On the Application Prospect of Computer Graphics in Mineral Resources

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Abstract. The exploitation and utilization of mineral resources plays an important role in promoting the country's economic development and social progress. With the rapid development of industry and science and technology, the scale of mineral resources development and utilization has expanded thousands of times, because mineral resources are non-renewable resources, so the cost of exploitation and utilization is low and the efficiency is high. With the development of computer graphics, it is expected to be applied to mineral resources. This paper introduces the development and application of computer graphics, summarizes its application characteristics and types, and plays a guiding role in its subsequent application and development in mineral resources.

Keywords: Computer Graphics, Mineral Resources, Applications

1. Introduction

Computer graphics is a science that uses various mathematical algorithms to convert graphics into grid form of computer display. Its main research content is how to make computer representation of graphics and how to process and analyze and display graphics[1]. Graphics are generally composed of geometric elements and non-geometric elements, geometric elements mainly include: points, lines, surfaces and bodies, non-geometric elements mainly include: color, gray, line type and line width. It is one of the main purposes of computer graphics to generate pleasing realistic graphics. The research contents of computer graphics are not extensive, mainly include: realistic drawing, solid modeling, computer animation, realistic graphics display algorithm, virtual reality, curve and surface modeling, simulation of natural scenery, graphic interaction technology and visualization of scientific calculation and so on. After decades of development, computer graphics has been widely used in various industries, has become a very active branch of computer science.

2. The formation and development of computer graphics
In the early days of the last century, MIT created the first modern computer with visual display. Soon, several companies in the United States successfully developed and launched both roller and flat plotters[2]. The emergence of computer graphics prompted the emergence of computer graphics, and in the entire 10 are in the stage of rooting brewing, everything is in the passive operation of external development, once the conditions are ripe to break out into active. The course of computer graphics is shown in Figure 1.

Figure 1. Course of computer graphics

At the beginning of the 1960s, Sutherland pointed out in his doctoral thesis that interactive computer graphics was a new field of study, using the technical term computer graphics for the first time, thus determining the independent status of computer graphics as a new branch of science. Steven Coons successfully constructed arbitrary surfaces in the early 1960s by interpolating 4 arbitrary boundary curves, French engineers Pierre Bezier developed the theory of Bezier curves and surfaces. Coon methods and Bezier methods were C A G D earliest pioneering work. The 1970s was an important historical period in the development of computer graphics. The appearance of grating display has greatly promoted the development of raster graphics algorithm, so computer graphics has entered a prosperous period. The light perspective model was established the 1980s, and the first example of the ray tracking algorithm was given. Scholars from Cornell University of the United States and Hiroshima University of Japan successfully simulated the multi-diffusion effect model between ideal diffuse reflection surfaces by radiance method[3].

Since 1980s, the successful development of VLSI and the improvement of computing speed have accelerated the development of computer graphics. At present, computer graphics is mainly used in the fields of scientific computing visualization, computer aided design and manufacturing, computer animation, graphic realistic rendering and natural scene simulation, computer art and computer aided
teaching.

3. Application direction of computer graphics in mineral resources

3.1. Application of computer graphics in computer aided design and manufacturing

The most widely used computer graphics is CAD and CAN technology, which has been applied to many industries, such as architectural design, road transportation, machining and so on. For some customized products with strict requirements, especially for the internal structure design of electronic products with high accuracy, in addition to the preliminary design of the application of computer technology, it is also necessary to carry out manual interactive operations, combined with the actual application of computer graphics to modify the product repeatedly. Computer graphics in aerospace, automotive manufacturing applications are need to be CAD technology and manual interaction to achieve the design of accurate graphics similar to the physical object. Because of the development of social science and technology, the most important subject in CAD technology field is the collaborative design of heterogeneous systems. The processing design of modern products needs to consider not only technical problems, but also the contents of various fields related to the design of products.

3.2. Application of computer graphics in visualization of scientific computing

Computer visualization is widely used in medicine, fluid mechanics, meteorological analysis and other aspects, especially in the field of medicine. In the field of medical research, the application of computer visualization technology is mainly manifested in the use of precision machinery for brain surgery[4]. When performing brain surgery, computer visualization technology can transform scanned data into graphic images, so that doctors can more specific and intuitive understanding of the patient's condition, improve the effectiveness of medical treatment. In addition, computer graphics can also be used in weather forecasting, through the application of visualization technology can help people to obtain weather and weather information, after careful analysis clearly foresee the weather after a few days, to facilitate people's lives.

3.3. Application of computer graphics in natural scenery simulation and real-time drawing

Real-time rendering is a kind of rendering technology which attaches importance to realism. The application of computer graphics in real-time rendering is mainly to imitate the physical properties of objects, such as the formation of objects, optical properties and so on. The application of computer graphics in natural scene simulation needs to eliminate the light and shade effect between hidden lines and surfaces, and need to do a good job of color model formulation and light tracking, radiance and so on. Natural scene simulation technology plays a very important role in the fields of film and television advertising, scientific calculation, command and control[5]. At present, most of the TV advertisements people see are using computer graphics technology, through the application of this technology for people to create a realistic physical model.

3.4. Application of computer graphics in computer animation

With the development of computer graphics technology and computer hardware technology, people put forward the requirement of dynamic display of scene setting. Computer animation appeared under the demand of people. Computer animation is a static image through subtle changes to create a lifelike
dynamic scene. Computer animation originated from cartoon film, so far, the content and form of computer animation display is rich and diverse, and realized the development transformation from two-dimensional to three-dimensional production.

Three-dimensional free form deformation is a commonly used computer animation production method in recent years, which refers to the process of calculating and making animation on the basis of a large number of applications of elastic mechanics and fluid mechanics. The purpose is to show people the real law of and to strengthen the intuitive feeling of motion[6]. At the present stage, Hollywood animation production is a model of the application of computer graphics technology, and under the development of science and technology, computer graphics technology is also used in commercial animation advertising production and special effects expression.

3.5. Application of computer graphics in computer art

With the development of the times and the improvement of people's aesthetic needs and aesthetic ability, more and more artists began to use computer software to engage in related artistic creation, especially art creation, such as two-dimensional, three-dimensional graphics drawing software, rendering software, vivid animation software and so on. But the application of these techniques cannot achieve the effect of traditional art. Computer graphics is a kind of simulated art form based on reality, which can rework traditional art, such as realizing vivid and vivid images of various patterns, patterns and oil paintings.

4. Problems to be solved in computer graphics application

4.1. Transparency of existing data-processing methods

At present, the data processing methods used in mineral resources evaluation are mainly some probabilistic statistical methods. The output, number, scale and occurrence of deposits are all regarded as probabilistic events or random variables. Using their statistical correlation with other geological variables, their prediction models can be established. It can be expressed by the following formula.

\[ y = f(x_1, x_2, ..., x_p) \] (1)

The formula \( y \) is a measure of the probability, number, size or occurrence of a deposit in a certain range; \( x \) is a geological variable associated with \( y \). These methods, combined with the functions of computer numerical calculation and data theory, form the mainstream of the current application of mathematics and computer science in mineral resources evaluation. The characteristics of these methods are quantitative, comprehensive ability and more objective. Because of this, for decades, their applied research and practice have continued unabated.

However, most of these methods have more complex mathematical background, and the mathematical formula is complex. In this case, it is not easy to interpret the results of their calculations directly and properly. Although some of the results contain a lot of information available, the information available to the general user may be far from available, and sometimes there is even a big deviation in the understanding of the information. So these methods have poor visibility and low transparency for ordinary users. This is also one of the main obstacles to the further application and popularization of these methods.
4.2. The adaptability of existing data processing methods to various geological data needs to be improved

Geological data include both quantitative and qualitative data, and qualitative data often exist in large quantities, and their role is significant. For qualitative variables, they can also be quantitatively processed. Of course, there are some conversion methods, so that the transformed variables are not nominal variables, but real quantitative variables. A variable in a unit, such as a stratum of an era, can be assigned according to the size of the area it exposes within the unit.

Because of the feasibility problem, a large number of conversion methods are still from qualitative variables to nominal variables. In addition to its own problems, how to mix quantitative variables with these nominal variables is also a thorny problem. The former are usually continuous variables and the latter are discrete variables. Until now, there are few mathematical models of mixed variables, even if there are. Their statistical inference theory is mostly not perfect or even established.

Geological data are of various scales: digital or graphic, and sampling points or observations vary with the geological medium sampled or observed. For these data, it is difficult to make comprehensive analysis with the existing data processing methods. Of course, in order to meet the requirements of these methods, some digital features can be extracted from the graph, and the format support points of the data can be unified by the method of thinning or interpolation extrapolation. The results of interpolation extrapolation also vary according to the method, which is not suitable for re-diffusion and transmission.

5. Conclusion

To sum up, with the development and progress of social science and technology, computer graphics has been developed rapidly and become an independent subject, which has been widely used in various fields. Computer graphics, as a product of modern science and technology, will be applied in a wide range of fields under the rapid development of computer technology, and then provide important support for the development and progress of society. However, the application and development of computer graphics in China is not mature enough at the present stage, so it is necessary for the relevant personnel to carry out more in-depth analysis and exploration, and to continuously develop and perfect the computer graphics technology.

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