Study on the Extraction of Effective Information from Cerebrovascular Image by Artificial Intelligence

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Abstract: In recent years, artificial intelligence has become a research hotspot in academia and industry, and it has been widely used in medicine and other fields. The latest research and application progress of artificial intelligence in biomedical image field, including the most cutting-edge direction of intelligent imaging equipment, intelligent image processing and analysis, focuses on the combination of medical image and natural language processing. This paper analyzes the importance and possibility of the research and development of the whole chain artificial intelligence technology, and explains the innovation work in the important direction of the academic and industrial circles. The research of artificial intelligence in the field of medical image is still in its infancy. The combination of artificial intelligence and medical image will become a long-term international research hotspot.

1. Introduction

Artificial intelligence (AI) is a hot spot in the field of industry. In recent years, with the rapid development, deep learning has been implemented in traditional image, video, speech recognition and other fields, and rapidly penetrated into text processing, natural language understanding, human-computer dialogue, emotional computing and other fields[1]. Safety, logistics, driverless and other industries have been playing an important role.the emergence of aging population and the increase of health demand pose a great challenge to the limited medical resources and medical technology. There is an urgent need for new technologies to meet these needs in the medical field. At the same time, artificial intelligence technology related to medicine develops rapidly at home and abroad. Scientific research and entrepreneurship projects provide new opportunities to solve the challenges in the medical field. There are many products such as computer-aided diagnosis, intelligent expert system, surgical robot, intelligent drug development, health management, etc.

2. Cerebral Vessels under Artificial Intelligence

Among many medical information, medical imaging is the most important information source to screen diseases, diagnose and decide treatmen[2]t. Medical image standard diagnosis and treatment, medical image imaging, image processing and analysis, image visualization, early disease screening, risk prediction and detection, disease diagnosis and surgical plan, in fact, support a series of representative long-chain and special fields such as vehicle navigation. At present, more than 90% of the information accumulated in the hospital is image information, which forms a huge data accumulation. Therefore, the technology and application of artificial intelligence based on medical image data has become the focus of medical institutions, scientific research, industry and government. Cerebrovascular diseases often cause very serious consequences, whose early diagnosis directly affects the timely treatment and prognosis, including the arterial blood supply of tumors, the relationship between brain tumors and blood vessels, and the invasion of large blood vessels caused by tumors. To select the methods that directly affect tumor surgery, to make the operation plan and operation effect. Therefore, the imaging method of cerebral angiography has

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been regarded as one of the focus of imaging research. There are digital assistant angiography, transcranial Doppler, CT angiography, MRI angiography and other cerebrovascular examination technologies, which are mature or often developed.

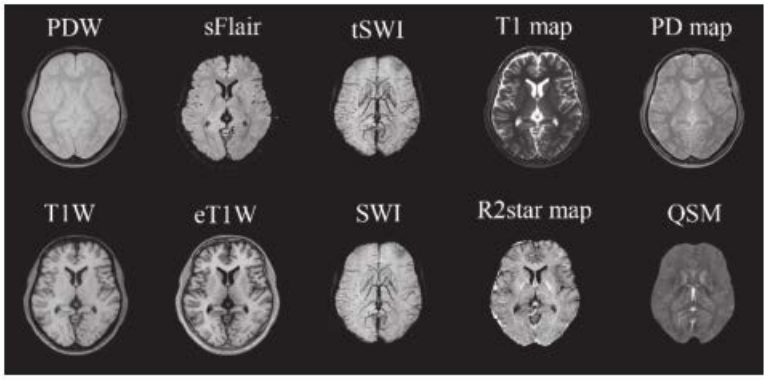

Figure 1 Head image information extraction

3. Intelligent Medical Imaging System

With the popularization of various large-scale medical image equipment at all levels of the hospital, medical image examination has become the most important examination method and diagnostic standard in various diseases diagnosis[3]. Compared with other examinations such as biochemistry, medical image can provide important information, such as the location, structure and function of the focus, and provide intuitive information and reference for diagnosis and treatment. At present, a variety of medical image systems also face many challenges, such as slow imaging speed, image quality affected by patient collaboration and cumbersome image workflow. This section introduces the improvement of artificial intelligence in all aspects of medical image system.

3.1. Brief Introduction of Medical Imaging System

Computer X-ray, nuclear magnetic resonance imaging, positron emission computer X-ray, X-ray, ultrasound and other commonly used medical image modes in clinical practice. Different modality medical images are suitable for observing different types of physiological and pathological information. Medical image machines collect physical signals related to specific physiological and pathological information of human body, and reconstruct the correct two-dimensional and three-dimensional spatial distribution of physiological and pathological information according to the mathematical and physical model of signal transmission. CT images reflect the distribution of X-ray attenuation coefficients of different tissues in a specific spectral band. Because the attenuation coefficient is directly related to the material density, CT images indirectly reflect the three-dimensional density distribution of human tissue. MRI can reflect proton density, longitudinal relaxation time, transverse relaxation time and contrast of human proton diffusion. PET image can reflect the metabolic distribution of FDG in human body. The process of 3D medical image imaging belongs to the category of inverse problem, which is to reconstruct the distribution of physiological and pathological information of human body[4]. The physiological and pathological information can generate the observed signals through the physical signals collected in vitro. This process is usually unstable, and the amount of signal captured due to the limitation of scanning time and dose is insufficient. There may be many reasons for finding out the inherent noise of signal, other signals of interference signal and defects of hardware of camera device. These factors usually can't get the image of analysis and reconstruction method based on ideal mathematical and physical model which can meet the clinical requirements. In order to solve this problem, it is traditionally necessary to add specific prior information of the image as a constraint in the reconstruction process to make the reconstruction process more stable. The commonly used constraints are L1 norm, L2 norm, global variation constraint and so on. These simple constraints have good universality, but they can not accurately reflect the essential characteristics of data. As for the specific image mode and

imaging mode, the optimal reconstruction results are not obtained[5]. Therefore, it is one of the problems in the field of medical image to design a better method of prior restriction. In recent years, with the rapid development of artificial intelligence technology, especially in the field of computer vision, image processing and analysis, international researchers have gradually realized the possibility of applying artificial intelligence technology in the field of medical images. AI technology abandons the traditional artificial design of image pre information, and uses the all data-driven method to learn the inherent deep-seated pre information of image. At present, the combination of artificial intelligence technology and medical image technology has become a hot spot of field research, and relevant research results are breaking out.

3.2. Fast Medical Imaging Method

In the process of clinical medical image scanning, imaging speed has been one of the most important factors. A long scan will reduce the daily circulation of the imager, which will also make the patient uncomfortable. The patient's involuntary movement during scanning may also have an adverse effect on the imaging quality[6]. In the field of rapid imaging, international research focuses on the acceleration of MRI, and published a lot of research on the integration of AI and imaging.

4. Methods of Medical Image Quality Enhancement

In the imaging process, the lack of collected data, the inherent noise of signal and the patient's involuntary movement cause problems such as artifacts and noise, which affect the medical diagnosis[7]. Traditional methods have many limitations. In recent years, international scholars began to apply artificial intelligence technology in the field of medical image quality improvement, and made great progress.

4.1. CT Image Quality Enhancement

The research on improving the quality of CT image focuses on how to use artificial intelligence technology to deal with the noise caused by reducing the amount of radiation and the fringe artifacts caused by the reduction of the number of projections[8]. In order to remove low-dose image noise, a method of CT image noise elimination based on residual automatic encoder is proposed. This method uses deep neural network to construct automatic coding. The difference between the encoder and decoder segments of the network is connected by the remaining methods. This advantage, in order to improve the modeling ability of the network, the combination of image features at different levels, the more effective error in the training process, and improve the training effect of the network[9]. In addition, because the network is connected by residual, in order to learn the mapping from noise image to noise, it is easy to directly learn the mapping from noise image to high-quality image. The results of simulation experiment and clinical image are presented. Compared with the previous image noise removal methods, Chen h et al proposed the residual automatic encoder method. It has the obvious advantages of peak signal-to-noise ratio, SSIM and other indexes. It's also very fast

4.2. Testing

Computer-aided testing is an important area of research, because the lack of examination of lesions can bring significant results for patients and clinicians. Cade's goal is to alert clinicians to abnormal or suspicious areas of the image. While reducing the false negative rate, Cade aims to increase the detection rate of disease areas. New HC [69] the 5-cn structure of CT scan in interstitial lung disease of thoracoabdominal lymph nodes. Detection of lymph nodes is important because it can be a sign of infection or cancer. The detection model of mediastinal lymph nodes was established with 0.95 AUC score and 85% sensitivity. The breast cancer model was examined in the mammogram of beckeras et al. In order to detect prostate cancer such as Wang x, the CNN model was trained with T 2 emphasized MR images.

5. Conclusion

In summary, AI is widely used in medical imaging. From these results, AI has made important progress in the intelligent medical image equipment, the standardization of data collection, standardization and the automation of data analysis. With the accumulation of data and the further maturity of technology, along with the combination of AI and medical treatment, the huge society has brought economic benefits, and the lack of medical resources. According to the changes of the situation, the technology has been promoted to the rapid improvement of the diagnosis and treatment level of grassroots doctors. In addition, it can effectively solve the problem of seeing a doctor.

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