Gamma Value Adjustment of 3D Software Maya during Optical Dynamic Capture Action Production

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Abstract: In today's animation, the demand for animation is getting higher and higher, and the application of advanced rendering engine is becoming more and more popular. In view of the problems encountered in the mental ray rendering engine of Maya, the two major color regions which are rendered by computer are introduced and the concept of recognizing gamma value in mental ray is put forward. The method of gamma correction is used to improve the efficiency and effectiveness of 3D animation rendering.

1. Introduction

Most of the image information that is particularly bright and dark and dark is not the parameter or the lighting settings, but the adjustment of the gamma value has not been debugged. The reason is that even if the render parameters are correct, the computer's rendering system is not consistent with the degree of human eye receiving image information. The gamma value is a conversion value or a balance value, which lets us anticipate the preview of the brightness and darkening, which coincides with the desired effect of the computer's rendering effect. In a simple way, the image rendered by the computer is not consistent with the image information we have received, and it is not seen, so a conversion value is needed in the middle of the picture information, that is, the gamma value. In other words, the most important thing is to do not understand the principle of computer rendering and the important parameters, especially in the computer graphics, the gamma value is ignored, which leads to the ideal effect of the animation rendering. Reading materials and books, such as "Maya -mental ray rendering principle and technology", "maya2011 white gold manual -- mental ray rendering article", "Maya / mental ray material and rendering big disclosure" and so on to explain the lighting, the reasonable wiring of the model, but ignore the concept of gamma value introduction and gamma calibration and debugging, made The gamma value of the pair is ignored. It is wrong to think that learning to render is to learn only the setting of lights, and the application of texture materials will be completed. Gamma value can be known if it exists. Rendering is optional, without debugging and learning. As you know, all computer graphics, as long as there is a calculation of the presence of rendering and display, will be debugged on the gamma value, so the gamma value is not understood or will not be used, will directly lead to the color difference of the rendering effect. Some people also think that the gamma value is only the scope of the hardware display output and the software rendering has no or no direct relation, but for the advanced rendering engine, the concept and application of the gamma value plays an important role.

2. Gamma Value in Rendering

The advanced rendering engine mental ray in Maya uses this principle to process image information. So when the animated picture is rendered without gamma correction, even if the image information is correct, it is not in accordance with the aesthetic appreciation of the human eye to receive the picture information, and the ideal image can be rendered. This is also the significance of the gamma value, which is used to easily debug picture information, to facilitate the image information received by the human eye, and to debug with the computer to render information images. The significance of the gamma value not only illustrates its importance and necessity, but

also needs to master the two sets of color management spaces in the Maya mental ray rendering engine. They are the linear color space of gamma 1 and the srgb[4] space with gamma value of 2.2, respectively, and the numerical value curve of function calculation is shown in the figure. In other words, a color space is a space for computer numeric calculations; the other color space is the space for the display to display the image relationship that fits the human eye. The linear color management space with a gamma value of 1 exists because the image generated by the 3D renderer is generated by the linear mathematics of the application. In order to operate conveniently, the image mathematical algorithms are calculated for the linear color space, such as the layer pattern of the layer screen (screen) and the mutiply (multiplied), and the commonly used CG images are stored in linear color space. The format of the commonly used pictures is high dynamic graph, such as HDR, 32 bit TIFF and so on. Its storage brightness information is more, the computer rendering formula is easy to render in the computer, the disadvantage takes up space and does not conform to the shadow of the image observed by people. The human eye looks at the image of the gamma value of 1 uncorrected, the picture is uncorrected. The information of the bright part is bright, and the information of the dark part is darkened. However, our display devices, such as monitors, do not use linear mathematics to image the data. So there is a relative sRGB color management space. Because of this, the information color space that conforms to the human eye receives the information color space, and it is calculated that in 1996, the color space of gamma value 2.2 is 2.2, and the picture format, such as JPEG, PNG and so on, is the picture format that exists in this color space management, its advantages are in accordance with the human eye view, but the color information will be lost because of the conversion. Its bright part image information and dark part image information. How to balance is the key to the quality of computer rendering. In other words, it requires us to manage the conversion of the images in the two color spaces, and to avoid the loss of information in the conversion and their strengths, and to make up for each other. The simulation user uses the environment, tests, and eventually turns the display to a comfortable value. Finally, the experiment is 2.2. According to this, Microsoft and HP issued the sRGB standard in 1996, and the standard of the 8 bit picture is gamma 2.2. From then on, the gamma of the display and the camera, which was originally set by gamma, was all along 2.2. The purpose of gamma correction is set for the needs of the human eye. The parameters of the image information are all visually adjusted, and the human eye is the decision maker. The so-called "nonlinearity" means that if the voltage intensity V applied to the cathode pickup tube is increased by 1 times the intensity of the light output on the screen surface, it will not be more than twice the ideal increase of [6]. So we use gamma value to transform its function and apply it to Maya's advanced rendering engine mental ray.

The interconversion between the values of the curves is as follows: the value of the image information received by the *0.45 of the linear computer image information value, and the value of the image information received by the human *2.2 to the linear computer image information value. So there is a set of 2.2 and 0.45 values. It is necessary to know the transformation, but also clear the parameters of transformation, but it is not always possible to use good gamma value to render good animated pictures. One of the most difficult points is overcorrection. Because the gamma correction is ideal, the two correction will make the picture pale and lose the details of the image information. Transition correction is a common mistake of many animators. There are three reasons: first, it is easy to confuse the different picture spaces of the two color spaces. Second, the transformation of both images is prone to errors and omissions. Third rendering details debugging difficult to control the value, because the Maya built-in mental ray rendering display and computing rendering is separate, is not the result, the control value, such as without gamma conversion, is difficult to debug the effect we need.

3. Gamma Value Adjustment of 3D Software Maya

In order to avoid the above reasons, in order to avoid the confusion of two color management areas and avoid the loss of image information caused by overcorrection, the following methods are proposed in the mental ray of Maya:

Understand the partition of computer color space and understand the connections and differences between low dynamic range diagrams and high dynamic range maps.

Distinguish between low dynamic range map and high dynamic range image [7] format, clarify the distinction between two color management and understand the meaning of existence. The so-called dynamic range (dynamic range) refers to the relative ratio between the brightest and darkest parts of a scene. A HDR picture is composed of an ordinary dynamic range image information of different exposure values, and its recorded image information is far beyond the value of the 256 levels of the actual scene. The low dynamic graph is the 8 bit channel image, that is, the number of colors that the display can display. The two kinds of dynamic charts are classified and classified into different color management spaces, and the image information is clearly classified.

To make the light and material in the mental ray the picture information of linear color management first, for example, in the default JPEG, PNG, PNG, TGA, and other ordinary dynamic range images, also known as ldr[7] need to be used by gamma school, and the image node multiplies 2.2 to make its response value 1. If the texture generated by the application of the material is not corrected, the two correction is the transition correction we say, and it is necessary to ensure that the light of mental ray in the Maya is also in the linear color space.

After ensuring, in all the Maya color management of the one-time correction echo response value of 2.2 gamma value, so that the light material consistent with the picture information in sRGB suitable for human needs.

The advantages of this method are also called over correction, which is also called over correction, effectively improving the efficiency and avoiding the confusion of the two space color management. First, the image is placed in the linear color space by gamma correction, and the linear color management space suitable for computer calculation can be used to improve the efficiency of the saving time. The final conversion to sRGB color image information, rendering effect visualization can be regulated, because all in the sRGB color is seen in the color, for light and dark adjustment, easy to adjust the control rendering details.

4. Summary

This method is only suitable for the Maya rendering engine mental ray mainstream software, for other 3D software rendering, although the principle of gamma value correction is the same, but the details are not the same. Because this is the explanation of the principle and the method, the specific parameters can not be adjusted one by one. The intention is to elaborate on the method of rendering the principle of rendering, not to formulate rules and regulations, and hope to provide a new and correct way of thinking for the creator of the animation and pave the way for the Chinese animation to fly.

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