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Computer-Aided Relevance Analysis of Digital Art Course Systems Informed by Medical Research

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Abstract. To improve the correlation analysis effect of the digital art course system, this paper combines computer-aided technology to conduct correlation analysis of the digital art course system. In the data processing of the digital art course system, this paper proposes two temporal index construction and query methods and time division methods and analyzes and evaluates them experimentally. Under the condition of ensuring a specific time and space overhead, the two index construction methods and three-time interval division methods proposed in this paper can improve the efficiency of temporal query in Fabric to a certain extent on different distributed data. The experimental research shows that the model presented in this paper can further connect the relevance of the digital art course system and promote its practical construction.

Keywords: computer-aided; digital art; course system; relevance; Informed by Medical Research.
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1 INTRODUCTION

Digital art disciplines are beginning to enter the ancient hall of even pure artistic creation. Today's society is an information society. From print advertising design, product modeling design, and interior design to textile design, jewelry design, display design, animation design, etc., digital art is widely used in various art design fields. Moreover, digital art pays attention to creativity, emphasizes functionality, and is guided by the market's needs, with purpose, science, functionality, and technology [18]. Computer software was easy to operate and kept up to date quickly, and digital art began to express its unique language of visual expression. It uses a new type of expression, which significantly changes the traditional modeling language and promotes the development of the field of art and design [12]. For college art and design students, digital art courses combine art and design theory with practical operations. Through the combination of theoretical teaching and

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practical teaching, it emphasizes the comprehensive application ability of majors. It realizes the combination of theoretical knowledge, essential capability, and creative thinking in education so that the designed works are more innovative and aligned with the market's needs [10].

Digital art courses should consider different majors. Graphic majors can open Photoshop, CorelDRAW, Illustrator, and other visual image processing software; architectural decoration majors can open AutoCAD, 3DSMAX, and other software to draw construction drawings and renderings; animation production Professionals can open software such as Flash for making two-dimensional animations and 3DSMAX for three-dimensional animations; web design majors can open FrontPage and Dreamweaver[15]. In addition, there are other special-purpose software, such as the human body modeling software Poser, the simulation hand-painting software Painter, the three-dimensional character animation software UleadCOOL3D, the rendering software Lightscape, the printing and typesetting software PageMaker, etc., which can be reasonably arranged according to the actual situation of the profession. Art design should be based on the requirements of the times. It is not enough to only operate software if you want to engage in the design industry, so the pre-course and follow-up courses are also essential. The prerequisite courses should be based on professional basic theoretical knowledge, such as sketching, color, modeling foundation, decorative painting, hand-drawn drawings, rendering techniques, interior design principles, etc., to form a good foundation for digital art courses and ensure smooth course teaching. Proceed to [1]. The follow-up courses should be based on practical classes, such as font design, packaging design, furniture design, CIS design, animation design, etc., so students can integrate their knowledge and do excellent design work [14].

Nowadays, more is needed for digital art designers to operate computer software. Whether they have a solid art foundation and specific artistic and cultural literacy is the key to determining whether they can design excellent works. Digital art courses in colleges and universities are usually taught in the school's computer room, using a teaching mode of teachers giving lectures and students practicing. This mode's teaching process is straightforward, and students can practice and master software tools' usage and example effects. However, this teaching mode also has some things that could be improved. Some students cannot master the content they have learned. They will be at a loss once they face problems in the actual design [13]. This situation is similar to the training situation of some computer schools in today's society. Such schools mainly train students in standard software courses but emphasize proficiency in software use. The students taught this way can only be called drafters. , and cannot be called designers [7].

To make students genuinely meet the standards of designers, teachers must cultivate students' solid artistic foundation and good professional quality as the premise in teaching digital art courses and perfectly combine computer production and creative conception. The teaching objectives of the course [5].

In teaching digital art courses, we should first recognize the meaning of art design. [3]. Art design should focus on combining aesthetics and practicality, and teachers should strengthen the interaction between technology and art in teaching. The technology mentioned here is different from the technology in the general sense and refers to the application method and operation skills of digital art software. In the design process, design skills are essential, but simply possessing design skills cannot make excellent designs. Students must master the basic theoretical knowledge of art design in teaching digital art courses, strengthen their artistic literacy, and cultivate design thinking. And design concepts with an innovative spirit. Only when design skills and artistic accomplishment are unified can students' comprehensive quality be improved and a good foundation be laid for design [4]?

The hand-painting course is an essential professional introductory course in the professional curriculum of digital art. Hand-painted techniques can be applied to various design fields. Hand drawing can help designers express their design ideas quickly and quickly grasp the integrity of the

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design through continuous adjustment of lines [2]. Therefore, hand-drawing is the primary method for designers to test their ability. Now, there are some misunderstandings in society, thinking that digital art courses are designed using computers to draw graphics and images, and some teachers also emphasize computer technology in the teaching process, ignoring the importance of hand-painting [17]. Computer technology is a means. Of course, computer technology is essential in teaching digital art courses. It can express the design plan as a rendering. However, hand-painting is also necessary when conceiving design sketches in the early stage. Hand drawing can tell the inspiration that flashes in the brain artistically on paper, and then the computer can be used for detailed processing. Many designers scan the hand-painted drafts directly into the computer and combine them to show the design requirements, which tests the designer's painting skills. Therefore, teachers should combine hand-painting and digital art in the teaching process to make the designed works more vivid and artistic [16].

In teaching digital art courses, some teachers often use tools to explain examples and lack pertinence, resulting in some students' grasp of knowledge needed to be more flexible to draw inferences from one case. Colleges and universities pay more attention to practical teaching. To promote the further integration of professional practice and professional education, teachers can allow students to participate in design competitions or some design projects that are publicly tendered and combine digital art courses with design competitions and design projects. Teaching, teaching The goal corresponds to the actual requirements of the competition and the project, and the inquiry into the problem in the learning can better achieve the practical and teaching goals. This can not only exercise students' functional ability but also mobilize students' enthusiasm for learning. Teachers should focus on social needs, connect school training goals with enterprise needs, avoid the blindness of talent training, and achieve the unity of supply and demand, training, and employment [6].

Based on the solid practicality of digital media art majors, it is advisable to adopt project practice teaching combined with students' advantages and characteristics to cultivate students' innovative ability to the greatest extent. The theoretical content revolves around practice and project-based practice teaching is conducive to integrating the course content and avoiding multi-disciplinary, repetitive teaching. The teaching results are presented in the form of works, and the project practice teaching conforms to the law of creation, which is conducive to improving students' creative level and the quality of course learning [16]. There are also many excellent works in related fields at home and abroad. Project practice teaching is also conducive to introducing the latest design cases into classroom teaching so students can understand first-hand design information, expand teaching content, improve teaching quality, and optimize student literacy. At the same time, using the project-based teaching model as a clue, all related courses are integrated into a whole, emphasizing the systematicness and integrity of project training between courses so that students can get comprehensive skills training in four years of study [11]. Traditional graphic design courses mainly focus on teaching students poster design and bookbinding design (static plane), but from the perspective of our digital media technology major, first, there is no good combination with professional characteristics; second, and later, Animation courses and film and television courses have poor acceptance; third, they are not oriented by market demand. Nowadays, graphic design majors are generally experiencing a wave of change, seeking transformation and flooding into the tide of Internet product design. Therefore, our visual design class must emphasize digital art, design updating, Internet thinking, and early Internet products. Design concepts are brought into the classroom [8].

This paper combines computer-aided technology to analyze the relevance of digital art course systems and provides a reference for constructing digital art course systems.

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2 TEACHING DATA PROCESSING ALGORITHM OF CLASSROOM SYSTEM BASED ON COMPUTER-AIDED

2.1 LevelDB

HyperledgerFabric selects LevelDB as the underlying database. The general architecture of LevelDB is shown in Figure 1.

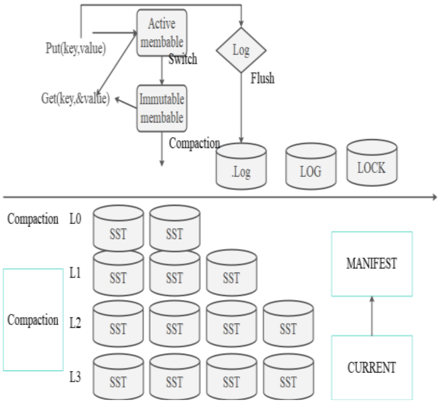

Figure 1: LevelDB architecture.

2.2 Research on Temporal Indexing in HyperledgerFabric

Fabric is an enterprise-level consortium chain platform. The current state of key-value pairs is stored in the state database. When the transaction is completed, the state database changes from the current state to the latest state. However, within the same transaction, only one update to the same key is allowed(Figure 2).

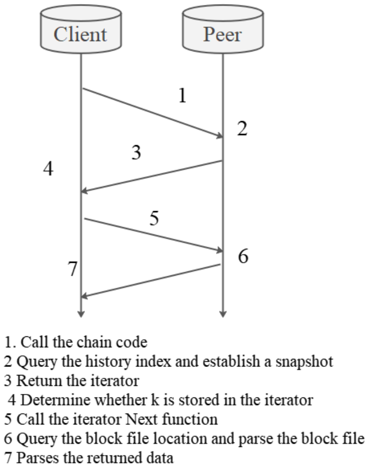

Figure 2: GHFK calling process.

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Figure 3 shows the critical structure that LevelDB stores in the file. As can be seen from the figure, when the key and value are stored, they are stored in adjacent positions. In LevelDB, the keys are arranged in order, so the value corresponding to the key can be searched through the order range of the key.

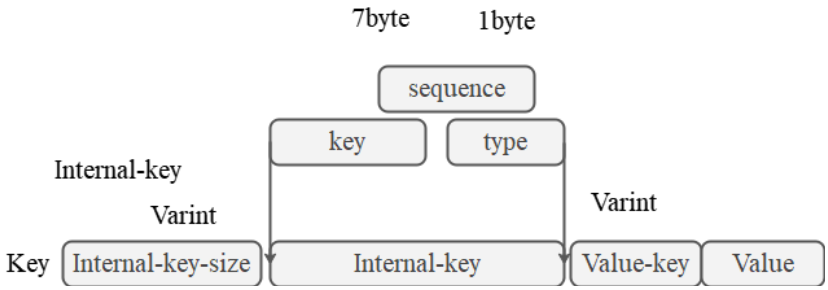

Figure 3: Structure of level key.

After completing the data verification, as shown in Figure 4, the first step is to check the validity of the data, package the valid transaction data into the block, append the block to the block file, and update the block index and other information. In the second step, the valid data is submitted to the state database in the state of key-value pairs so that the corresponding values in the database are updated to the latest state. The third step is to update the data index in the historical database. Since the primary purpose of the historical database is to index the historical state of the data, it will not store all the values corresponding to the transaction.

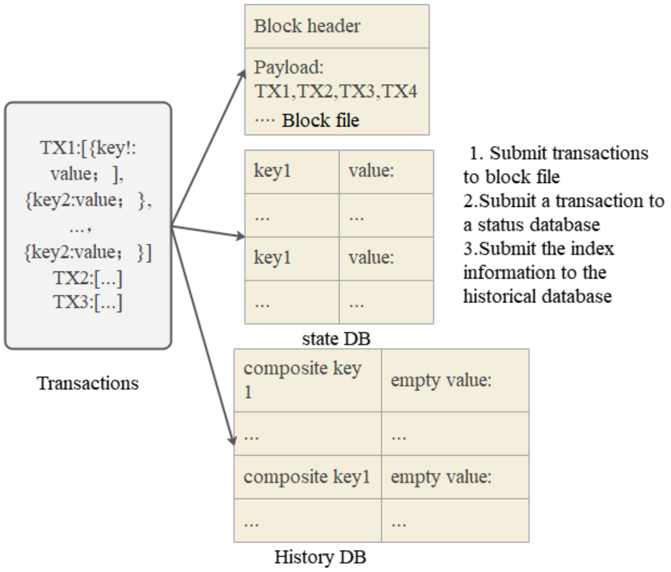

Figure 4: The submission process of transaction data.

In addition to the standard transaction logic, (k, θ) is used as a composite key, $\varepsilon(k, \theta)$ is used as a value, and $< (k, \theta), \varepsilon(k, \theta) >$ is inserted into the state database in the form of a key-value pair as a temporal query acceleration.

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The algorithm updates the state of $< k, \theta_n >$ from state n to state n+1, that is, appends the current event $valuen_{n+1}$ to $\varepsilon(k, \theta_n)$; if θ_n satisfies the time division condition at this time, the algorithm submits the current $< (k, \theta_n), \varepsilon(k, \theta_n) >$ to the block file, updates the index to the historical data, and creates a new time interval θ_{n+1}. If the time interval θ_n is invalid, the algorithm first submits the current $< (k, \theta_n), \varepsilon(k, \theta_n) >$ to the block file, updates it to the historical data, updates the state of $< k, \theta_n >$ to $< (k, \theta_n), " " >$, and creates the latest event set $< (k, \theta_{n+1}), \varepsilon(k, \theta_{n+1}) >$ (Figure 5).

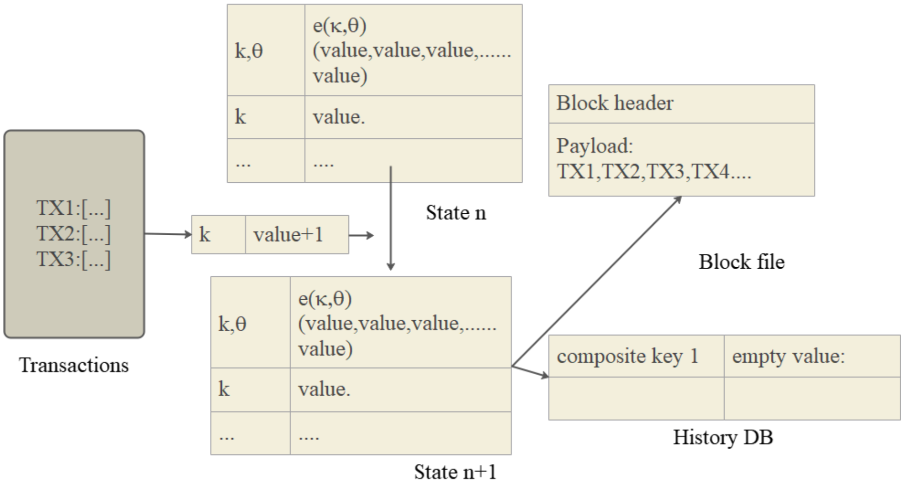

Figure 5: SDTI index construction process.

To illustrate the query process, three kinds of relations are defined here: temporal connection relation, temporal connection relation, and temporal inclusion relation. For the time interval θ_i and θ_j, if there is $\theta_i \cap \theta_j \neq \emptyset$, then θ_i and θ_j are called temporal connection relationship, denoted as $\langle \theta_i, \theta_j \rangle$ .If $\theta_1, \theta_2, \ldots, \theta_n$ holds $\langle \langle \theta_1, \theta_2 \rangle, \langle \theta_2, \theta_3 \rangle, \ldots, < \theta_{n-1}, \theta_n$, then θ_1 and θ_n are called temporal connectivity.For the time intervals θ_i and θ_j, if $\theta_i \subseteq \theta_j$ is satisfied, then there is a temporal inclusion relationship between θ_i and θ_j. We define the function relation to determine the relationship between time intervals:

$$\text{relation}\left(\theta_i, \theta_j\right) = \begin{cases} \text{Join } \theta_i \cap \theta_j \neq \emptyset \\ \text{Inclusion } \theta_i \subseteq \theta_j \\ \text{none otherwise} \end{cases} \tag{7}$$

We need to query all events about k in the time interval τ, denoted by $\varepsilon(k, \tau)$. First, the algorithm queries the time range $\theta(k)$ corresponding to k through the iterator returned by GetStateByRange. The algorithm calculates the interval between $\theta(k)$ and the target query interval that has a temporal connection relationship or a temporal inclusion relationship, denoted as $\mathrm{o}(\theta(\mathrm{k}), \tau)$, and the first θ and the last θ in $\mathrm{o}(\theta(\mathrm{k}), \tau)$ are temporal connectivity.

For each θ contained within $o(\theta(k), \tau)$, the algorithm executes a call to $GHFK(< k, \theta >)$.

The following will illustrate the temporal query process through an example, as shown in Tables 1 and 2, representing the query table and the table storing the index. The attributes in the query table are the key to be queried and the target time interval T to be queried. The index table records the event corresponding to the key in the corresponding time interval, the key corresponds to the key in the query table, T represents the time interval in which the record is located, and the Event attribute records the event corresponding to the key in the time interval T.

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Key	*T*
Key1	*[1-5]*
Key2	*[5-10]*
Key3	*[3-10]*

Table 1: Lookup table.

Key	*T*	*Event1*	*Event2*
Key1	*[1-5]*	$(c_1, 1, "l"())$	$(c_1, 3, "ul"())$
Key2	*[5-10]*	$(c_2, 6, "l"())$	$(c_3, 8, "ul"())$
Key3	*[1-7]*	$(c_3, 1, "l"())$	$(c_3, 6, "l"())$
Key4	*[1-5]*	$(c_4, 2, "l"())$	$(c_3, 5, "l"())$

Table 2: Index table.

Key	*T*	*Event1*	*Event2*
Key1	*[1-5]*	$(c_1, 1, "l"())$	$(c_1, 3, "ul"())$
Key2	*[5-7]*		$(c_2, 6, "l"())$
Key3	*[3-5]*		$(c_3, 5, "l"())$

Table 3: Connection results.

The temporal query must be performed according to the data in Table 1. First, the target time interval needs to be constructed. The attribute T in this step can naturally connect the two tables. The connection results are shown in Table 3. Secondly, the results returned for the time interval with a temporal inclusion relationship are directly appended to the result set, and the events in the time interval without a temporal inclusion relationship are traversed according to the target time interval.

For the temporal query through the GHFK function in Fabric, Tqkт is used to represent the query time for the historical state of the keyword k in the time interval $\tau(t_s,\ t_e)$, which can be expressed as:

$$T_{qk\tau} = num(\,E(k,\tau)) \times T_{it} \tag{8}$$

Among them, E(k) represents the events related to the keyword k, $num(\,E(k,\tau))$ represents the number of events of the keyword k in the time $(t_0, max(t_s,\ t_e))$, and t_0 represents the time when the system first started trading. It means the time required for the iterator to iterate once after the GHFK call is relatively stable and can be regarded as a constant. In the query process, the iterative operation is the most critical and time-consuming, so the total iteration time is used to measure the query time. In the typical data insertion process, we use V_k to represent the insertion rate of events related to keyword k, which can be expressed as:

$$V_k = \frac{num(E(k,T))}{T} \tag{9}$$

$$T_{qk\tau} = V_k \times T \times T_{it} = V_k \times (max(t_s, t_e) - t_0) \times T_{it} \tag{10}$$

Ten shows that the temporal query time implemented only using the GHFK function and iterator is related to the insertion rate of events and the start and end time points of the query time interva. When the event rate is constant, the farther the query interval is from the time t_0; the closer it is to

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the current time, the more time the query consumes. When the query interval is relatively fixed, the larger the occurrence rate of events related to k, the longer the query time.

The impact on the query time is different for the three other time interval division methods, and the description will be given below.

For the total time length T and a given fixed time length T_f, there is:

$$num(\theta, T) = \frac{T}{T_f} \tag{11}$$

The temporal query time is expressed as follows:

$$T_{qk\tau} = o(\theta(k), \tau) \times T_{it} \tag{12}$$

Among them, $\theta(k) = \{\theta_1, \theta_2, \dots, \theta_m\}$ is used to represent the set of time intervals corresponding to the keyword k within the total time length T. θ represents the time interval, τ represents the time interval of the temporal query, and $o(\theta(k), \tau)$ represents the overlapping interval between the target interval τ and $\theta(k)$. In the query process, the data corresponding to these intervals needs to be queried, so the total query time is measured by the query time of all interval data. It can be seen from formulas 11 and 12 that:

$$T_{qk\tau} \le \frac{T}{T_f} \times T_{it} \tag{13}$$

For the total time length T and the number of all events num(E(k, T)) related to the keyword k that occurred within T, there is:

$$num(\theta, T) = \frac{num(E(k,T))}{C} \tag{14}$$

Among them, C is the set number of fixed events, which can be known from equations 9, 12, and 14:

$$T_{qk\tau} \le \frac{V_k}{C} \times T \times T_{it} \tag{15}$$

$$num(\theta, T) \le min\left(\frac{T}{T_f}, \frac{num(E(k,T))}{C}\right) \tag{16}$$

$$T_{qk\tau} \le num(\theta, T) \times T_{it} \le min\left(\frac{T}{T_f}, \frac{V_k \times T}{C}\right) \times T_{it} \tag{17}$$

Therefore, using the DI method to divide the time interval, the temporal query time of the keyword k has a negative correlation with the setting of the fixed time interval T_f and the specified number of events C and has a positive correlation with the event rate V_k. Under normal circumstances, T_f and C in $\frac{T}{T_f}$ and $\frac{num(E(k))}{C}$ should be greater than 1, so the temporal query time using an index is less than that in Fabric without an index when the length of the target interval τ of the query is equal to the total size of time T, the equations 13, 15, and 17 hold.

3 RELEVANCE ANALYSIS OF DIGITAL ART COURSE SYSTEM BASED ON COMPUTER-AIDED

Tutoring support is essential in learning activities and decisive in their smooth development. Tutoring support typically includes rule conditioning, progress support, and human interaction. The three are independent and interconnected and jointly escort the development of learning activities, as shown in Figure 6.

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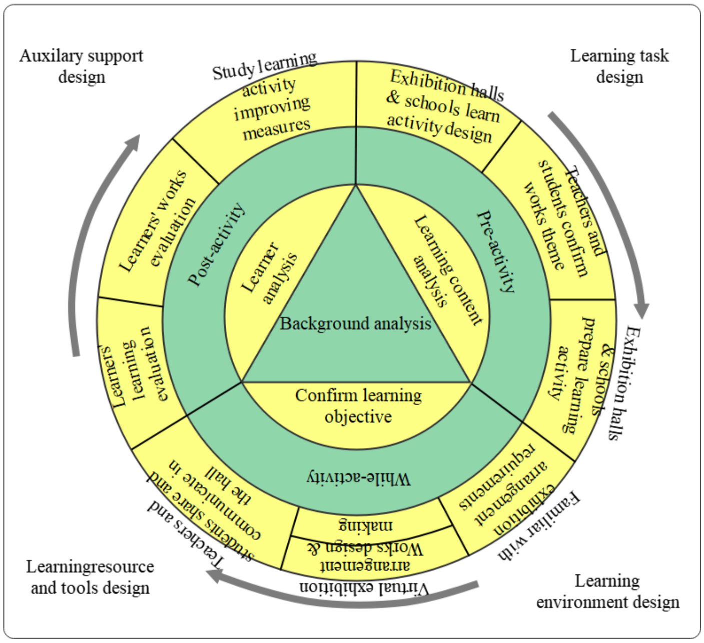

Figure 6: Computer-aided digital art course system.

The computer-aided digital artwork display model designed in this paper is shown in Figure 7.

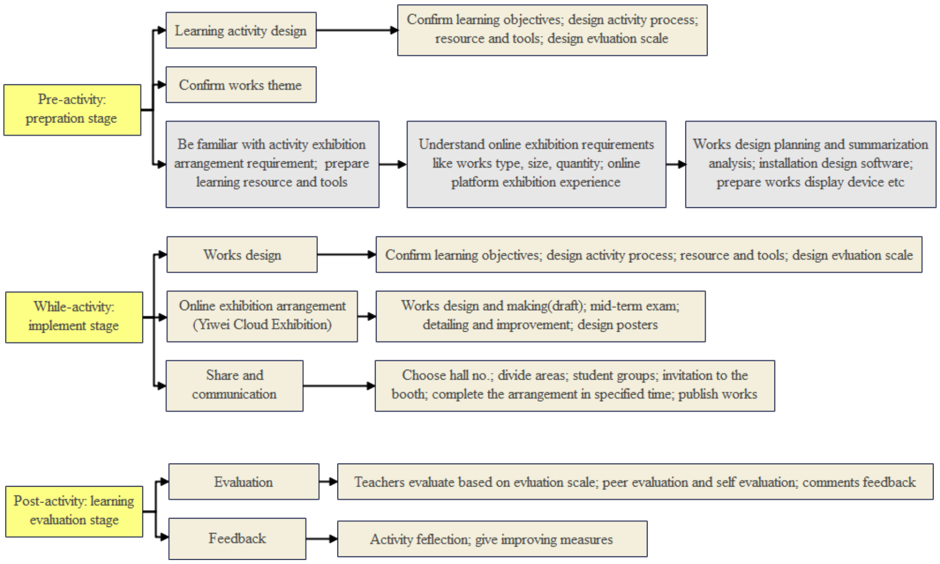

Figure 7: Display model of digital artworks based on computer aids.

After constructing the above model, this paper combines computer-aided technology to analyze the relevance of the digital art course system, and the verification results are shown in Table 4.

Number	*Relevance*	*Number*	*Relevance*
1	*80.53*	*18*	*80.53*
2	*81.11*	*19*	*72.11*
3	*77.60*	*20*	*77.46*
4	*76.94*	*21*	*79.87*
5	*77.23*	*22*	*78.48*
6	*73.02*	*23*	*73.33*
7	*82.45*	*24*	*78.48*
8	*81.58*	*25*	*78.10*
9	*76.12*	*26*	*77.76*
10	*82.64*	*27*	*73.92*
11	*72.10*	*28*	*79.89*
12	*77.04*	*29*	*78.04*
13	*81.97*	*30*	*77.42*
14	*73.90*	*31*	*75.49*
15	*76.30*	*32*	*75.44*
16	*81.44*	*33*	*76.52*
17	*72.31*	*34*	*75.50*

Table 4: Relevance statistics of digital art course system.

Based on the above research, the model proposed in this paper can further demonstrate the relevance of the digital art course system and promote its practical construction.

4 CONCLUSIONS

At present, the training mode of art and design majors in some colleges and universities imitates the mode of undergraduate colleges and needs more uniqueness. Art and design students in colleges and universities are social-oriented and should strengthen professional practice courses according to the professional ability requirements in the teaching plan. Moreover, it is necessary to cultivate advanced applied talents with modern art design concepts and practical ability who can teach art design courses in secondary and higher vocational education and independently complete various design and production tasks. In the training process, we should be guided by the needs of the industry, expand students' knowledge, strengthen students' professional abilities, and integrate theoretical teaching, practical teaching, and quality education. In this paper, the correlation analysis of the digital art course system is carried out in combination with computer-aided technology. The research shows that the model proposed in this paper can further link the correlation of the digital art course system and promote the practical construction of the digital art course system. Additionally, AI-powered assessment tools could provide more accurate and comprehensive language proficiency evaluations among medical practitioners. These assessments could consider various linguistic aspects relevant to medical communication, ensuring that professionals are adequately prepared to interact with patients, colleagues, and global medical communities.

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