Computer-Aided Optimization of Digital Media Creation System Based on Internet of Things

Ying-ying Gong[1*] and Zhiying Wu[2]

[1]School Of Art And Design, An Hui Broadcasting Movie And Television College, Hefei City, 230011, China, gongyingying1981@163.com
[2]Department of Art, Anhui Jianzhu University, Hefei 230022, China, wuzhiying@ahjzu.edu.cn

Corresponding author: Ying-ying Gong, gongyingying1981@163.com

Abstract. Among the traditional digital media creation system, when the user visits increase, the data processing speed is too slow. To this end, a digital media resource management system according to the Internet of Things (IOT) technology is designed. Build the overall system architecture through the application layer, data processing layer, and data service layer. On this basis, complete the system hardware design through servers, embedded microprocessors, user terminals, etc.; through user management modules, resource retrieval modules, and resource upload/download the module completes the system software design, and thus completes the digital media creation system design according to the Internet of Things technology. Through comparative experiments, compared with the traditional digital media resource management system, the simulation predicted results indicate that the employed digital media creation system according to the Internet of Things technology has a faster data processing speed.

Keywords: Internet of things; computer; digital media creation system
DOI: https://doi.org/10.14733/cadaps.2022.S6.13-23

1 INTRODUCTION

Since the digital media technology is developing gradually, the management of information resources has undergone tremendous changes. The recording form of information is not limited to text, but extends to various forms such as pictures, videos, audios, and multimedia presentations. Due to the rapid growth of these information and data resources, a large number of digital format texts, videos, pictures, and audio files have been produced. Liang [1] believed these files are all valuable resources. Comprehensive management of them is of great significance to social and economic development. In recent years, in order to manage these digital media resources, people have done a lot of research work on their management systems and improved the management level. However, the digital media

creation system excited now has disadvantages such as too slow data processing speed when the number of users increases, and it needs to be further improved. Fan and Li [2] think the Internet of Things is according to the Internet and is a network that interconnects objects and objects. The Internet of Things realizes intelligent management of information exchange by connecting objects with the Internet. In the application of the Internet of Things, it mainly includes RFID technology, sensor technology and embedded system technology. Among them, Farha et al. [3] consider the embedded system technology can increase the data processing rate, has a good enhancement effect in terms of network capacity, speed, etc., and can solve the problem of network congestion.

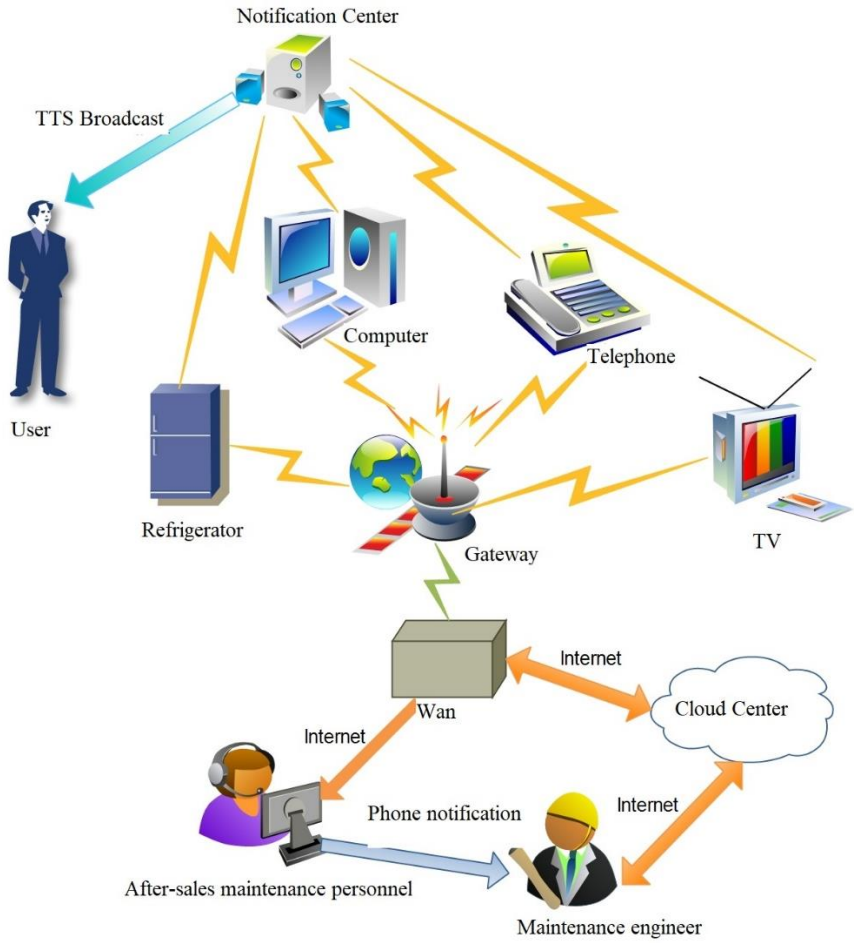

Figure 1: Schematic diagram of the Internet of Things.

The principle of the Internet of Things diagram is shown in Figure 1. As a network connecting many terminal nodes, the Internet of Things is mainly defined as the interconnection of people, machines, and things in unlimited time and unlimited locations. Devices, buildings, etc. use sensors, software, and embedded technology to interact with data and networks. Le et al. [4] think the technological achievements of the Internet of Things such as smart cities, smart transportation, smart logistics, electronic medical care, and environmental monitoring are gradually becoming important themes of science and technology. At the 5G NB-IoT Industry Summit held in 2020, my country's Ministry of Industry and Information Technology also proposed that by 2019, my country's NB-IoT base stations

will exceed 700,000, and there will be more than 1 billion network device connections for mobile objects in the entire network.

Deng et al. [5] consider the Internet of Things penetrates deeply into the three sub-fields of industrial control, smart cars, and smart homes. From the perspective of technical architecture, the Internet of Things uses a cloud-pipe-end architecture. The three-tier architecture involves the integration and information transmission of the cloud, mobile phones, and terminals. Realize that the user downloads the corresponding APP provided by the system on the mobile phone to transmit information with cloud data, and sends commands and instructions, and these commands are then forwarded by the cloud to the terminal device for implementation. In this way, in any environment, smart devices with smart chips and operating systems can be manipulated to execute user demand commands when connected to the Internet, thereby achieving intelligence. The intelligent hardware terminal is a special existence that is different from the traditional Internet logic in the entire technical logic. It constitutes the entrance to the outside world in the IoT architecture. The popularity of smart terminal applications will continue to increase, and the development speed will be very rapid. In just a few years, the past decades of development in the PC field in Western countries will be completed. In contrast to the architecture of the Internet of Things and the Internet, the intelligent terminal equipment at the perception layer of the Internet of Things is an additional crucial link.

In addition, with the development of computers and the Internet, traditional media has gradually transformed into digital media (also called new media). Digital media art is an interdisciplinary study that uses the latest contemporary computer technology, image processing technology, and interactive design to present traditional art and plastic art. It breaks the expression form of traditional art and presents it with a brand-new sensory experience. Now, more traditional arts will use digital media arts to complete cultural innovation, the audience groups are gradually increasing, and cultural inheritance will also develop at a faster rate. The characteristics of digital media art are diversified in forms, efficient in creation, and digitized in language. The most essential feature of digitization is openness, compatibility, and sharing. Digital media art combines various scientific and artistic elements, deriving a new art form of digital media art, which shows us the rich style of contemporary art.

Due to the intervention of information and digital technology, the creative process of digital media is significantly different from traditional media, and some new creative methods and methods are adopted. For example, the use of professional digital video and video capture equipment and capture equipment for creation, collaborative creation for three-dimensional scenes, and personalized creation and publishing systems for broadcasting and digital web newspapers through cloud computing technology. In the prior art, digital media creation requires professional equipment and software on the one hand, and the creation cost is high. On the other hand, cloud-based digital media operations are only for a single creative type, and they do not have the ability to create a unified digital media efficiently and quickly share, and also lack the ability to provide real-time creative materials [6,7].

Some scholars have provided a unified method for providing cloud services. According to the user ID carried in the service request or the service information of the requested service (when it is not carried, the system defaults to be processed), query and obtain the service trigger criterion to complete the comparison. Different business requests provide different business service capabilities, so that a cloud platform can provide differentiated service capabilities. However, the solution proposed in this paper does not provide a solution for the special cloud service providing platform of digital media creation, especially the basic Internet of Things digital media service providing platform with real-time material resource acquisition or adjustment capabilities [8,9].

In addition, some scholars have proposed an interactive cloud broadcasting method. The document uses computing cloud as a common platform, in which electronic devices such as smart phones and tablets connected by the Internet can log in and create, review, and censor. Edit and download and play digital content. In this method, the user is connected to the cloud service platform, and the cloud service platform must provide at least one broadcast list, and the user can re-edit, create, add, and delete the digital content in the list. However, the document technical solution does

not have a unified multi-type digital media efficient creation and rapid sharing capabilities, and it also lacks the ability to provide real-time creation materials. The present invention can solve the above problems well [10].

This paper aims to designing a digital media creation system according to the Internet of Things technology, and verifies the effectiveness of the proposed digital media creation system according to the Internet of Things technology through comparative experiments.

2 DIGITAL MEDIA CREATION SYSTEM BASED ON INTERNET OF THINGS

The designed digital media resource management system relies on the Internet, maintenance and management of digital media resources. The overall architecture of the system is shown in Figure 2. The digital media creation system according to the Internet of Things technology is composed of an application layer, an intermediate layer and a basic layer. The functional design of each layer is as follows. In general, the digital media creation system according to the Internet of Things proposed in this article is to open professional digital media software and hardware resources on the platform, so that the platform has real-time material capture capabilities and massive digital media storage capabilities. The unified creative function of digital media improves creative efficiency; the system of the present invention is composed of an application layer, an intermediate layer and a basic layer, which includes the following: Application layer: used to provide creative and design interfaces for film and television special effects animation and digital media material library; Middle layer: used to provide a digital cloud media platform, and on this basis, provide film and television special effects and animation production software, high-realistic parallel rendering engine software and massive digital media material library; basic layer; used to provide digital according to the Internet of Things Media services, including digital media IoT smart gateways, mass media data fusion processing modules according to the Internet of Things.

Application layer: This layer is the creative and design layer of digital media culture. This layer includes a digital media animation design material library, virtual and real combined with film creativity and design based on motion capture animation creativity and design three user interfaces. Combining virtual reality with film and design, it is a basic ability package for film and television special effect creativity and design, including virtual reality, augmented reality, face calculation chroma keying and sensor tracking capabilities. Animation creativity and design based on motion capture are used to develop real-time and non-real-time animation materials. For non-real-time animation materials, the contents of the massive material library are used for secondary editing; for real-time animation materials, the numbers are captured in real time by manipulating the corresponding equipment. Media materials and edit them. Digital media animation design material library is used to provide various digital media materials, including digital object motion data, digital images, images, voice, game animation, interactive animation and other material products. It mainly includes the user terminal. The user logs in to the digital media creation system by accessing the browser at the user terminal to implement comprehensive management of information.

Middle layer: This layer is the digital media technology and software design layer. It mainly includes: digital media cloud platform, film and television special effects and animation production software, and high-realism parallel rendering engine software. The digital media cloud platform is used to provide public large-scale centralized computing and storage capabilities for digital media. High-realistic parallel rendering engine software, based on a digital cloud media platform, is used to support the parallel rendering capabilities involved in film and animation production software. Film and TV special effects and animation production software, based on digital media cloud platform and high-realistic parallel rendering engine software, is used to provide composite software that integrates movie special effects, composite painting and deformation software.

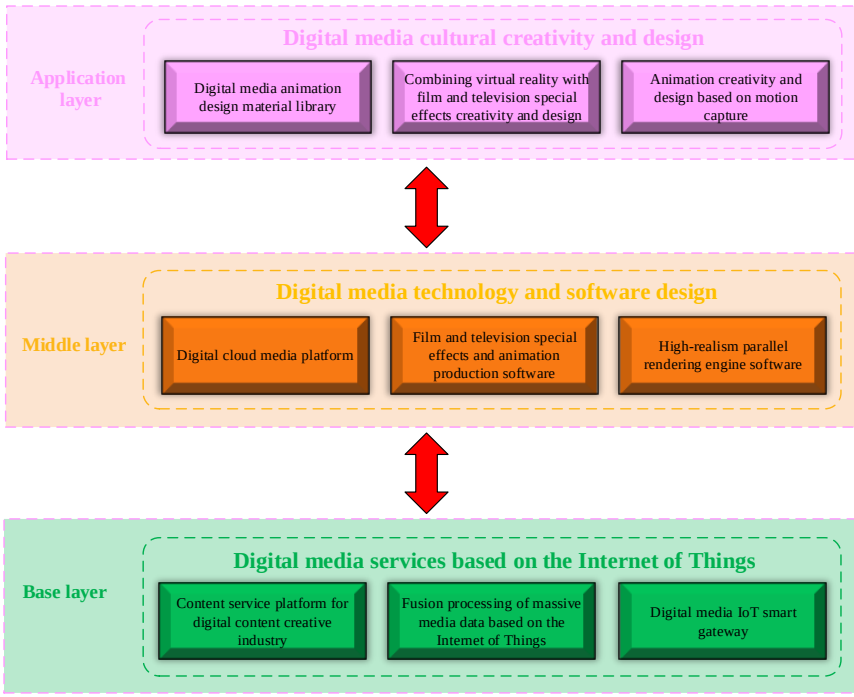

Figure 2: Overall system framework.

Its main function is to process information resources, including the input, query and statistical update of information data, and its essence is a decision-making function. This layer contains three functional modules, namely resource upload/download module, resource retrieval module, and user management module.

Basic layer: This layer is a digital media service layer according to the Internet of Things. Specifically, the content service platform of the digital content creative industry is based on the massive media data fusion processing of the Internet of Things, and the digital media Internet of Things smart gateway. The fusion processing of massive media data according to the Internet of Things is used to combine the related technologies of the Internet of Things to build a massive digital media data fusion model, and realize the pixel-level, feature-level and decision-level data fusion of massive digital media data. The digital media IoT smart gateway is used to fuse perception information and carry out tailor-made and precise communication. The content service platform of the digital content creative industry is based on the two modules of the integration and processing of massive media data according to the Internet of Things and the intelligent gateway of the digital media Internet of Things. It is used to build an open "full platform" for digital content services to realize real-world digital The virtualization of the media creation device provides a unified service interface to the middle layer so that the middle layer can obtain or manipulate the designated information of the actual digital media creation device.

Its essence is a database, and its main function is to classify and store information resources such as pictures, videos, audios and other forms of files, data, etc., to provide support for system decision-making. According to the overall system architecture, the hardware and software of the system are designed. The specific design process is shown in Figure 3. The hardware structure of the digital media creation system according to the Internet of Things technology mainly includes servers, computers, embedded microprocessors, and user terminals. The construction of these hardware facilities provides support for the realization of the software.

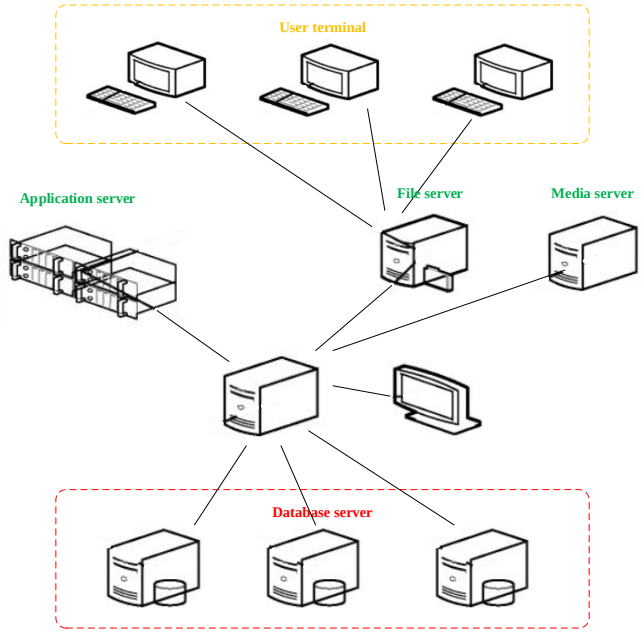

Figure 3: The hardware structure of the digital media resource management system.

For the user management module, resource retrieval module, and resource upload/download module, the functions of each module are designed. Users can log in to the digital media resource management system. Resource retrieval module: This module mainly implements the retrieval of resources in the digital media resource management system. Through this process, the resource retrieval function is realized. Resource upload and download module: In the process of resource upload, resources in different formats need to be converted and converted into a unified digital format for storage in the database. The specific conversion process is as follows:

First, extract digital media resources from the database to obtain digital media resources in different formats, which are expressed as:

$$U = \{U_1, U_2, ..., U_n\} \tag{1}$$

Among them, *U* represents a collection of digital media resources in different formats; *Ui* is a digital media resource in *i* format. Import the data into the embedded microprocessor for data conversion, which is realized by formula (2):

$$p(U|\theta) = \sum_{k=1}^{K} \alpha G(U|u_k) \tag{2}$$

Where: p stands for upload function; θ stands for conversion code; α stands for conversion coefficient; G stands for response function; *u* stands for responsivity; *k* stands for conversion times. Through formula (2), the digital media resources of different formats are converted into a unified format and stored in the database of the digital media creation system, as shown in formula (3):

$$q(O|\theta) = \sum_{k=1}^{K} \beta G(O|u_k) \tag{3}$$

Where: *q* stands for storage function; *O* stands for storage set; β stands for conversion coefficient. Through formula (3), it is stored in the database. In the same way, the implementation process of

the download function of digital media resources is opposite to the upload process. The specific implementation process of resource download is shown in Figure 5.

Through a specific process, the download function of digital media resources is realized. In summary, based on the overall system architecture, the design of a digital media resource management system according to the Internet of Things technology is completed through system hardware design and software design.

For example, as shown in Figure 4, this example takes the smart gateway as the main body as the provider of a certain type of material resources, adopts the system rules, and defaults to the first smart gateway, which specifically includes: the requester makes a request for material resource acquisition. Can include the asset type identifier. After receiving the above request, the server judges whether it contains the material resource type identifier. The material resource type identifier is set and maintained by the system. When the user creates a new resource and sets the resource type, the system automatically adds the resource type identifier to the material resource. Type identification such as "3D scene", "2D scene" and so on.

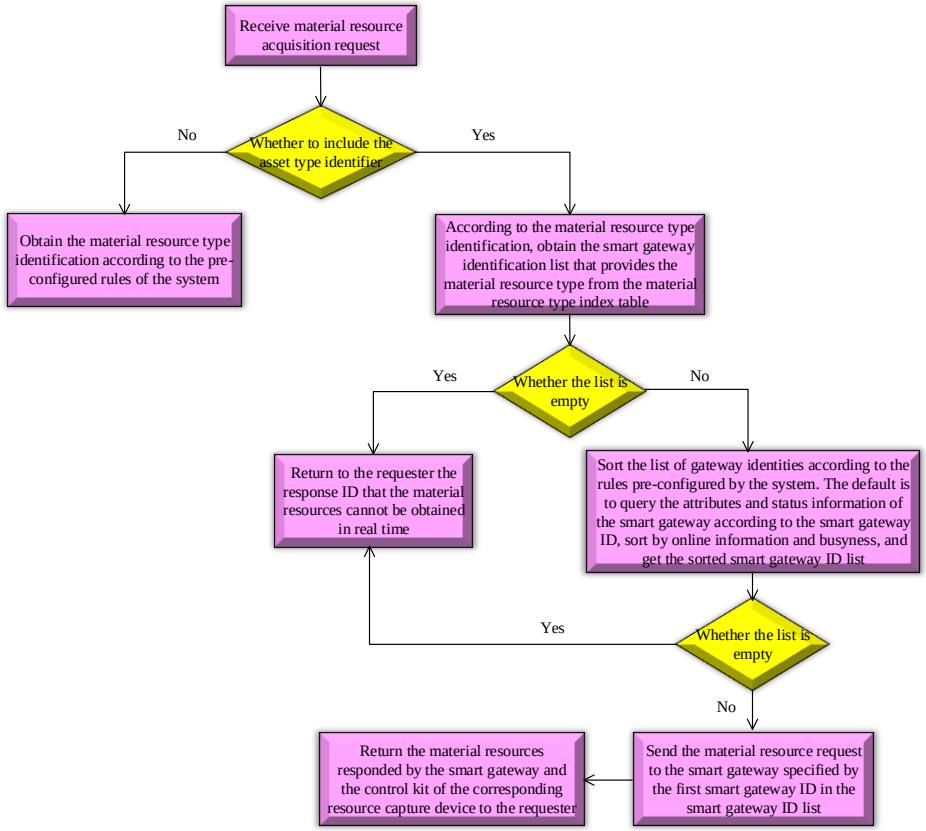

Figure 4: A certain type of material resources.

If the request does not contain the material resource type identifier, the material resource type identifier is obtained according to the pre-configured rules of the system (for example, the default 3D scene); otherwise, the material resource type identifier in the request is directly extracted. According to the identification of the material resource type, a list of smart gateway identifications that provide the material resource type is obtained from the index table of the material resource type. Judge whether the list is empty. If it is empty, return the response ID of "Unable to obtain

material resources in real time" to the requester; otherwise, sort the list of gateway IDs according to the rules pre-configured by the system. The default is: query the attributes and status information of the smart gateway according to the smart gateway ID, sort according to the online information and busyness, and get the sorted smart gateway ID list.

If the list of smart gateway identifiers is empty, the response identifier of "cannot obtain material resources in real time" is returned to the requester; otherwise, the material resource request is sent to the smart gateway specified by the first smart gateway identifier in the smart gateway identifier list, and the smart gateway The material resources responded by the gateway and the control kit of the corresponding resource capture device are returned to the requester.

3 SIMULATION

The digital media resource management system according to the Internet of Things technology that is employed in this paper is compared with the traditional digital media resource management system. Access numbers with different numbers of users

Take the resource management system as an example to compare the data processing speed of different digital resource management systems.

First, set up an experimental environment. The experimental environment of a digital media resource management system according to the Internet of Things technology is plotted. After setting up the experimental environment, when different numbers (100, 200, 500, 1 000, 1 500, 3 000, 5 000, 8 000) of users access the digital media creation system, the data processing of different digital media resource management systems Speed test. Taking a university in Nanchang City, Jiangxi Province as the experimental object, use this system to design its digital media creation.

The system homepage interface in this paper is mainly classified into three contents, the top of the interface is the system name; the most center of the interface is the user login module, this part will check the user information and confirm it, only after the system confirms the user information, can the login succeed , To expand the specific access to the system; the left side of the interface is the server management and resource management related content, you can enter different interfaces by clicking on it, according to the system request, respond to the time, upload the relevant data in the background, realize the digital media resource management, after the user logs in The classification interface will be displayed. The predicted results are shown in Figure 5, Figure 6 and Figure 7.

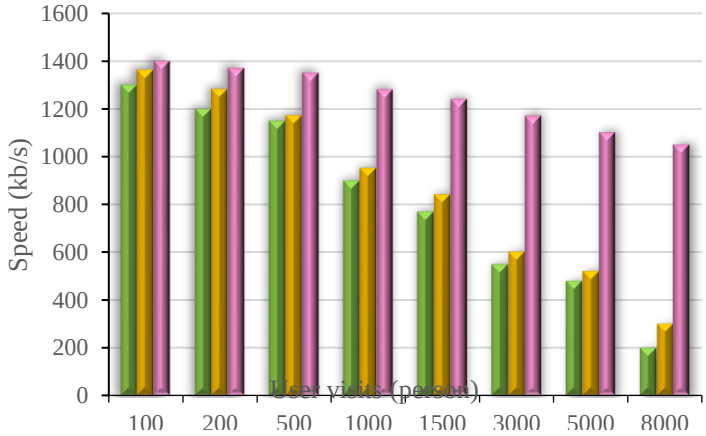

Figure 5: Data processing speed comparison results.

After the login interface, there will be related categories, such as digital media resources such as image modules, text modules, and video modules. Users can select different categories according to their needs to start further operations. If the user needs to upload data, the relevant port receives the logic processing request, and calls the Event Process class in the upload module to upload the relevant data to the media resource management library and store it. The retrieval function of the system in this paper is realized by judging the authority, and supports a variety of content retrieval, such as keyword retrieval, classification retrieval, etc.

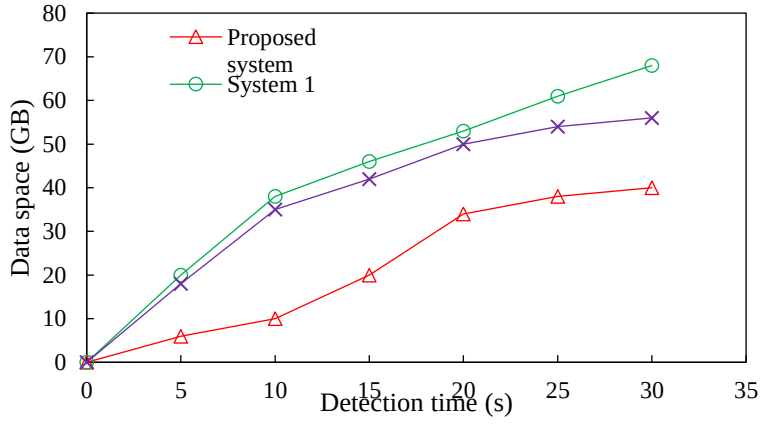

Figure 6: Comparison results of data information occupying space.

The search page is distributed in 4 columns, which are title, category, date and keywords. Search by keywords. The lower part of the interface is the search result. Click the "View" button on the right to see the specific content of the search result and the search result. Or sort by date or by first letter, users can perform further operations according to their needs.

It can be seen from the above that after the performance test of the user management module, resource upload module, resource download module, and resource retrieval module, it is easy to find that the system performance in this paper is good, can achieve the expected detection effect extremely, and has good stability. Meet the needs of experimental subjects for storage and digital media creation.

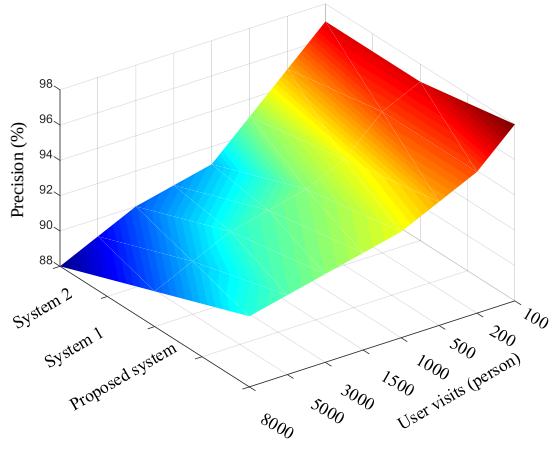

Figure 7: Calculation accuracy of data information.

Using this system and the traditional digital media resource management systems 1 and 2, the comparison result of data processing speed is shown in Figure 8 and Figure 9.

It can be seen from the figure that when the number of user visits is 100 people, there is no significant difference in the data processing speed of the three digital media creation systems. With the increase of user visits, the data processing speed of the three digital resource management systems All have declined, but there are obvious differences. Using traditional digital media resource management systems 1 and 2, with the increase of user visits, the data processing speed drops sharply with the increase of user visits; while the system in this paper is according to the Internet of Things technology and uses embedded microprocessors For data processing, as the amount of user access increases, the data processing speed does not drop significantly. Through comparison, it can be found that, by comparing with the traditional digital resource management system, the data processing speed of the digital media resource management system according to the Internet of Things technology employed in this paper is faster.

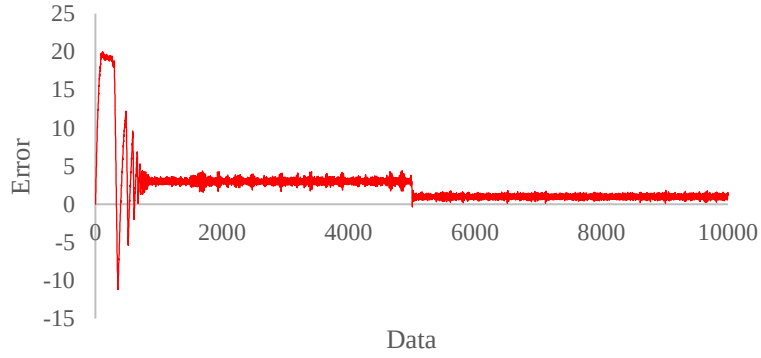

Figure 8: Error with different data.

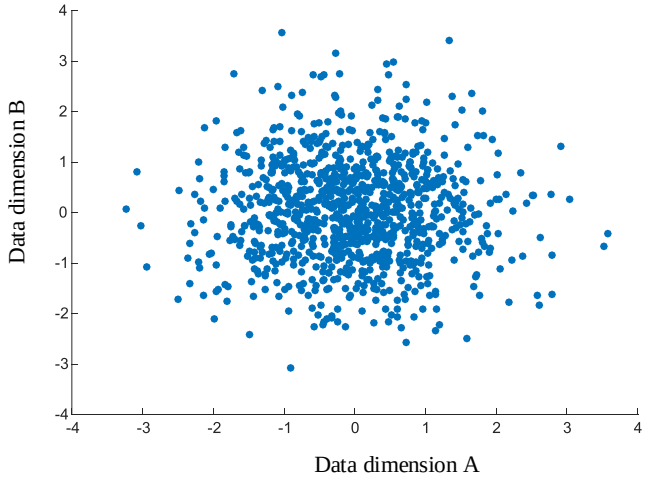

Figure 9: Data dimension comparison.

4 CONCLUSION

In the traditional digital media resource management system, when user visits increase, due to the problem of too slow data processing speed, a digital media resource management system based on

the Internet of Things technology is designed for this purpose. Through comparative experiments, compared with two traditional digital media resource management systems, the experimental results show that the digital media resource management system based on the Internet of Things technology proposed in this paper has faster data processing speed. Among the traditional digital media creation system, when the user visits increase, the data processing speed is too slow. To this end, a digital media resource management system according to the Internet of Things (IOT) technology is designed. Build the overall system architecture through the application layer, data processing layer, and data service layer. On this basis, complete the system hardware design through servers, embedded microprocessors, user terminals, etc.; through user management modules, resource retrieval modules, and resource upload/download the module completes the system software design, and thus completes the digital media creation system design according to the Internet of Things technology. Through comparative experiments, compared with the traditional digital media resource management system, the simulation predicted results indicate that the employed digital media creation system according to the Internet of Things technology has a faster data processing speed.

Ying-ying Gong, https://orcid.org/0000-0002-6780-3014
Zhiying Wu, https://orcid.org/0000-0001-9333-4816

REFERENCES

[1] Liang, W.: Scene art design based on human-computer interaction and multimedia information system: an interactive perspective. Multimedia Tools and Applications, 78(4), 2019, 4767-4785. https://doi.org/10.1007/s11042-018-7070-6

[2] Fan, M.; Li, Y.: The application of computer graphics processing in visual communication design. Journal of Intelligent & Fuzzy Systems, 39(4), 2020, 5183-5191. https://doi.org/10.3233/JIFS-189003

[3] Farha, F.; Sugandhi, K.; Raju, G.; Debabrata, S.; Biswaranjan, A.; Manas, Ranjan P.: A Novel Threshold based Method for Vessel Intensity Detection and Extraction from Retinal Images, International Journal of Advanced Computer Science and Applications, 12(6), 2021, 1-9. https://doi.org/10.14569/IJACSA.2021.0120663

[4] Le, D.; Biswaranjan, A.; Ajaya, K.; Jyotir, M.; Raghvendra, K.: NoSQL Database Classification: New Era of Databases for Big Data, International Journal of Knowledge - Based Organizations, 9(1), 2019, 50-65. https://doi.org/10.4018/IJKBO.2019010105

[5] Deng, L.; Wang, G.; Chen, B.: The colour combination method for human-machine interfaces driven by colour images. Journal of Engineering Design, 28(7-9), 2017, 505-531. https://doi.org/10.1080/09544828.2017.1356021

[6] Li, S.: Trends, Development and Issues in Tourism Information System, The Frontiers of Society, Science and Technology, 14(2), 2020, 1-9. http://doi.org/10.25236/FSST.2020.021402

[7] Yael, R.; Ayelet, G.; Amit, R.: Identifying attributes of public transport services for urban tourists: A data-mining method, Journal of Transport Geography, 93, 2021, 134-144. https://doi.org/10.1016/J.JTRANGEO.2021.103069

[8] Filip, E.; Andrea, H.: Big Data: a Source of Mobility Behaviour and a Strategic Tool for Destination Management. Czech Journal of Tourism, 8(2), 2019, 85-102. https://doi.org/10.2478/CJOT-2019-0006

[9] Cheng, M.; Jin, X.: What do Airbnb users care about? An analysis of online review comments, International Journal of Hospitality Management, 76, 2019, 58-70. https://doi.org/10.1016/j.ijhm.2018.04.004

[10] Baltasar, G.; Ortin, F.: A didactic object-oriented, prototype-based visual programming environment, Science of Computer Programming, 176, 2019, 1-13. https://doi.org/10.1016/j.scico.2019.02.004