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Research on Application of Data Visualization in the Context of the Era of Big Data

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ABSTRACT. *In the era of big data, information technology develops rapidly and information grows at a geometric rate. As a result, how to deal with and utilize information has become a problem to be solved in various industries. This paper analyzes the principles and potential problems of visualization, describes necessary understanding of the development of visualization under the background of big data, and puts forward the methods and misunderstandings that need to be paid attention to in the design display process. By combining the conclusion, it is found that visualization is a product of multi-party integration, which can be used as the main means to excavate the value of data itself.*

KEYWORDS: *Big data, Visualization, Research on application*

1. Introduction

We are dealing with numbers every day. A great amount of information containing data catches our attention. Consequently, an effective way to extract useful information from a large amount of information and to generate some kind of correlation in a timely manner is needed. In this way, people can make relatively correct and reasonable judgments. Data visualization, a process of combining visualization technology with big data and then turning information containing data into an intelligible visual image, can allow people to observe the data more intuitively and discover all the connections among data.

2. The Process of Data Visualization

(I)Data Visualization Model

The data visualization model usually refers to a three-step transformation process: the original data - the visual data - the data view.

(II)The Process of Visualization

The process of data visualization can usually be divided into three stages by the data visualization mode.

i. Data Pre-processing

Data pre-processing, an elementary stage of visualization technology, includes a simple processing of all the collected data, integrating and modularizing the entire associated data. Operations such as formatting and standardizing the data, as well as checking and clustering data from different domains are basically conducted.

ii. The Phase of Drawing

The transformation of information from data to geometric images requires taking into account the requirements of different user groups.

iii. Interaction and Display

The display function outputs the drawing results -data in the form of graphics or images, depending on the needs of users accordingly. This stage, displays relevant data and image information, transmit the development trend of interactions among relevant data , and finally sends feedback obtained to the software; as a result, the goal of human-computer interaction is achieved.

(III)The Manifestation of Data Visualization

The origins of data visualization date back to the early days of computer graphics in the 1950s. However, producing computer graphics and intuitive graphical forms required conditions. At present, big data visualization

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technology is divided into data visualization, information visualization and scientific visualization. Cloud computing, the Internet, computers, and other sensors around the world all rely on data sources or operators, which leads to the popularity of people's behaviour and emotions generally being measured in detail on social networks. For example, by calculating and analysing users' preferences and habits based on their browsing history, some operators are capable to find the most appropriate products and services that cater for users' interests and habits and purposefully improve and adjust the service of the product to satisfy the users. This is the value of big data. The significance of this technology is that it not only allows people to obtain a lot of information, but also enables us to work more professionally on some critical and important data. The key to developing this technology well is to achieve profitability, improve the "processing power" of data, and attain the improvement of data through "processing".

i. Scientific Visualization

Scientific visualization uses computer graphics and image processing techniques to demonstrate data visualization. Visualization usually resorts to different colors, network sequences, geographic locations, etc. Traditional data visualization techniques cannot directly provide corresponding algorithm visualization improvements, while the most commonly used visual computing nowadays is distributed rendering and fast CPU rendering algorithms.

ii. Omnimedia Multi-platform Data Visualization Presentation

Information visualization technology allows users to understand very abstract data through visual perception, making it less difficult for people to interpret data. In addition, the information visualization technology has its own data structure, and it is becoming widely available on tools such as smartphones and car computers nowadays. The development trend of the technology will be led by new interactive data visualization tools. Data visualization elements are being frequently applied to movie dramas, TV dramas and video games as well, directly adding a sense of future to the science and technology of the production and making information prensent in a more efficient way. Today, data visualization will move toward new interactions with the widespread use of in-vehicle smart devices.

iii. Data Visualization in Geography and Meteorology

Geo-information visualization technology presents in three forms: two-dimensional, three-dimensional and multi-dimensional and can be expressed by maps, multimedia and virtual reality. After its integration with computer technology, a relatively real and small world model can be simulated in the map, based on which people can zoom in to get more details such as the vehicle and river, and zoom out to view the Earth from a full perspective. In addition, virtual reality is called VR-GIS, which emphasizes the user experience and immersive feeling. Fundamentally, what is presented must meet the user's understanding of the physical world and their own life experience. Consequently, the virtual world should be vividly shown with the help of technology, so that users can feel like that they are in the real world, in which everyone's participation, no time limit, spatial analysis and other functions can be achieved. But since this technology is not real enough compared to today's virtual reality technology, considering its provision just with sense of vision, hearing and movement without touch and smell, so it is still a not-yet-perfect virtual technology.

iv. Data Visualization Technology in the Life Sciences

Visualization technology in the life sciences today has reached a very mature stage. The three-dimensional image visual technology used in medicine is biological image processing. CT and computer X-ray scanning are the mostly used technology. PET can track nuclides injected into the organism to obtain their changes, resulting in positive electron decay. Combining the above can receive medical images. Integrating the images with the help of visual technology , we can help doctors to obtain the exact size, shape and spatial position of the lesions, which is conducive to the improvement of the diagnostic effect of medical workers.

3. Trend of the Development of Data Visualization Technology in the Big Data Background

In the era of big data, data visualization technology can help people extract effective data efficiently, deal with the data correlated and the relationships between production data, and ultimately present them in front of the users. It is an effective and comprehensive processing technology for data processing.

(I)Multi-dimensional Overlay Visualization

Data visualization can overlap on social networks and living consumption, which is very attractive to younger people. Interaction and entertainment are manifested in the sharing and dissemination of network data on the geo-location. For example, WeChat, allows users to select friends based on each other's distance

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information; Google Maps, allows users to search for where they want to go based on massive map information; and some popular review smartphone apps, based on geographic information, allow users to find and consume in nearby restaurants released on the map. Users can get multi-dimensional visual information.

(II)Data Management Services Visualization

The visualization of data not only has the presentation of data, but also has certain functions. In other words, people can conclude the relationship between data and predict the development trend of data through the comparison of multiple related visualized data. In the big data background, visualization services can be easily reached and visual methods can be generated after the completion of data collection. For example: Alipay statements. Alipay can automatically generate a personal consumption chart at the end of the month by analyzing the user's Alipay transaction information. With the data at hand, users can recognize their consumption situation, and then make adjustments and planning.

(III)Omnimedia Multi-platform Data Visualization Presentation

The era of big data not only calls for dealing with a large amount of data, but also requires us to process, share and disseminate information, which unconsciously makes omnimedia multi-platform data visualization presentation flood in every corner of people's lives. For example, mobile phones people hold is not only a data acquisition tool but also a multimedia data visualization platform. Similarly, much more use of data charts and dynamic demonstration of data elements in news dissemination at present can make works full of science and technology. If they are applied to education and science, there is much room to develop as well, considering that people have little interest in relatively conservative ways of narration of the past, and they expect much more efficient ways of expression; fortunately, the visualization of data can just live up to this need. The popularity of smartphones and tablets, for example, has made this new way of interacting a future trend.

(IV)Big Data Visualization Analysis Methods

In the design of data visualization applications, these analysis methods of big data are followed: data acquisition and association, live interaction analysis, computing and quantification, user interface interaction technology, etc. Today, visualization technology has been applied to every aspect of people's daily lives. In social life, for example, dating apps can recommend friends according to the preferences of users with the help of the technology. In education, relevant learning sites and mobile terminals use this technology to achieve human-computer interaction and offer a variety of education. Other fields like weather, and finance can also use visualization technology but call for higher requirements. Data information updates rapidly and requires visualization technology to conclude associated data. The advent of big data brings both opportunities and challenges for visualization technology, so it is necessary to explore the continuous improvement of technology to meet the growing needs.

4. Conclusion

At present, information technology has realized the change from quantitative term to qualitative term. The era of big data has arrived. With the global users' increasing access to sensing data, the discovery and analysis of data becomes particularly important. The growing demand of users require a larger data analysis system and greater data visualization. The actively or passively constant participation of common users in the design and construction of visualization projects can make it reflect the user's needs of data more effectively, understand and help users to make choices and offer more experiences and a variety of visualization technologies.

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