

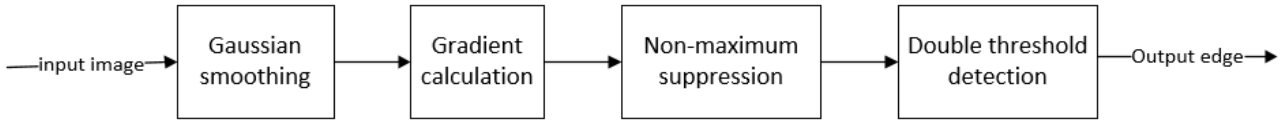
(1) Smoothing the image, we mainly use a Gaussian filter;

(2) Calculate the amplitude and direction;

(3) The amplitude of the gradient must be suppressed by the maximum value;

Canny's gradient is calculated by the derivative of the Gaussian filter. The main flow chart of Canny is shown in Figure 4.

Fig 4.
Canny algorithm flow chart



Gaussian smoothing: Images are represented by f(x, y), and the required matrix is obtained by convolution.

Calculate the magnitude and direction angle: the gradient of the known smoothing matrix S(i,j), the two matrices P(i,j) and Q(i,j):

$$sS(i,j) = G(i,j;\sigma) * F(i,j) \qquad (3.1)$$

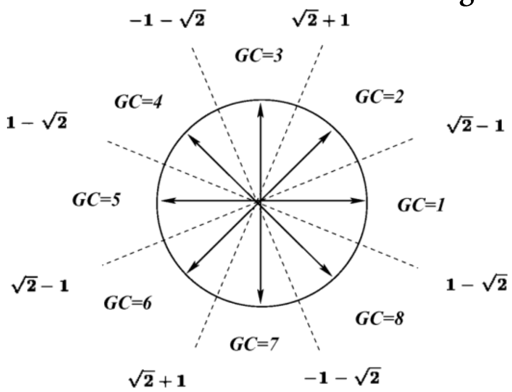
$$P(i,j) \approx (S(i+1,j) - S(i,j) + S(i+1,j+1) - S(i,j+1))/2 \qquad (3.2)$$

$$Q(i,j) \approx (S(i,j+1) - S(i+1,j+1) - S(i+1,j))/2 \qquad (3.3)$$

Non-maximum suppression: Since we have to convert the image to the necessary transformation to solve the problem of how to solve the maximum value of the magnitude matrix, this is not the final result. Then we call this process Non-Maxima suppression (NMS).

Using the magnitude of the suppression gradient line, the range of gradient angles Θ (i, j) is controlled to one of the four regions, as shown in Figure 5 below:

Fig 5.
Normalization of the direction angle



We refine M(i,j) to have only a single pixel width. The height of the ridge needs to be preserved. Assume:

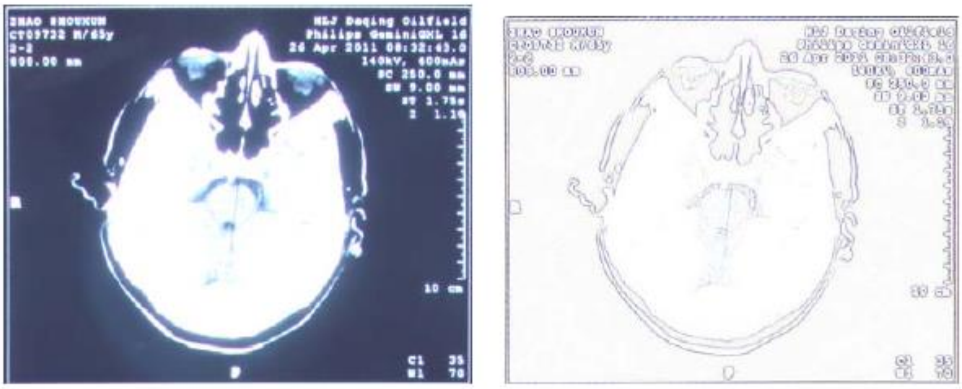
$$N(i,j) = NMS(M(i,j), \varsigma(i,j)) \qquad (3.4)$$

This formula represents the process of suppressing non-maximum values. We need to smooth the image in edge detection, but the resulting amplitude image still has many false edges produced by noise and texture.

Double Threshold Detection: Canny proposes an effective method for measuring noise. First, the image edge signal must have a small response, but this increases the noise response, so the threshold can be obtained from the cumulative histogram of the filtered image (later in the improved algorithm, Canny will be obtained by the Otsu algorithm).

Error edges are still present in the edge matrix obtained by thresholding, so choosing the appropriate threshold is relatively difficult because it requires a lot of iterative testing. Canny's proposed dual threshold-based approach can effectively solve this problem. First, a high threshold T_1 is obtained by accumulating the statistical histogram, and then a low threshold T_2 is taken (T_1 and T_2 are satisfied in this paper to satisfy T_2= T_1). If the response is greater than its maximum value, then it can be determined that this must be the edge value; if it is between T_1 and T_2, then it depends on whether its eight-neighbor pixel has an edge larger than T_1, if any, then It is the edge, otherwise it is non-edge. The original Canny results are shown below. (Figure 6)

Fig 6.
Unoptimized edge detection effect of Cannuy algorithm



MTM Algorithm

In the final evaluation, a single noise is usually used to evaluate these methods. In theory, this will have a better filtering effect. Lee and Kassam for the different application scopes of the median filtering algorithm, combined with the advantages of each algorithm, get the optimized MTM, which can filter Gaussian and impulse noise at the same time.

The filtering effect obtained in this way is better, but the disadvantage of the MTM algorithm is mainly because the algorithm must first sort the pixels in the window, and the filtering speed is slightly slower than the original Canny algorithm [17].

The specific process of the algorithm is as follows:

First select the appropriate filter window and calculate the median of its internal pixels. It should be noted that the center pixel should be weighted before the median search operation, ie

$$m_c = median\{x_1, x_2, \dots, \omega x_c, \dots, x_n\} \qquad (3.5)$$

In addition, it is necessary to emphasize the problem selected by qc. The qc size is an important parameter. If the selection is not correct, it will seriously affect the filtering results. At the same time, the elimination of impulse noise is enhanced, but the elimination of Gaussian noise is weakened. Although this can attenuate or filter the impulse noise, it can also increase the intensity of eliminating Gaussian noise [18]. At the same time, the edge information also suffers losses.

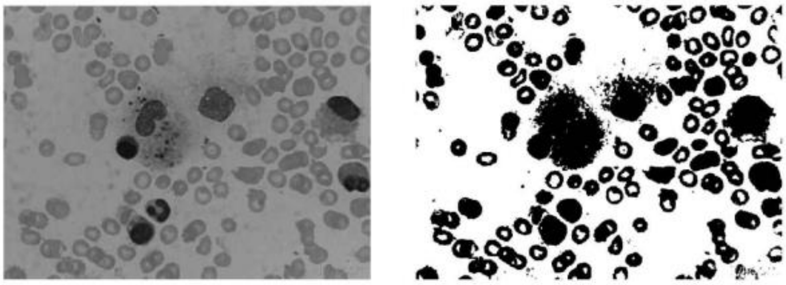
In the process of solving the intermediate values in $m_c = median\{x_1, x_2, \dots, \omega x_c, \dots, x_n\}$, a problem is involved: how to sort effectively and quickly Operation.

If we want to calculate the size and direction of the filter gradient like the Canny algorithm, we must complete the mean filtering weighting of the center pixel and determine the edge of the image.

Otsu Algorithm

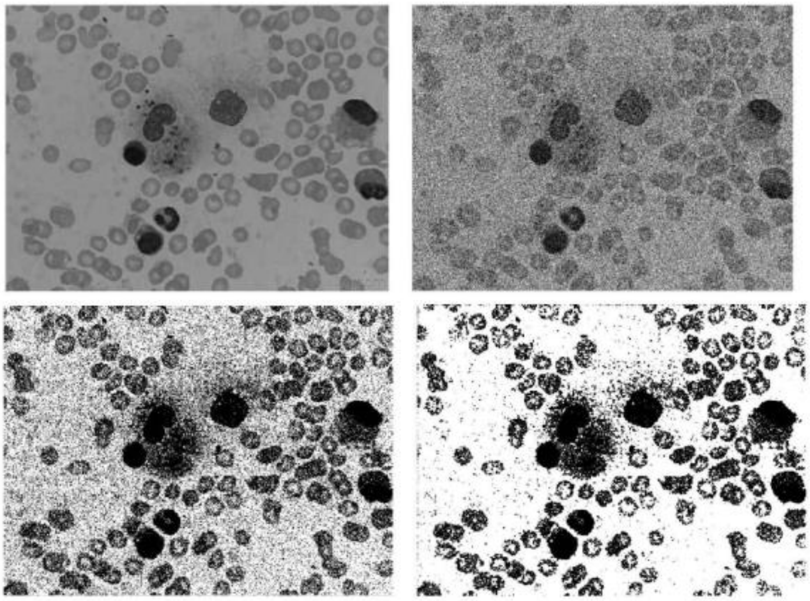
The choice of threshold is usually based on such an assumption. The optimal threshold should then have the best two thresholds that can be separated. The algorithm is relatively simple to calculate and in some cases is not affected by image contrast and brightness variations. At the same time, it is widely used in some real-time processing systems. It has long been considered an automatic threshold selection [19]. The most optimized method in the field. The original grayscale image and the one-dimensional Ostu algorithm process the result as shown in Figure 7.

Fig 7.
One-dimensional Ostu algorithm edge detection effect



In the presence of noise, the segmentation effect of the two-dimensional Ostu algorithm is better than the one-dimensional Ostu algorithm. At the same time, the two-dimensional algorithm can reduce the false positive rate of pixels in the threshold processing process and avoid misclassification to some extent [20]. This is an advantage compared to the two-dimensional Ostu algorithm and the one-dimensional Ostu algorithm. The effect of the two algorithms is compared as shown in the figure below. (Figure 8)

Fig 8.
Comparison of the next dimension and the two-dimensional Ostu algorithm with noise



The basic principle of Otsu's maximum interclass variance is: Let f(x,y) ∈ [0,L-1], remember G={0,1,2,...,L-1}, p(i) is the gray level The frequency of i, the probability that the gray level is i:

$$p(i) = \frac{1}{MN}\sum_{f(x,y)=i} f(x,y) \quad i \in G_L \qquad (3.6)$$

Now set the threshold to t, then the image can be divided into two parts: the target area O and the background area, which use the {original medical image f(x, y) ⩽ t} and {the original medical image f (x, y)>t} to represent, so there is

Target ratio: $\omega_0(t) = \sum_{0\le i\le t} p(i)$

Target mean: $\mu_0(t) = \sum_{0\le i\le t} ip(i) \,/\, \omega_0(t)$

Background ratio: $\omega_1(t) = \sum_{\varepsilon\le i\le L-1} p(i)$

Target mean: $\mu_1(t) = \sum_{\varepsilon\le i\le L-1} ip(i) \,/\, \omega_1(t)$

Total mean: $\mu = \omega_0(t)\mu_0(t) + \omega_1(t)\mu_1(t)$

The optimal threshold formula for the image obtained by the Otsu algorithm is as follows:

$$T = \mathrm{Arg}Max_{t\in G_t}\left[\omega_0(t)\big(\omega_0(t)(\mu_0(t)-\mu)\big)^2 + \omega_1(t)(\mu_1(t)-\mu)^2\right] \qquad (3.7)$$

The actual value in parentheses is the variance value between the categories. As the value of the variance increases, the uniformity gradually deteriorates, and the segmentation effect becomes better [21].

Results and Analysis

The configuration test results are shown below.

(Figure 9-10)

Fig 9.
Original image, Canny and CMO algorithm results comparison (1)

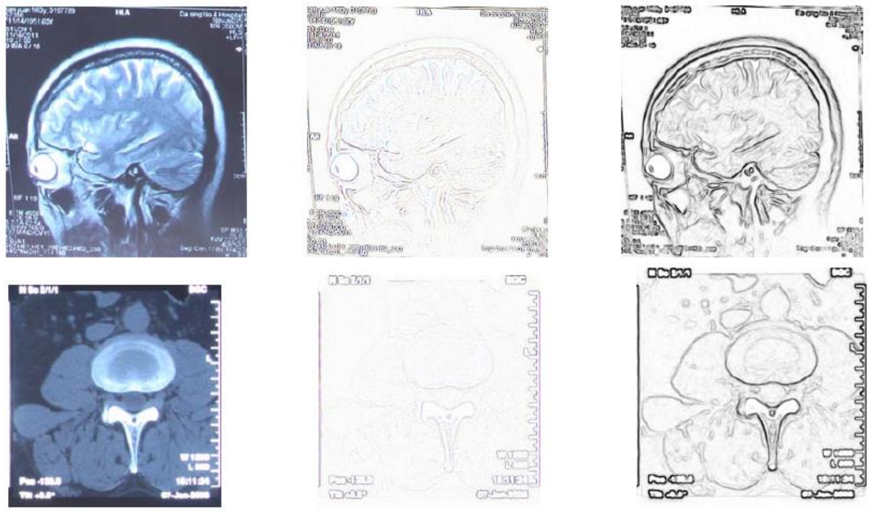
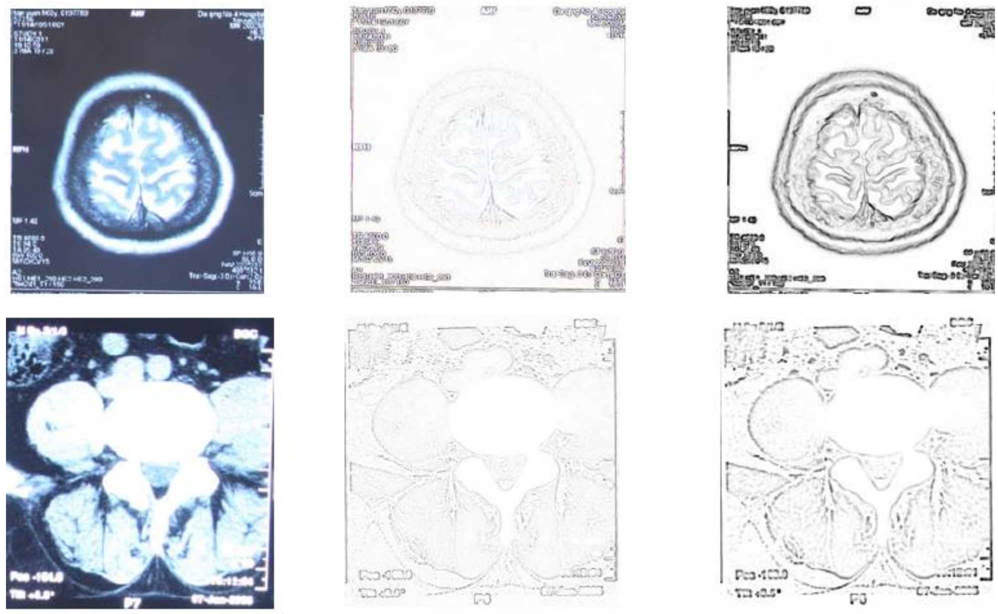


Fig 10.
Original image, Canny and CMO algorithm results comparison (2)



The comparison between the average processing time of the Canny algorithm and the CMO algorithm and the number of detected boundary points is shown in Tables 1 and 2.

Table 1.
Comparison of average processing time between edge detection of Canny and CMO

Image	Canny algorithm	CMO algorithm
Head side view CT original picture	64ms	535ms
Waist top view CT original picture	46ms	554ms
Head overlooking CT original image	60ms	583ms
Waist top view CT original picture	314ms	2406ms

Table 2.
Comparison of edge detection points of edge detection between Canny and CMO

Image	Canny algorithm	CMO algorithm
Head side view CT original picture	5400	34400
Waist top view CT original picture	5220	35500
Head overlooking CT original image	4900	25500
Waist top view CT original picture	6750	48700

It can be clearly seen from the results of the test that better results are obtained by replacing the artificial input threshold with the Otsu algorithm, for example: more complete edge connectivity, and a significantly reduced number of false boundaries. It can be seen that the Canny algorithm has the following disadvantages: (1) edge breakage; (2) inaccurate positioning. Compared with this, the detection effect of the CMO algorithm is significantly better than the former. The processing time of the CMO algorithm is much longer than the original Canny algorithm, and the duration is about 8-12 times that of the Canny algorithm, which is also the inadequacy of the CMO algorithm. However, considering the efficient processing speed of today's computers and the lack of high requirements for real-time performance, comprehensive processing quality and measurement time can still accept such processing time range.

SUMMARY

It is undeniable that the rapid development of information technology has brought about fundamental changes in many fields of the world, because information technology has been gradually applied to all aspects of life and work research. Among them, in the field of medical imaging, the application of image processing technology has been very extensive, so image edge detection and feature extraction are the application basis and premise of image processing and pattern recognition, machine vision and other related fields.

This article begins with an introduction to the history of image processing and the current state of research at home and abroad. Secondly, a brief description of the commonly used detection methods, followed by some classic detection algorithms, especially the famous Canny algorithm. A more in-depth analysis was carried out. Then the MTM and Otsu algorithms and the traditional Canny algorithm are combined to obtain the CMO algorithm described in this paper. The practical application of a large number of medical images proves that the CMO algorithm is more traditional than the traditional CMO algorithm. There are outstanding advantages in the field of image edge detection. This article has mainly completed the following work:

1. By analyzing the edge detection algorithm of the image, the optimized edge detection and edge extraction methods are obtained. This method can reduce the calculation amount according to edge features and shorten the time consumption of boundary tracking.

2. Through the research and learning of the denoising method in original imageology, a denoising method suitable for medical image features is proposed and a good denoising effect is achieved.

3. The medical image boundary automatic extraction interactive system is designed by using digital image processing algorithm and filtering and noise reduction, edge tracking and other editing processing techniques.

With the rapid development of computer

hardware technology and the rapid improvement of computer computing power, we can develop relevant selection criteria in terms of execution speed, quality of processing results, and hardware price.

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