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Application Analysis of Particle Swarm Optimization in Medical Imaging

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Abstract

At present, the rapid progress of Internet and development, scene constantly innovative optimization and subdivision, standardization of technology products and service platform of some traditional gm has cannot fully able to meet the enterprise customers personalized service requirements, all kinds of enterprises in technology application, and the scene for the business core enterprise multidimensional technology together, providing customized Sex of technical service and product solutions to model, became our drive enterprise's value creation of an effective development path, health, medical professionals fusion is to speed up the pace of development, to promote the leap-forward progress of medical science, medical technology, medical imaging, as one of the important product of medical professionals fusion, even if has made substantial progress in many ways, However, for the further development of medical imaging, it is still necessary to strengthen medical innovation and improve the fusion effect. This paper will start from the particle swarm algorithm, expounds its application in medical image, improve the depth of the application of particle swarm algorithm in medical image.

Keywords

Particle Swarm Optimization; Medical Imaging; Application Analysis.

1. Introduction

1.1 Research background and significance

Along with the progress and development of medical information technology, all kinds of medical equipment is more and more appear in the various departments of the hospital and department, as the medical imaging technology in our country, widely used in the field of clinical medical, it followed the development of image processing technology, mainly is suitable for increasing the accuracy and quality of medical imaging, computer or computer aided detection And diagnosis, application in interventional surgical treatment and other diseases of the treatment and surgical effects and evaluation and assessment. In the progress and development of modern medical image technology, we are constantly striving to pursue the following points: one is to improve image quality, enhance accuracy, improve image contrast, and further improve the diagnosis and treatment ability of clinical medical science; Second, the resolution of the image is changed, and the image is segmented according to the most interesting disease features such as color, texture, gray scale and edge of the image. The image is segmented into a group of connected regions that meet certain similar criteria or have certain homogeneous features, and the features are calculated, so as to improve the diagnostic ability. Traditional medical imaging diagnosis, mainly through the observation of two-dimensional slice images to find out the body, usually is very dependent on physician's reading and analysis of the diagnosis to complete, therefore, diagnosis of diseases and the results tend to be affected by physicians of human, the practical experience of clinical diagnosis of physicians in the diagnosis of great significance and role in the process. The traditional medical images are processed and analyzed

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by computer image processing, so that doctors can see the characteristics of the disease more intuitively, so as to improve diagnostic efficiency. The third is to evaluate the effectiveness of treatment and operation. The comprehensive application of image signal processing technology in medical image can quantitatively analyze and evaluate the curative effect before and after surgery or the medical image image made by drugs before and after surgery, so as to make an evaluation and accuracy of its effect in treatment and surgery.

1.2 Research content of medical image processing

Medical image processing refers to the process of applying a series of operations to a digital medical image to achieve the predicted results. Its main processing object is the medical image with different imaging wit, it covers all the medical image related science and technology and intelligent algorithm, all kinds of medical images have their own functions and characteristics, which is mainly due to the difference of their imaging system and imaging working principle.

At present, medical image processing mainly focuses on the following research contents:

1.2.1 Transform medical images

At present, the resolution of the medical image has been more and more high, the required storage space occupied more and more, containing data and information becomes more, so the need for image processing, calculation of data quantity also will follow accordingly, in order to be able to not only ensure the quality of the image processing, at the same time can reduce the difficulty of image processing, a lot of Experts and scholars have extended a variety of indirect image processing techniques to image processing in the calculation of these methods, such as Fourier transform, wavelet transform, discrete cosine transform, etc.

1.2.2 Image analysis

Image analysis is mainly to detect, measure and describe an object of interest in an image. The research purpose of image analysis is mainly to obtain the data closely related to the image related target through the database, and rely on other relevant data to analyze, intuitively obtain the relevant diagnostic information, and improve the diagnosis and treatment level.

1.2.3 Image registration technology

Image registration technology plays a very important role in image processing. Its purpose is to compare or fuse images of the same object under different conditions. There are three ways to register an image. One is mainly based on grayscale and template; The second type uses the matching algorithm based on the feature. The third method is based on domain transformation.

1.2.4 Medical image segmentation

Medical image segmentation is based on similarities and characteristics of all kinds of medical image as the basis, to all kinds of medical image is divided into innumerable not interconnected areas, a process related to the characteristics in the same area will show the consistency or similarity, if in different areas, its performance are obviously different, that is to say in this Each pixel on the boundary of each region has some kind of discontinuity.

2. Particle Swarm Optimization

2.1 Overview of particle swarm optimization

Particle swarm optimization (PSO) is an evolutionary computing method based on swarm intelligence, which originated from complex adaptive systems (CAS). The basic concept of PSO is derived from the research on the foraging behavior of flocks of birds. It initializes a random group of particles to search for the optimal individual solution and the optimal group solution to complete the optimization.

2.2 Algorithm process

The flow of fundamental particle swarm optimization (PSO) is as follows:

Step1: Initializes the particle swarm.

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Step2: calculate the fitness of each particle.

Step3: Update PHEST and GBest according to fitness, and update particle position velocity.

Step4: if the maximum number of iterations or the global optimal position meets the minimum limit, the algorithm ends. Otherwise, the second to fourth processes are repeated until the conditions are met.

3. Improved Particle Swarm Optimization Algorithm

In order to get out of the trap that neural network algorithm is easy to get convergence or is a local optimal, PSO algorithm and neural network are organically closely combined. The first step is to establish a particle model that fully conforms to the conditions, and it is also necessary to determine an adaptive function and a searchable space. The particle weight and center offset of the algorithm in neural network machine learning must be consistent with the center position of each particle when it moves. The basic operation steps of the particle optimization processing algorithm are as follows: (1) particle structure optimization of a neural network, To set an initialization algorithm (2) will then automatically generated 1 to N different particle swarm, set different particle swarm initialization algorithm in the initial position of each particle and the speed of the particle movement, according to the particle structure of the neural network can be concluded that function in different particles in PSO optimization algorithm to search the node space dimension (3) randomly select neural network structure MSE is used as an adaptive function of each particle swarm optimization algorithm, and the adaptive value of each particle in the particle swarm is calculated. (4) by each particle at the same time in the history of the current best adaptive value and the current optimal adaptive value, if the current optimal adaptive value is better, can make the best adaptive value of the particle current best adaptive value, and will be the best place to save for the history of the individual particles optimum value. By comparing the current best fit value of the particle with the current historical best fit value of the whole, if the current best fit value is better, the position of the current best fit value can become the global historical best fit value, and the best position of the historical best fit value needs to be saved. (5) Can use the individual position and speed to carry out the upgrading. (6) If the error of the adaptive value in the neural network has far exceeded the error limit set by the algorithm, or the number of iterations has far exceeded the maximum number of iterations, the algorithm ends and the optimal position of output history is the optimal historical weight and optimal bias of the whole neural network required by the algorithm. The optimal weight of the wireless neural network and the optimal bias of the network image obtained by the algorithm are substituted into the formula to calculate the threshold of the network image, and then the image is divided.

Through experiments, we determine three parameters derived from gray level co-occurrence matrix to achieve good image segmentation effect: (1) uniformity (2) energy (3) diagonal moment, these three texture features and pixel gray values can be optimized by the proposed algorithm, so as to achieve texture image segmentation.

4. Conclusion

Particle swarm optimization algorithm can converge to the optimal solution more quickly, to the improvement of particle swarm algorithm makes it very good avoid falling into the trap of local optimum, in its application of medical image to promote the further development of medical professionals fusion, further expand the application field of particle swarm optimization (pso) algorithm is pushing us to explore and study unceasingly, it has good application prospect.

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