Research on Design of Digital Display Platform Based on Cloud Computing

Han MIAO[1]
PShinawatra University, Thailand

Abstract. With the change of times, the existence of art can be seen everywhere in life, and the natural beauty and artistic beauty are permeated everywhere in life. The arrival of cloud computing provides a great opportunity for the development of art appreciation methods, which provides a powerful platform for art appreciation learning, which is the development trend of art appreciation supported by computer. The purpose of this paper is to study the art appreciation platform based on cloud computing. The feasibility and related technologies of the platform were analyzed, and an art appreciation platform based on cloud computing was designed, highlighting the resource integration and evaluation function of cloud computing assisted art appreciation. Finally, the platform was optimized, and the performance of the optimized art appreciation platform was increased by 4%.

Keywords: Cloud Computing Technology, University Art, Appreciation Teaching, Teaching Design

1   Introduction

The significance of art also lies in beautifying life, broadening horizons, improving aesthetics, and guiding human civilization correctly [1-2]. Without the support of powerful "cloud computing", the vast amount of art data collected from the internet, mobile phones, and other terminals would be just a bunch of meaningless numbers, and only through ultra precise computing can it have true meaning. Cloud technology provides a new way for art appreciation in the new era. With the support of new technologies, a digital space with a large number of online art resources has been established, providing users with various spaces and styles [3-4].

Art appreciation is an effective way to carry on aesthetic education and develop aesthetic skills. Amal Dev Parakkat has used modern information technology to develop a series of open hands-on teaching activities that enable students to appreciate art outside the classroom. Through mobile location and information platforms, students have organized 32 art appreciation events in their hometowns [5]. Tanima Dutta has made a preliminary construction of this teaching model and analyzed the main factors influencing this teaching practice from the perspective of students, teachers and the environment, based on a semester of teaching practice and practical situation. Corrections and improvements have also been made to enhance students' self-awareness, motivation, teaching content, interactivity and evaluation in order to promote the development of value-added arts courses in universities [6].

---

[1] Han MIAO, PShinawatra University; e-mail: shenxuan1404@163.com

Cloud computing is based on the Internet. By connecting multiple servers, it can share and exchange information among different servers, thus achieving the purpose of efficient information transmission. It is precisely because of this feature that enterprises can contact customers through the network and provide related services to customers.This paper deeply analyzes the current art platform based on cloud technology; Subsequently, under the guidance of cloud computing and other theories, the relevant technologies of the platform are proposed. On this basis, the integration of "cloud" platform and art appreciation is discussed, and the optimization results of the platform are discussed.

2   A Study on the Design of Teaching Art Appreciation at University

2.1. JSP Technology

JSP, also known as JavaServer Pages in Chinese, is essentially a pocket Servlet. It is a standard for designing dynamic HTML, led by Sun IT and co founded by many other companies [7-8].

It achieves the goal of extending the Java language in Hypertext Markup Language. It is similar to a Servlet and is executed on the server side. Generally, the client side is provided with a text written in Hypertext Markup Language, so the client side only needs to have a browser to view it [9]. Designing JSP as a dynamic page technology aims to achieve the goal of isolating surface logic from Servlets [10-11].

2.2. HTML5 Page Design Language

HTML5 is a very popular and widely used front-end page development language, which is a more comprehensive standard formed after four modifications to Hypertext Markup Language (HTML) [12-13].

2.3. Platform Feasibility

Regardless of the level of user, as long as the user has had contact and understanding of the network system, they can smoothly use the system, that is, the operability of the system is completely feasible [14].

3   Design of a Cloud Computing-assisted Art Appreciation Teaching Platform

3.1. Platform Functional Module Design

The structure of the platform modules is shown in Figure 1.

The so-called "cloud" is actually a kind of network. Cloud computing is a network that can store data. When users need it, they can retrieve data from the "cloud". In a sense, this storage space is endless. On the other hand, cloud computing integrates computing data to form a resource sharing pool, that is, cloud, and then automatically controls it with software, which can quickly transfer data without too many people. Cloud computing is a major change in the modern information society. Cloud computing is scalable

and can bring new experiences to users. Its core lies in the integration of data from multiple computers, so that users can obtain unlimited data without time and space constraints.

Front-end visualization module: The function of the system is to provide an intuitive and fast operating interface for the users of the art appreciation teaching platform.

Query module: mainly for users to use, this platform to achieve the art information query function. Since the platform design divides art resources into structured and unstructured categories and stores them in two types of databases, it is necessary to interface with these two types of databases when designing this query module.

Art resource upload module: Users can upload art resources to the art resource platform and save them in the Hadoop HDFS. If structured data resources are uploaded, they are saved in the MySQL database. If unstructured data resources are uploaded, they are saved in the HBase database of the cluster.

Art resource browsing module: The software can display the existing art resources on the web page, and can be downloaded and other operations. Resource storage module. The storage of art data is realized. It is divided into two sub-modules: structured sub-module and unstructured sub-module.

Evaluation module: In the art appreciation teaching design, evaluation is one of the most basic steps, and its function and significance are mainly manifested in: checking whether the user has completed the predetermined goal; Evaluation can help users find deficiencies in art works and make improvements to achieve better results; Evaluation can mobilize users' appreciation enthusiasm and enhance users' appreciation motivation. The evaluation module includes user evaluation of the work and the platform.

In order to make the digital modeling and display platform based on cloud computing truly serve users, save time and effort for users, and at the same time ensure that the three-dimensional model is displayed in the browser without data loss, that is, ensure that the three-dimensional image model is not distorted in the process of compression, decompression and transmission, and ensure the office quality of users. Therefore, how to choose the appropriate compression algorithm and what kind of serialized data format is the problem to be solved in this paper. On this basis, this paper will continue to study related algorithms suitable for this platform.
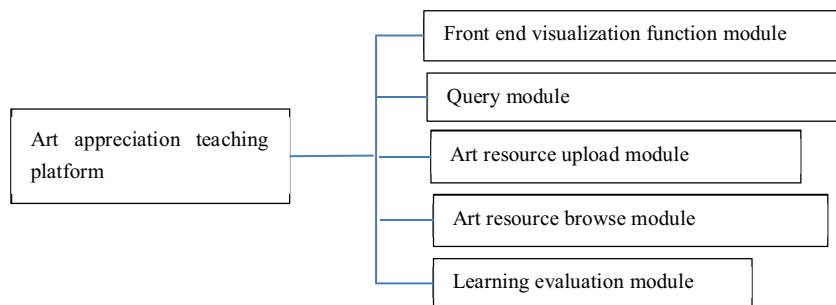

Figure 1. Platform module structure

3.2. Hadoop Parameter Optimisation

On this basis, a new evaluation index system is proposed for the characteristics of art appreciation teaching resources. All optimal experiments were performed with the Tera-Sort software, which is a real 2 GB dataset.

io.file.buffer.size optimisation

In core-site.xml, the parameter io.file.buffer.size indicates the stream file buffer, which is 4096 (4KB) by default. hadoop buffers are used to read and write files from hadoop to HDFS. The performance of the system can be improved by increasing the size of the buffer space to reduce the amount of input and output. For operations such as hard disks and networks, the larger the cache size, the faster the data can be transferred, but it also comes with more storage space and greater latency.

Add the following xml code to the core-site.xml file.

```
<property>
<name>io.file.buffer.size</name>
<value>131072</value>
</property>
```

dfs.block.size optimization

dfs.block.size is critical in the performance optimization of a distributed file system, which will have a direct impact on the results of MapReduce and is of great practical importance for its performance tuning. dfs.block.size means the upper limit of a data block, with a default size of 64M. resources take up the largest share, it contains descriptive information about media files, lesson plans, lecture notes and so on. And these files are generally very small. Therefore, when setting the block size, care should be taken that the block size is not too large, otherwise it will result in a waste of block resources. In this thesis, we set the block sizes to 32 M, 64 M, 96 M, 128 M and 256 M and experimented with their optimisation.

Add the following configuration to HDFS-site.xml:

```
<property>
<name>dfs.block.size</name>
<value>33554432</value>
</property>
```

4   Optimisation and Evaluation of a Cloud-based Teaching Platform for University Art Appreciation

Comparing the test time metrics before and after optimisation, the results were obtained as shown in Table 1 and Figure 2:

When the resource scale is 100MB. It was 21 before optimization and 22 after optimization. As the testing data gradually increases, the optimized platform performance gradually becomes apparent. For files with a size of 2GB, the platform saves about 4% of the test time.

Table 1. Comparison of platform optimization.

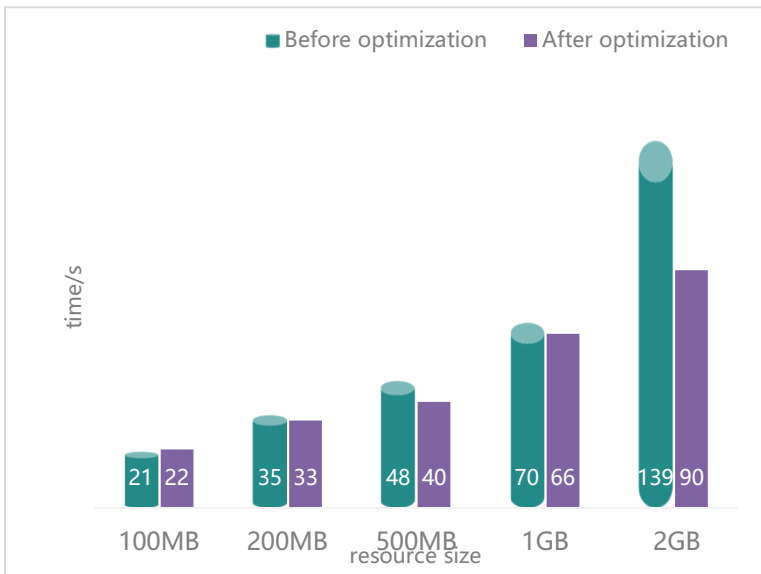| Resource size	Before optimization	After optimization
100MB	21	22
200MB	35	33
500MB	48	40
1GB	70	66
2GB	139	90

Figure 2. Comparison of platform optimization

5   Conclusion

Based on the new trend of art appreciation development, this study has made innovative progress in combining cloud computing with school art appreciation,the cloud platform designed and implemented in this paper can greatly reduce the time required for users to load models, and at the same time, it can also meet the requirements of using common modes for interactive operation, greatly improving work efficiency, for files with a size of 2GB, the platform saves about 4% of the test time,but the integration of literature and reference data is not enough to analyze the related concepts of art appreciation at the theoretical level, which may weaken users' interest in original artworks.When show art and appreciate pictures, users will only see an interface facing them, and it will not appear on the back of the three-dimensional model, so we can delete the pictures to some extent when drawing, so as to improve the display effect of the interface.

References

[1]   Phillip Sangwoo Lee, Chong Min Lee: *Are South Korean College Students Benefitting from Digital Learning? Int. J. Hum. Comput.* Interact. **39**(4): 743-754 (2023)
[2]   Eun Jeong Heo: Financial aid in college admissions: need-based versus merit-based. Soc. *Choice Welf.* **60**(1): 265-297 (2023)
[3]   Sittisak Rattanaprapawan, Apisak Sindhuphak, Krissana Kiddee, Sompol Dumrongsatien: Digital Sketching Applications for Design of Multicultural Toys Based on Himavanta Creatures from Thai, Laos, and Myanmar Fine Arts. Int. J. Interact. Mob. *Technol.* **14**(9): 196-214 (2020)
[4]   Nadav Cohen, Yael Newman, Ariel Shamir: Semantic Segmentation in Art Paintings. *Comput. Graph. Forum* **41**(2): 261-275 (2022)
[5]   Amal Dev Parakkat, Pooran Memari, Marie-Paule Cani: Delaunay Painting: Perceptual Image Colouring from Raster Contours with Gaps. *Comput. Graph. Forum* **41**(6): 166-181 (2022)
[6]   Tanima Dutta, Sabyasachi Mohanty, Hari Prabhat Gupta: An Efficient Reversible Digital Oil Painting Technique for Smartphone and Tablet Users. *IEEE Trans. Ind. Electron.* **69**(6): 6420-6428 (2022)

[7]   Min-Chi Chiu, Gwo-Jen Hwang, Lu-Ho Hsia: Promoting students' artwork appreciation: An experiential learning-based virtual reality approach. Br. J. Educ. *Technol.* **54**(2): 603-621 (2023)

[8]   Sangseok You, Cathy Liu Yang, Xitong Li: Algorithmic versus Human Advice: Does Presenting Prediction Performance Matter for Algorithm Appreciation? J. *Manag. Inf. Syst.* **39**(2): 336-365 (2022)

[9]   Manuel van der Veen: Crossroads of seeing: about layers in painting and superimposition in Augmented Reality. *AI Soc.* **36**(4): 1189-1200 (2021)

[10] Mohammad Reza Mohammadi, Fatemeh Rustaee: Hierarchical classification of fine-art paintings using deep neural networks. *Iran J. Comput. Sci.* **4**(1): 59-66 (2021)

[11] Giovanna Castellano, Eufemia Lella, Gennaro Vessio: Visual link retrieval and knowledge discovery in painting datasets. *Multim. Tools Appl.* **80**(5): 6599-6616 (2021)

[12] Deepanwita Das, Srabani Mukhopadhyaya, Debashis Nandi: Swarm-based painting of an area cluttered with obstacles. *Int. J. Parallel Emergent Distributed Syst.* **36**(4): 359-379 (2021)

[13] Cosimo Anglano, Massimo Canonico, Marco Guazzone: An educational toolkit for teaching cloud computing. *Comput. Commun.* Rev. **51**(4): 36-46 (2021)

[14] Kanmanli Maimaiti: Design of cloud computing-based foreign language teaching management system based on parallel computing. *Int. J. Inf. Commun. Technol.* **16**(1): 17-29 (2020)