

Application and Prospect of Generative Adversarial Network in Film and Television Production

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Abstract

With the development of intellectualization and the improvement of audience demand in the field of film and television production, many problems have appeared in digital production era. The application of in-depth learning has become the trend. GAN, as the best performance neural network, can meet the needs of current and future film and television production areas. This paper introduces the basic principles of GAN, and then analyzes its development and application in various aspects of video production, the future development of the GAN existing problems in the field of movie and TV production are discussed.

Keywords

Generative Adversarial Network; Film and Television Production; Unsupervised Learning.

1. Background

Under the influence of the tide of intellectualization in various fields, the field of film and television production is also developing more intelligentized. From the film era to the digital era, digitization processing has been widely used in the movie and TV production industry. With the development of film and television works and science and technology, the audience needs to produce excellent works, special effects, rich scenes, etc.. Then they need to have better technology and methods than digital processing, so that the quality and efficiency cost of the works can be improved at the same time. Therefore, in-depth learning and the application of algorithms are necessary.

Under the background of the rapid development of in-depth learning, image and video processing algorithms have also developed rapidly, which makes the multi-processing and generation of images and videos have been greatly improved. The GAN(Generative Adversarial Network) emerged in this general trend. It has made great achievements in many fields of image processing, and has a very good effect.

This paper will briefly explain and discuss the concept of GAN and its application in the field of video production, and make a forecast and analysis on the development trend of future applications.

2. Introduction of GAN

GAN is a new framework for generating models through confrontation process estimation, which was proposed by Ian J. Goodfellow and others in Generative Adversarial Networks in October 2014. The basic principle is that the framework trains two models at the same time. One is the generator, which generates the data or image according to the given data set, in order to make the generated data or image as real as possible; the other is the discriminator, which judges whether the data or image generated by the generator is real or not. The generator and the discriminator play games with each other, and train dynamically, and finally get the results. In the ideal case, when the correct rate of the discriminator is $p = 0.5$, the training model is considered to be completed; in the actual process, the training times are determined according to the required accuracy, and the required model is obtained.

GAN can learn to generate very realistic and excellent quality images according to its own frame structure. Because of its great advantages in image generation, GAN can be applied in the field of film and television production, which can not only increase the quality of image generation, but also save time and capital cost. It is a very ideal film and television production tool.

3. The Application of GAN in Film and Television Production

The most basic GAN framework generates images with very low resolution, poor authenticity, and very few functions. With the development of GAN, researchers add different modules to the basic framework, which improves the authenticity and realizes different functions.

3.1. Image Generation

When Goodfellow et al. Proposed the basic framework, the resolution of the image is less than 32×32 , and the image can not meet the high quality of the current film and television works. Then researchers introduced convolutional neural network into GAN to get DCGAN. DCGAN greatly improves the quality and style of the generated image, and can generate images of various styles, such as: Animation, simple strokes and so on, make GAN not only can be applied in ordinary film and television works, but also can be applied in animation and other styles of film and television works, but the picture quality of DCGAN is not perfect, and it does not solve the problem of unstable generation. At present, PGGAN uses the idea of progressive neural network in training, and the training grid will deepen according to the training process, and finally achieve the goal Stable output of 1024×1024 resolution image.

GAN can also generate the required pictures according to the text narration. When using GAN, users can describe the characteristics of the generated subject according to their own needs. For example, a middle-aged man wearing a hat and holding an umbrella is generated. The generated images are different middle-aged men with hat and umbrella elements.

In the actual film and television production process, the application of GAN to directly generate character images can replace the existing method of using 3D modeling to establish basic character images, and then using rendering and other technologies to complete character production when clear characters are needed. This method costs a very high cost, and the production cycle is very long. Compared with the existing methods, GAN can generate a large number of high-quality and high-resolution samples in a short time after training the required model, and GAN can generate many images with complex components according to the text, which can not only save the time cost, but also reduce the hardware loss, production costs and other costs. When a large crowd is needed, it can be generated directly, without a large number of group performances or copying materials, which can save costs and avoid the appearance of mistakes.

When GAN is used to generate object images, it can complete the layout of studio environment and video scene, etc. GAN can generate different items needed by one click, and then splice them

with the actual scene, which can completely save the process of building part of the real scene for every program, not only save the cost of human and material resources, but also reduce the waste of materials as much as possible, and protect the environment.

3.2. Image Style Transfer

In the perspective of character style transfer, styleGAN sets the starting point of the generator to a fixed value, and controls each convolution layer to fix the generated style, so that different characters can use the same style to transfer; in the perspective of image style transfer, cycleGAN uses the idea of circular consistency to realize style transfer according to the reconstruction error generated by the two converters, and realizes style transfer one object becomes another style object, for example, the image of the object is transformed into a cartoon style image, the horse into a zebra, etc.

The image style transfer of GAN can be applied in the film and television works with specific background. For example, the characters and objects needed to be generated need to be in the background of Tang Dynasty. Using styleGAN and cycleGAN can quickly generate the characters and objects needed in Tang Dynasty, which can save a lot of clothing, layout materials and other costs corresponding to the background, and avoid the lack of materials due to the small number of subjects. It is difficult to buy the corresponding goods.

3.3. Music Generation

The Google team proposed GANsynth, which uses parallel generation of the whole sequence instead of generating audio by sequence. Compared with the previous method, the quality of generated music is improved, and the speed is increased by 50,000 times. In addition, the treble and timbre can be adjusted separately to achieve fast generation of high fidelity adjustable audio.

GAN generated music can greatly help the low-cost production of film and television works. Using the generated music can avoid the cost of using a lot of music or inviting people to create music. Film and television works don't have to be timid because they worry about the cost. They can add music to the parts that need to use music at will, which improves the quality of the whole film and television works.

3.4. Image Inpainting

Because GAN has a good ability to fit the real distribution, it can use the results of learning and training to complete or modify the damaged image. UCTGAN uses the end-to-end method, as well as the conditional encoder module, manifold module and generation module to repair or complete the image. Deniz et al. transformed CycleGAN to realize image deblurring.

As like as two peas, image inpainting can play a huge role in the special production of video and film production. When the required image material is damaged and can not be re photographed or produced within the required time, GAN image restoration can repair the damaged material in a short time. Although it may not be exactly the same, it does not appear to be reasonable in the audience.

4. Summary and Prospect

GAN is the most advanced generation method at present, which can provide help in all parts of film and television production, from the characters to the screen layout, and then to the soundtrack, etc. GAN can quickly generate the required parts with high quality. The application of GAN can reduce a lot of production funds, and also greatly reduce the difficulty of finding scarce minority resources, so as to greatly reduce the threshold of film and television production, so that many creators who are blocked by funds can have the opportunity to enter the field of film and television production, and encourage more creators to appear. At present,

short video is in a period of vigorous development, but the short video stage will continue to develop. The video creation atmosphere formed by short video may promote the whole short video stage to develop in the direction of film and television creation. These creators can use GAN to complete some big scenes in an environment with a very small number of people and limited funds, such as a large number of people and troops, luxury clothing, etc. With the continuous development of GAN technology, the creators arrange the generated images according to their own ideas.

GAN can realize the film and television works completed by only one person. Because of the high efficiency and high quality of GAN generation, it can make many unconstrained ideas that are difficult for creators to realize come into reality, and generate completely fictional images that look very real and have a strong sense of audience immersion, so that the film and television creator's ideas can be realized, but also because the creator's creation is no longer limited by the actual shooting.

Although GAN has achieved different success in various aspects related to film and television production, there is still a way to go for GAN to be applied in film and television production.

1) There is no trained database

GAN can generate the required images on the premise that it has experienced sufficient training, and the better the quality of the training set is, the better the generation effect is. But now there is no corresponding professional high-quality database in the field of film and television production, so if users want to use the GAN method to generate images, they need to spend a lot of time looking for the training set, which greatly reduces the fast speed of GAN's a great advantage.

2) There is no easy way for the creator to operate

At present, GAN needs to be implemented through original code, which is very challenging for creators in the field of film and television production. Creators need to find the parameters and data they need to change in a large number of code. There is no GAN application that is packaged and easy to operate, which makes it very difficult for creators to use GAN and leads to low enthusiasm of creators.

3) The creator has no similar experience

At present, most creators have not used deep learning for film and television production. They are very unfamiliar with the way of deep learning, and the concept of deep learning is not easy to understand. It will take some time for creators to fully accept it.

5. Conclusion

GAN has a great application prospect in the field of film and television production, and can greatly improve the speed and quality, reduce funding, and solve many difficult technical problems. Similarly, the application of GAN in the field of film and television production also faces many difficulties, which need the joint efforts of all aspects to solve. Ultimately, the quality and effect of film and television production can be better improved, and film and television production can flourish.

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