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Retraction

Retracted: Data Collection and Management of Digital Process of Painting and Calligraphy Based on Internet of Things

Mobile Information Systems

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope
(2) Discrepancies in the description of the research reported
(3) Discrepancies between the availability of data and the research described
(4) Inappropriate citations
(5) Incoherent, meaningless and/or irrelevant content included in the article
(6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] C. Sun, "Data Collection and Management of Digital Process of Painting and Calligraphy Based on Internet of Things," *Mobile Information Systems*, vol. 2022, Article ID 6060115, 6 pages, 2022.

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Research Article

Data Collection and Management of Digital Process of Painting and Calligraphy Based on Internet of Things

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With the advent of the information age, the research on the digitization of calligraphy and painting information is particularly important. In order to improve the efficiency of data management after the digitization of printed information, this paper designs a digital information flow management system and data retrieval model based on the Internet of Things. According to the mismatch between the selected unit and the actual spatial data distribution and the influence of data dispersion, an algorithm for building an r-tree of a digital information flow control system using computer graphics is proposed through efficient data retrieval based on the *r*-tree index. The experimental results show that the algorithm has good practicability.

1. Introduction

Chinese traditional painting and calligraphy artworks have undergone thousands of years of integration and development, forming a unique national style with distinctive features compared with European and American countries, and forming an independent cultural phenomenon in the world [1]. When digitizing Chinese painting and calligraphy artworks, it is far from enough to only capture their macroscopic appearance, and it is crucial to fully identify and capture their artistic characteristics, which requires the optical resolution, color depth, and grayscale value of the digitizing equipment to fully meet the needs, so that the artistic characteristics represented by ink color and layers of painting and calligraphy artworks can be presented in the digitizing display equipment in a clear and precise manner, which provides the opportunity for the file storage format of the digitized collection results is an important factor affecting the security of its digital document storage [2].

Whether for interest, appreciation, or decoration, people's attention to painting and calligraphy has been rising, and their taste for painting and calligraphy artworks has been greatly improved [3]. On this premise, in order to meet the people's demand for public culture, many art galleries or museums regularly launch various exhibitions, allowing people to appreciate the works of famous Chinese calligraphers and painters in the past or some modern artists, and calligraphy and painting artworks have gradually transformed from the original collection of a few people to the cultural consumption of the general public.

However, because of its scarcity and uniqueness, the value of painting and calligraphy artworks is necessarily expensive, and the high price often stops most people from appreciating them. In addition, we will digitize the paintings and calligraphy in paper and set up online museums or galleries, so that more art lovers can enjoy the masterpieces in high definition on the Internet without leaving home [4]. In addition, the digital collection of painting and calligraphy artwork after image processing to produce a high degree of reproduction is also a widely used form of promotion. People will buy a replica to decorate their home or office after enjoying the original. From the second point of view, the precious works in the museum need to be regularly exhibited or transported off-site for cultural exchange, and in the process, there is a high risk of collision damage or even loss, which poses a great risk to the safety of the artwork. In this case, the exhibition unit will use various ways to produce replicas that are almost indistinguishable from the originals for exhibition instead of the originals, so that the general public can enjoy the beauty and art on the basis of protecting the originals. In addition, for students who are engaged in the study of art, they often enjoy the original works of art in museums or galleries for a short time and from a distance or study the works of master painters in albums, and the size is usually much smaller than the size of the original work, which largely limits the accurate grasp of the artist's artistic standard. In this case, many art schools will give students high-quality reproductions of original works for study and copying, so that students can learn in detail the artist's brushwork, use of ink and detailed changes in creation, and deeply understand the artistic essence of the original work. Under this demand, how to accurately restore Chinese painting and calligraphy artworks into a fine reproduction after digital acquisition and to innovate in certain directions becomes a worthy research topic [5, 6].

The technologies in the IoT are applied to the entire digital process of calligraphy and painting data collection [9, 10]. In this paper, we hope that through the discussion of digital acquisition and image processing of calligraphy and painting artworks, through theoretical argumentation and example analysis, it can be said that the innovative image processing based on the objective reproduction of the artistic characteristics of calligraphy and painting is suitable for people's aesthetic interests in the new era.

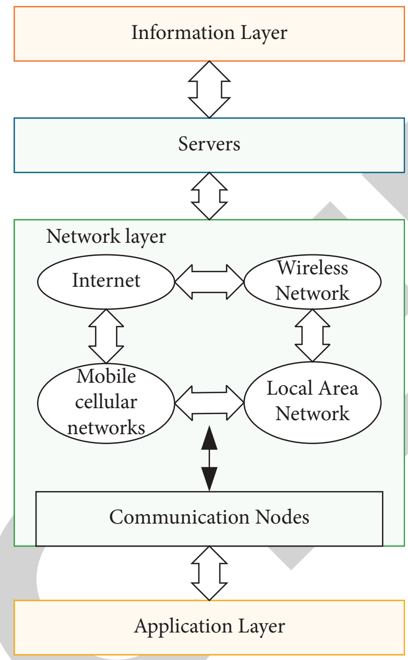

Figure 1: Intelligent digital information management system for painting and calligraphy.

2. Related Work

Digital acquisition and image processing of painting and calligraphy artworks have been emerging in the last two decades, and it has become a major form of promotion of painting and calligraphy artworks. Digital acquisition and image processing of calligraphy and painting artworks are not only for reproduction but also to disseminate them to the public in a more convenient and faster form [10].

The earliest reproduction of calligraphy and painting artworks was by hand copying, as in the case of the aforementioned "Women's History" and "Lanting Preface," using the hook copying method to get a copy of the original was the most important way of reproduction before modern times [11]. Hand copying requires a high level of painting skills and a deep understanding of the original work, as well as familiarity with the artist's characteristics and techniques. Such a copy also has high artistic value, especially if it is from the same era as the original author or not too long ago, and has completely taken the place of the original work when it has not been handed down. Handprint reproductions take longer and are small in number but are of high value, such reproductions have high collectible value but are difficult to get into the homes of the general public [12].

The second type is woodblock watermarking, which uses woodblock engraving to make multiple engraving plates on rice paper according to the color separation characteristics of the original painting to obtain a copy that is basically the same as the original. This method requires that the color separation and engraving staff must have a high level of artistic training and a high foundation in painting, so as to get a copy that matches the charm of the original. This belongs to the category of batch printing, but the production cycle is long, low production, there is a high degree of hand skills and artistry, using traditional painting materials such as pigments and rice paper, it has a certain collection value, and Beijing Rongbaozhai is a typical representative of the more successful woodblock watermarking done.

The third is the color plate printing and offset printing, which belongs to the category of printed matter, high efficiency, large print volume, and low cost and belongs to the propaganda and popular products, and the propaganda and promotion of Chinese calligraphy and painting have made a great contribution, but there are still some gaps between the printed matter and high-quality reproductions.

After the emergence of digital capture and image processing technology, in addition to using digital media such as the Internet to disseminate, making physical reproductions is a common form of promotion. For the digital capture and image processing after the electronic version of the painting and calligraphy artwork, using a digital microjet on the surface treatment of rice paper or silk reproduction of the original is a very desirable form, the level of fine, natural transition, in the presentation of details and the original highly similar. This requires high-resolution digital capture of the original work and the use of design software to adjust the color and level of the electronic image to a level that allows for digital microblowing. Digital microjet works are different from conventional prints. The biggest difference between conventional prints and manual copying and woodblock printing lies in the emotional, intellectual, and human input, which gives the impression that the prints are cold and single, lacking in dynamism, and are mass-produced industrial products [13]. Digital microjet works are not only more accurate than conventional prints, have an independent color correction system for each piece of work, and cannot achieve mass production, which is currently a more desirable path for painting and calligraphy artwork reproduction.

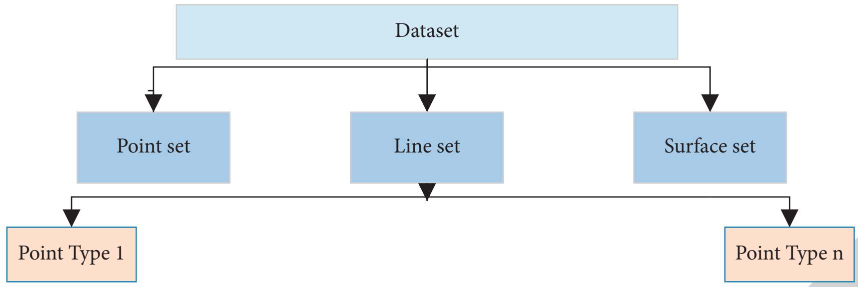

Figure 2: Hierarchical partitioning model.

There are many types of digital capture and image processing for painting and calligraphy artworks, and different methods and image processing processes are used depending on the digital capture equipment used. The objective state of the original painting and calligraphy also determines the way of digital acquisition [14].

The use of high-definition digital cameras for stitching after shooting is also the way used by some researchers, and this form is suitable for the type of not easy to scan, such as too large an area and not convenient to move.

The use of high-precision large-format photographic equipment for one-time digital acquisition is a form of collection quality is relatively high, and most companies engaged in this direction have their own set of complete programs [16, 17]. It is difficult to analyze the artistic characteristics of each work in this form, but only to achieve the resemblance. Regardless of which digital capture and image processing methods need to solve the problem is to carefully study the original art style before the digital microjetting of electronic images and design a set of independent color correction programs for the work, so as to achieve a high degree of "form and spirit with" the original work [18].

Although the digital acquisition and image processing of calligraphy and painting artworks are developing relatively rapidly, they are only at the stage of enterprise application and have not yet formed a mature theoretical system, lacking a unified theoretical guidance [19].

3. Data Acquisition and Management System of Calligraphy and Painting Digitalization Project Based on IoT

Using the network calligraphy and painting readout computer system does not meet the expectations and needs continuous optimization. Index database has many methods such as fixed grid and quadtree.

After 20 years of development, more and more p tree varieties have gradually formed the R-tree family of leaf space index. Based on geohash tree, they proposed a GRISTT method including spatiotemporal index. This method supports time and time-oriented queries. They proposed a dynamic tree (R-tree) construction method based on K-means + spatial topics to enhance the topic relevance of spatial data and improve the clustering multipath method and the segmentation algorithm of the overall efficiency of

Input $S_l = \{r_{l1}, r_{l2}, L, r_{ln}\}$
  Initialization $C_l = \{C_l^1, L, C_l^k, L, C_l^d\}$
  For $i = 1$ to m do
  Calculation $d(r_i, c_i)$
  If $d(r_i, c_i) r_i \in M, M = \{r_b | d(r_b, C_l)\}$
  End for
  Calculation C_l'
  Calculation $r_c = \arg\min(d(C_l', S_l)), r_i \in S$
  Output r_c
Output Clustering centroids r_c.

Algorithm 1: DCC algorithm implementation process.

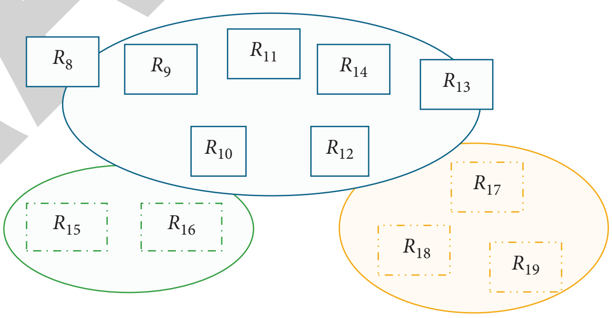

Figure 3: Minimum enclosing rectangle.

the R-tree. However, this method has the problem of abnormal interference of spatial data. In addition, the algorithm has defects in processing a large amount of data.

Therefore, to address the problems of mismatch between the selected clusters and the actual spatial data distribution, which are easily affected by outlier data, this paper constructs an R-tree in the intelligent painting and calligraphy digital information management system based on the dynamical clustering center (DCC) algorithm, so as to improve the data retrieval efficiency.

3.1. Intelligent Digital Information Management System for Painting and Calligraphy

3.1.1. System Structure. Figure 1 shows the intelligent digital information management system of calligraphy and painting built based on IoT technology.

This layer can define and install various processes, programs, and applications, such as an intelligent medical document management system.

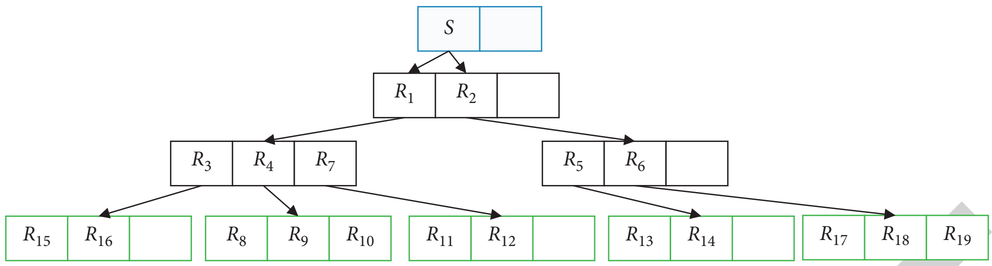

Figure 4: *R*-tree construction process.

Input: *R*-number type *N*, request data node *W*.
If Nlevel = 0 do
Back Null
Else
For $i = 1, 2, L, n$ do
If $N.P_i \in W W\prime = R.\text{search}(N.P_i, W)$
End if
End for
End if
Output W'
Output: Retrieval result.

Algorithm 2: *R*-number retrieval process.

Table 1: Simulation-related parameters.

Parameters	Values
Total network bandwidth	100 MB
Medical records (T_1)	0.52 MB
Health monitoring information (T_2)	4.58 MB
Polling complexity (Q_1)	10
Number of polling tasks N_1	12088

3.1.2. System Core. The *R*-tree index method is used to realize the rapid access to data. Data storage is a kind of physical spatial data storage, which provides fast access to different spatial object index structures. The database of intelligent calligraphy and painting digital information management system based on tree *R* is based on a relational database. First, space objects are divided into three simple entities according to geometric types: point, line, and surface. The required subtopics (as shown in Figure 2) are defined according to the properties and needs of physical space objects.

3.2. R-Tree Based Information Retrieval Model

3.2.1. DCC Algorithm. In order to ensure the effective access to large-scale data, the improved R-tree data index technology is introduced into the system. The calculation process is as follows:

$$R = \frac{1}{\sqrt{m/D}}. \tag{1}$$

Let d_i be the distance from the data to i. If $d_i \le R$, mark i as a neighboring object of the data; if $d_i > R$, record it as a nonneighboring object of the data. Let r_1, r_2, L, r_m be the m members of the spatial data cluster R_d. Assuming that c_i is the center of cluster i, the distance between r_i and c_i is calculated as follows:

$$d(r_i, c_i) = \sqrt{\left(r_i^1 - r_i^1\right)^2 + \left(r_i^2 - r_i^2\right)^2 + L + \left(r_i^d - r_i^d\right)^2}. \tag{2}$$

Suppose the set of samples in l is denoted as $S_l = \{r_{l1}, r_{l2}, L, r_{ln}\}$; that is, S_l contains n data. Furthermore, the average point of S_l can be described as $C_l = \{C_l^1, L, C_l^k, L, C_l^d\}, m$, where C_l^k denotes the k th attribute of C_l; then, we have

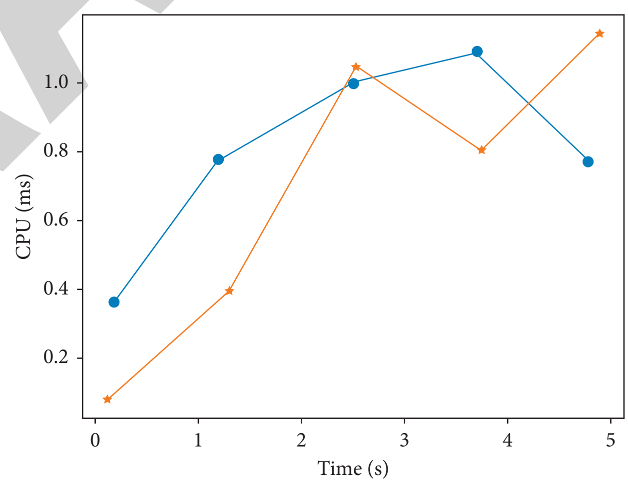

Figure 5: Comparison of CPU execution efficiency of different methods.

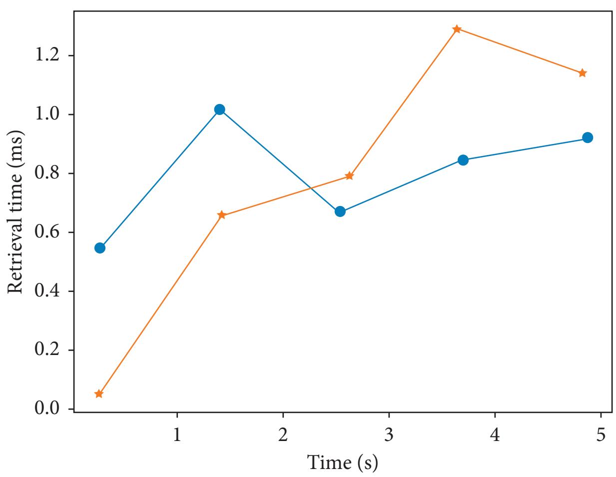

FIGURE 6: Comparison of retrieval efficiency of different methods.

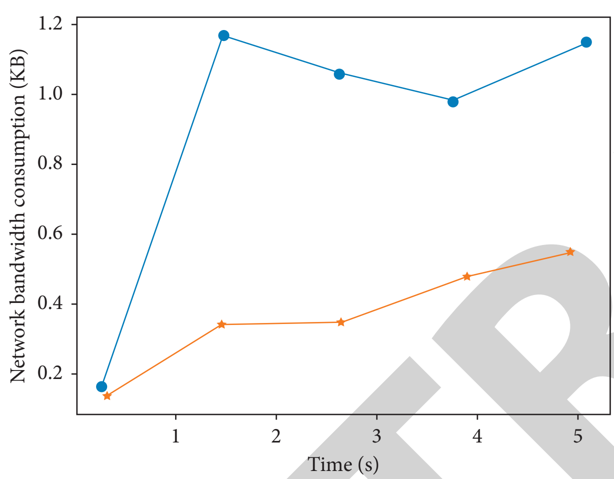

FIGURE 7: Comparison of bandwidth requirements for different methods.

$$nC_l^k = \frac{\left(r_{l1}^k + r_{l2}^k + L + r_{\ln}^k\right)}{n}. \tag{3}$$

In selecting the clustering centers, the average points of the data on the C_l class are first obtained. Then, the distances from C_l to other data are calculated. The neighboring objects of C_l are obtained according to the distance index R. Using the closest spatial data as the cluster center point r_c and calculating the average point C_l' of the neighboring objects, we have

$$N.P_i \in W' = R.\text{search}\left(N.P_i, W\right)_{13}, R_{14}, L, n_{11}, R_8 R_9, R_{14}, R_{17}, R_{18}. \tag{4}$$

Among them, $S_l = \{r_{l1}, r_{l2}, L, r_{\ln}\}$. In summary, the process of DCC algorithm implementation can be described as shown in the following algorithm:

3.2.2. R-Tree Index Construction. This section details the indexing process used to create a dynamic R-tree.

Next, the R-tree index structure matching any spatial object set is introduced. The basic creation process is as follows: first, create a minimum closed rectangle for all space objects, as shown in Figure 3. Then, the condensation center (DCC) algorithm of outer rectangular series clustering is determined according to the dynamics. As shown in Figure 4, R_{12} selects the point closest to the midpoint as the source center of the cluster, with a value of $k = 1$. R_{19}, which is farthest from the cluster center R_{12}, and R_8, which is farthest from R_{19}, are selected as the cluster centers to start clustering. $R_{13}, R_{14}, R_{17}, R_{18}$ are grouped as R_{19}, and R_9, R_{10}, R_{11}, R_{12}, R_{15} and R_{16} are grouped as R_8, and finally form two groups. The largest cluster with radius and center is selected from the two clusters, and then, R_{15} (farthest from R_{12}), R_{11} (farthest from R_{15}), and R_{18} is grouped as the center of the cluster R_{12} and then evenly distributed, and the measurement function of the cluster is calculated.

3.2.3. R-Tree Based Retrieval Process. The R index of a tree has a complete set of indexes (inserts), queries, and deletes nodes. The following only introduces a query algorithm, which is executed according to the tree index R of the database geometric table. Creating an R-tree index in the database will greatly improve the data retrieval efficiency of many users. The following algorithm describes the indexing process of the R-tree:

4. Experiments and Analysis

This section conducts experimental analysis through the digital information data set of paintings and calligraphy (the basic experimental data mainly come from the painting and calligraphy data of a city museum). About 5 MB of painting and calligraphy data were collected in advance, and a multigroup server was used to simulate an intelligent painting and calligraphy digital information management system. In the experiment, about 5 MB of painting and calligraphy data were collected in advance, and multiple servers were used to simulate the intelligent painting and calligraphy digital information management system. The parameters of the simulation are shown in Table 1, and the specific idea is to verify the query efficiency of the proposed method through two query tasks under different network bandwidths. The simulation environment is as follows: CPU is i5 slightly Lenovo workstation, memory is 8 GB, the operating system is windows 10×64, and programming language is Python.

The performance of the system is analyzed multidimensionally during the simulation and compared with the HBase indexing algorithm. The results of the CPU execution efficiency comparison are shown in Figure 5, where both the HBase method and the proposed method show the trend of CPU execution time increasing with time.

Figure 6 shows the retrieval efficiency comparison results, the maximum retrieval time of the HBase method is about 3.21×105 ms, and the proposed method is about 3.19×105 ms.

Figure 7 shows the bandwidth requirement comparison results, the peak of the HBase method is 178 KB, and the proposed method is 137 KB.

It can be seen that when the number of tasks is small, the deployment speed of the implementation rate of the algorithm is significantly improved. The reason is analyzed mainly because it takes some time to start building the *R*-tree.

5. Conclusion

Aiming at the improvement of data management efficiency after printing information is digitized, this work establishes a computerized information management system based on Intranet technology. In order to achieve this goal, this study uses the *R*-tree index method to quickly access data. In this method, the DCC algorithm is used to establish the tree *R* model of an intelligent calligraphy system, and the data retrieval efficiency is improved by the R-tree index. In the experimental analysis, the paper ignores the risks of network attacks and user information disclosure.

Data Availability

No data were used to support this study.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

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