Visual Data Analysis Technology Based on Data Center

Tianjun Wang\textsuperscript{1,\*}, Cengceng Wang\textsuperscript{2}, Jiangtao Guo\textsuperscript{2}, dildar\textsuperscript{2} alim\textsuperscript{2}

\textsuperscript{1}State Grid Xinjiang Xintong company, Urumqi, 830000, Xinjiang, China

\textsuperscript{2}State Grid Xinjiang Information & Telecommunication Company, Urumqi, 830000, Xinjiang, China

*Corresponding author e-mail: tianjunwang@xjq.sgcc.com.cn

Abstract. Today, people are in an information explosion society, and visualization technology (VT) is an inevitable product of the development of the information society. With the emergence of multimedia products such as computers, networks, and communications, humans are paying more and more attention to data processing. Many countries in the world have already begun research in this area and have achieved remarkable results. VT is a core part of data analysis, also known as information processing and storage technology. It has a very extensive and important application in the field of data management. However, because the key information hidden in the data is often immersed in the massive data, it is necessary to filter the data information efficiently, and the visualization data analysis technology is a crucial part. This article adopts the experimental analysis method, which aims to provide a new method to solve the problems of traditional technology and the challenges that may arise in the future by further understanding the existing visual data analysis technology and development trend. According to the research results, the recognition rate of the optimized color visualization features under different classifiers is higher than that of the original emotional features. It can be seen that visual analysis technology is not limited to data sets with physical meaning, but can also be applied to abstract feature sets such as emotional features.

Keywords: Data Center, Data Analysis, Visualization Technology, Data Mining

1. Introduction

Since entering the information society, the explosive growth of data has brought new opportunities and challenges to information processing and data analysis. At the same time, data analysis is an important subject. It is not only simple processing of raw data, but also indispensable and vital in data mining. VT is an important part of data analysis. It can help us understand how users classify and describe information resources, and can use these characteristics to determine what is useful or useless. Through visual data analysis technology, quantitative processing and analysis of data can enable people to more intuitively understand the world and things around them, so as to better understand the interconnections between things.

From the current point of view, the research results on data center and visual data analysis...
technology are relatively rich. For example, Xin Yong pointed out that the visualization of data relationships based on the ability of data resource retrieval in the data center can provide a more effective support for its convenient and easy-to-use services, and effectively meet the front-end data analysis and product services [1]. Chen Bin believes that the analysis of data VT in the context of big data can contribute to the development of innovative data analysis and VT [2]. Chen Yue proposed that data visualization analysis has become a hot spot of people's attention. It makes the presentation of big data easier, and it also provides more convenience for big data analysis [3]. Therefore, this article focuses on the research on the visualization data analysis technology based on the data center, which has certain practical significance and research value.

This article mainly includes these aspects. First, it explains the related concepts of data processing and analysis, and the research status of visual data analysis technology. Then it introduces the application of data processing module and its algorithm in visual data analysis. Finally, based on the visual data analysis technology of the data center, the experimental research is carried out, and the emotional feature set and the visual graph feature are analyzed and compared under different classifiers, and the final analysis result is obtained.

2. Research on Visual Data Analysis Technology Based on Data Center

2.1. Data Analysis and Data Mining

Big data analysis not only reflects the characteristics of massive data, its main purpose is to generate intelligent, comprehensive, and valuable information behind the data. There are many examples that have proven its ability to capture the deep value of data. The analysis method is the main factor that determines whether the information can be effectively obtained. Appropriate data analysis methods are particularly important for the rich data attributes, complex structure and fast update speed in the big data environment. From the current point of view, data analysis mainly includes five basic aspects, as shown in Figure 1.

![Figure 1. Five Basic Aspects of Data Analysis](image)

Data mining is a technology for analyzing and processing data. It does not require prior knowledge to solve practical problems and has strong practicability. The application of data mining technology in data analysis is to classify data, extract effective laws from this information through different methods, and then analyze a large amount of original information and transform it into a computer language or machine learning tool. Information that enables forecasting, design, and maintenance. The clustering algorithm is a statistical method based on the target object as a training sample to classify it, so as to realize the mutual connection and internal connection between the objects. It uses a variety of effective methods to extract useful content from a large amount of information, and a series of processes such as classification processing and association analysis on these data are called clustering [4-5].

The combination of data mining and data VT enables analysts to have a deeper and more intuitive understanding of data, while data mining enables analysts to focus on important relationship patterns and relationship trends, and use VT to explore these patterns And trends in order to better support analysis and decision-making. The data center is the accumulation of activities and data of existing and new information systems, and provides an intermediary and support platform for the
implementation of new activities and new applications [6-7].

2.2. Visual Data Analysis Technology

In today's era, people are in a sea of massive and complex information. In order to analyze these data faster and more efficiently, an intuitive, interactive and responsive visualization environment like the human eye is needed. Therefore, the visual data analysis technology came into being under this situation.

Visualization refers to analyzing the amount of information in the process of data processing and transforming it into intuitive, simple and easy-to-understand graphics. Through visual means, data, information and knowledge can be analyzed and represented. And this cyclical process from data to visual graphics to information perception is also called visual information model.

As early as the mid-1970s, a large number of scholars in the computer field set off an upsurge of visualization, and people gradually became aware of and committed to the development of this technology. By 1980, some researchers used computer graphics, data analysis and other methods to process and describe data. As for the 1990s, with the development of computer technology, visual data analysis has become an independent subject. VT is an important part of data analysis. It mainly expresses complex and abstract image information with numbers by visually describing graphics. Until now, this technology has made great progress and is widely used in many fields around the world. In addition, in the context of the rapid development of computer technology and the continuous progress of other disciplines, various types, levels, and forms of visualization tools have emerged [8-9].

Visual analysis technology can effectively improve people's ability to better understand data characteristics and display data information in the analysis process. It has many characteristics such as good interactivity, dynamic display, rich effects, etc., which can help analysts deal with large, wide, multi-source and dynamically changing information. Many analytical methods will be used in this process, which can help people better understand and describe things such as changes, laws, and problems. It can also portray complex things through a computer or other graphic tools, and can also use image language to express concepts. Digital technology can also be used to explain some important content, so that everyone can more easily accept and learn knowledge points and achieve better results. Combine organically to realize information processing and image comprehension, thereby improving its operating efficiency.

Generally speaking, systems that use VT to display information select specific display models to highlight the characteristics between data and data. Some commonly used classical visualization models involve this connection between data through different display methods. Understanding the correct relationship between graphics and information helps to properly manage the relationship between form and content when designing a system. Some data searchers often encounter some difficulties in doing so. It is impossible to closely coordinate the characteristics of the data with the representation. Visual representation methods can be roughly divided into four categories, namely: diagrams, abstract analogies, concrete analogies, metaphorical models, etc. [10-11].

2.3. Application of Data Processing Modules and Algorithms in Visual Data Analysis

In visual data analysis, points and polygons are the more commonly used images. This type of image consists of a series of discrete points, and each is different. Although straight lines can connect them, the data points are often not dense enough, and the resulting graphs are difficult to analyze. Therefore, it must be converted into a continuous curve or surface, and the data processing module is a module specially designed to perform this function. To convert a point or polygon into a continuous curve or surface, there are two main interpolation and approximation methods in computer graphics. In the process of interpolation, a smooth curve is drawn through a set of given points. In the process of approximation, the drawn smooth curve must be close to these points. Generally, interpolation problems and approximation problems are closely related, so curve fitting can be used to check both types of problems together. The system uses Bezier polynomials to give an approximate solution to the
curve fitting problem [12-13].

The Bezier polynomial does not directly use the data points to determine the polynomial, but determines a set of guiding points to obtain the desired curve shape. The Bezier polynomial has many advantages: it can be applied to a larger interval, unlike the classic polynomial interpolation, which is only suitable for small areas; the algorithm implementation is relatively simple: the approximate solution has high accuracy; the most important thing is that it can not only be used, but also two-dimensional vectors. It can be used for vectors of any dimension, which is extremely beneficial for describing spatial curves. The definition of Bezier polynomial and its geometric algorithm are given below.

\[
O(r) = \begin{bmatrix} O_y(r) \\ O_z(r) \end{bmatrix} \quad \quad O_u = \begin{bmatrix} y_u \\ z_u \end{bmatrix}
\]

\[
D_u = D_u^{n-2} + D_u^{n-2} 
\]

\[
O_{0n}(r) = (2 - r)O_{0n-2}(r) + rO_{2n}(r)
\]

Among them, \((y_1, z_1)\) and \((y_n, z_n)\) are the coordinates of the guide point, \(r\) is the parameter, \(n\) is the number of approaching points, and \(D_u^n\) is the number of combinations of \(u\) in \(n\).

3. Experimental Research on Visual Data Analysis Technology Based on Data Center

3.1. Experimental Background

As a new subject developed at the end of the 20th century, VT has not yet formed a fixed model for its worldwide research. At present, the visualization research of data representation is being done thoroughly. Scientists continue to provide various simulation technologies for data visualization, but VT not only plays a role in the first part, through the combination of VT and recognition form, a series of visual mode research methods have been formed, which has become another research hotspot in data information visualization. Use various visualization techniques to simulate data in two-dimensional or three-dimensional space, and then use the visualized graphic attributes to extract appropriate visualized attributes.

3.2. Experimental Process

In this experiment, the emotion set features, shape features, center of gravity features, and color features of the data set were extracted, and then visual feature tests were performed under the SPQ, MKL, and KEQ classifiers selected for testing. Then use optimized features to test and compare with individual visualization features. According to the sentiment feature set and the visual map feature, the analysis and comparison are carried out under different classifiers, and the final analysis result is obtained.

4. Experimental Research and Analysis of Visual Data Analysis Technology Based on Data Center

In this experiment, the emotional feature set and the visualized map feature were analyzed and compared under different classifiers. The analysis results are shown in Table 1.

Table 1. Analysis Results of Sentiment Feature Set and Visualization Map Feature under Different Classifiers

| Project | Emotional characteristics | Center of gravity | Shape | Color |
|---------|---------------------------|------------------|------|------|
| SPQ     | 61.3                      | 57.6             | 58.3 | 69.1 |
| MKL     | 63.4                      | 59.8             | 57.2 | 67.3 |
| KEQ     | 72.5                      | 60.1             | 36.7 | 79.6 |
Figure 2. Analysis Results of Sentiment Feature Set and Visualization Map Feature under Different Classifiers

It can be seen from Figure 2 that the recognition rates of the optimized color visualization features under the SPQ, MKL, and KEQ classifiers reach 69.1%, 67.3%, and 79.6%, respectively, which are all higher than the original emotional features. It can be seen that visual analysis technology is not limited to data sets with physical meaning, but can also be applied to abstract feature sets such as emotional features.

5. Conclusion

In recent years, with the rapid development of computer software and hardware technology, people have higher requirements for data processing. Data analysis is also playing an increasingly important role in the development of work in various fields. How to use complex data insights to obtain valuable and in-depth insights is the hottest topic at the moment. At the same time, visual data analysis technology is an indispensable tool and tool for big data analysis. This article has carried out research on visual data analysis technology, learned the theoretical concepts and some basic principles of massive information extraction and processing work, and also learned the practical application of visual data analysis technology in real life; and learned how to use it skillfully. Data analysis technology is very helpful for solving these problems with visualization tools, for example, it can increase the calculation speed and reduce calculation errors. Therefore, this article is based on the visualization data analysis technology of the data center, which has important theoretical significance and practical value for the subsequent theoretical research.

References

[1] Xin Yong, Huang Wensi, Luo Yiwang, et al. Research on Data Resource Retrieval Technology in Enterprise Data Based on Graph Database [J]. Electric Power Information, 2019, 017(007): 6-10.
[2] Chen Bin. Research on visualization technology based on network big data analysis [J]. Communication World, 2019, 026(009):205-206.
[3] Chen Yue. Research on data visualization technology based on big data[J]. Industry and Technology Forum, 2020, v.19(10):40-41.
[4] Sun Yanhua, Feng Yan, Li Hongran. Research on financial data analysis technology based on Python platform[J]. Information and Computer (Theoretical Edition), 2020, v.32; No.457(15):159-163.
[5] Jiang Yong, Wei Chaoao, Chen Shaohui, et al. Research on visual analysis technology of equipment asset data based on PDCA[J]. Electromechanical Information, 2018, No.549(15):117-119.
[6] Zhao Zengtao, Luo Yong, Liang Chenghui. Research on cloudification construction and big data analysis of power enterprises in Taiwan[J]. Hydropower Automation and Dam Monitoring, 2019, 005(005): 70-74.

[7] Yang Yuqi, Guo Shuxing. Research on the Data Bank Model Based on China-Taiwan Architecture[J]. 2021(2020-3):17-17.

[8] Cui Xue, Yun Weiying, Zhou Qiang, et al. Research and application of spatial big data visualization technology based on SuperMap[J]. Surveying and Spatial Information, 2017, 40(0z1): 28-31.

[9] Zhou Sheng, Xie Min, Wang Zheng, Wang Wen. Research on cloudification construction and big data analysis of China and Taiwan under the ubiquitous power Internet of Things[J]. China Information Technology, 2020, No.318(10):75-76.

[10] He Zongyao, Zhao Dongsheng, Yang Bin. Exploration and analysis of land and space planning system based on digital middle station[J]. Journal of Henan Urban Construction Institute, 2020, v.29; No.141(04):64-68.

[11] Sun Yi, Fang Mengyang, He Jianning, Liu Jiufen, Zhang Siyuan, Yang Wantao, Gao Tiansheng. Construction of a comprehensive observation platform for natural resource elements based on the Internet of Things and data center technology[J]. Resources Science, 2020, v.42(10) :131-140.

[12] Lu Huijing, Yang Guangqian, Peng Junfeng, et al. Application implementation of big data scientific research platform based on intelligent medical data center[J]. China Digital Medicine, 2020, 015(004): 22-25.

[13] Zhao Zengtao, Luo Yong, Liang Chenghui. Research on cloudification construction and big data analysis of power companies in Taiwan[J]. Hydropower and Pumped Storage, 2019, 005(005): P.70-74.