Exploring Intellectual Property Management and Protection Construction Industry in China through the Lens of Digital Art and Big Data

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Abstract. In order to improve the effect of intellectual property management and protection, this paper combines intelligent algorithms to analyze the transformation and performance of China's intellectual property management and protection in the era of big data. Aiming at the problems of missing model details and over-simplification of local regions in quadratic error measurement, a new grid model simplification algorithm for quadratic error measurement based on local characteristic degree is proposed in this paper. On the basis of the simplified algorithm of quadratic error metric mesh model, this paper introduces the curve curvature constraint factor to preserve the model details, introduces the local area constraint factor to improve the influence of different triangulation methods on the quadratic error metric folding error, and introduces an edge length penalty factor to prevent oversimplification of the flat region of the model.In addition, this paper constructs an intellectual property management and protection system. From the clustering results, it can be seen that the intellectual property management and protection system proposed in this paper can effectively improve the protection effect of intellectual property.

Keywords: big data; intellectual property; management; protection; Lens of Digital Art; Construction Industry
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1 INTRODUCTION

From the perspective of the management department of scientific research projects, its responsibilities in intellectual property management of scientific research projects start from the establishment of the scientific research plan project system, followed by guide generation, project establishment, contract conclusion, project implementation, acceptance and evaluation, and finally the application and promotion of intellectual property rights.In the literature [5], in view of the current intellectual property management of scientific research projects: the consideration of intellectual property issues is not comprehensive, and the whole process of management is not involved; the utilization rate of information is low, and relevant intellectual property strategies have not been formed,the utilization of third-party forces such as experts and service agencies is insufficient, the results are not evaluated during project acceptance due to time-related problems,the transformation rate of the results is low, and the national interests cannot be guaranteed, the authors propose a whole-process management mechanism for scientific research projects.In the literature [14], the authors believe that the whole process management should start from the establishment of the scientific research plan project system, promote the diversification of innovation subjects in the project establishment stage, and comprehensively consider the previous intellectual property creation and protection level of the undertaker and the feasibility of the project itself. Moreover, it is necessary to agree on the ownership and maintenance costs of intellectual property rights when the contract is concluded, and the project implementation stage is mainly based on supervision and rewards. At the same time, in the acceptance evaluation stage, the intellectual property index can be set as a one-vote veto index, and the project results can be promoted through the construction of a network service platform.

Literature [13] proposed that the selection of management system in project implementation should be based on the importance of the project month, and tracking management should be adopted for major special projects. For other projects, the combination of classified management and regular reporting can be selected; The third party mainly refers to the service agencies or experts other than the management agencies and the undertaking units, which are mainly responsible for supervising and controlling the completion of the intellectual property tasks of the undertaking units during the project process, and establishing an evaluation mechanism. Literature [9] proposed that the intellectual property achievements not included in the original plan should be post evaluated, that is, one year after the completion of the project, they should be rewarded according to the output level of the achievements to encourage the undertaking units to re create. As for the promotion of the achievements, it is believed that government procurement, self implementation by units and technology transfer can play a better role.

Literature [12] analyzed the key points of intellectual property management in each stage from the planning, scheme approval, implementation, acceptance and achievement application stages of scientific research projects. In the scheme approval stage, intellectual property planning should be carried out and the application direction of intellectual property should be determined; In the implementation phase, the phased achievements of the project shall be protected on the basis of tracking domestic and foreign intellectual property documents, and the intellectual property layout shall be determined. At the same time, the whole process management of intellectual property of the Institute is defined as "the whole process of integrating intellectual property management of the Institute into scientific research and innovation activities", that is, the whole life cycle (generation, management, transformation, application and protection) of intellectual property is combined with the whole process of project establishment, implementation, conclusion evaluation and achievement operation of scientific research projects. For the link of intellectual property protection in intellectual property management, literature [10] analyzed the intellectual property management work in three periods after project initiation, implementation and conclusion: intellectual property retrieval and project approval review should be carried out in the project initiation stage; During the implementation of the project, it is necessary to prevent papers from leaking secrets, and emphasize the protection of textbooks, papers, software and other copyrights; After the conclusion, the archives management is conducive to the inheritance of project achievements, and it is also essential to promote the transformation of achievements. In addition to these three stages, the organizational structure, policies and regulations, incentive mechanism, and supervision and punishment mechanism are also essential guarantees for the smooth operation of the management system. Literature [7] suggested that the United States intellectual property management organization model should be adopted in the organization, and a special agency should be set up to carry out intellectual property application, registration, promotion, authorization, etc., that is, the special agency should be responsible for the whole process of intellectual property management. This model can not only help researchers focus on research and creation, but also protect the intellectual property rights of scientific research achievements. Literature [3] analyzed the intellectual property management system of IIT Mumbai campus from three parts: intellectual property creation, intellectual property protection and intellectual property commercialization. The source of intellectual property creation is mainly the research of teachers and students, cooperative research with the outside world and projects providing administrative support; Intellectual property protection includes invention disclosure, feasibility analysis of cutting-edge technology, review by review committee and intellectual property application; The commercialization of intellectual property rights mainly includes the evaluation of intellectual property rights and technology transfer. The former determines the value of intellectual property rights through market price estimation, technology status and market comparison, and the latter includes two types: authorization and by-product. Literature [8] pointed out that the responsibility of the intellectual property management system lies in the information storage of intellectual property, assisting in the design of intellectual property portfolio schemes, and assisting users in competitive evaluation of intellectual property and providing decision support. The intellectual property management activities of enterprises' scientific research projects are different from those of research institutes and other units. The main purpose of their intellectual property development is to market the commodities. The results management part in the general steps of literature [17] is divided into three stages: product listing, industrialization and post industrialization. The paper gives a detailed description of information products such as documents produced in each stage, and proves the correctness of the study with a case. Literature [6], based on the analysis of an example of a group, added the analysis of competitors in the market competition. At the same time, unlike scientific research institutions, which carry out early-warning analysis in all fields, enterprises pay more attention to the analysis of competitors in their development. Compared with the former, they are more targeted, which has implications for simplifying the monitoring of intellectual property information in the operation of projects. Literature [11] designed the whole process management system of intellectual property rights on the scientific research project date by using the idea of system engineering: at the project initiation stage, the novelty search of intellectual property and non intellectual property technologies, the analysis of intellectual property information and the definition of intellectual property ownership, specific goals and tasks were carried out; In the project implementation stage, on the basis of subdividing the intellectual property tasks, the dynamic tracking of intellectual property information in relevant fields shall be carried out at the same time, and the intellectual property database shall be established to improve the level review and information submission of inventions and creations; During the project acceptance, an acceptance report shall be issued to analyze the development prospects and implementation plans of the project's intellectual property achievements and make plans for further development. Literature [15] proposed that the construction of the intellectual property commissioner system and an appropriate incentive mechanism are also conducive to the development of intellectual property management, and elaborated on the adverse impact of the confidentiality nature of intellectual property on its management. It believed that the lack of information platform restricted the establishment of an infringement early warning mechanism.

Literature [16] proposed a "full cycle, multi subject" intellectual property management model, and defined the work content of project participants in each stage: in the project initiation stage, the competent department of scientific research projects should conduct intellectual property analysis, while the applicant needs to establish a special intellectual property management department and information collection and analysis team; During the project review, focus on the intellectual property status of the applied project, and take the construction of the intellectual property management post of the undertaking unit as one of the important evaluation indicators; In the project implementation stage, in order to ensure the smooth implementation of the intellectual property management work of the undertaking unit, the competent department should provide intellectual property management training. At the same time, the undertaking unit needs to have a special management department to review papers and other documents related to the project results; After the completion of the project, the competent unit will provide a corresponding platform for the transformation and promotion of the project achievements, and the project undertaking unit will formulate corresponding incentive policies to promote innovation [1]. Intellectual property training, proprietary technology protection, promotion of international exchange, effective implementation of contract management and improvement of personnel evaluation mode are effective measures to ensure the maximum benefits of R&D units and investment units and promote innovation enthusiasm. This management mode has established a three-dimensional framework for the management of intellectual property rights of scientific research projects through the two dimensions of full cycle and multi-agent [2].

Literature [4] has constructed the data flow model, transaction flow model, user demand model and system comprehensive model of the intellectual property information management system. Among them, the data flow model is mainly about data collection and processing, and the system's control over data flow is mainly reflected in security authority, system defense, data standardization and information integrity; Transaction flow is divided into three parts: basic affairs (including retrieval, storage, transmission and processing), daily affairs (including application management, financial management, legal management and project management) and complex affairs (micro analysis and macro analysis)

This paper combines intelligent algorithms to analyze the transformation and performance of China's intellectual property management and protection in the era of big data, and builds an intellectual property management model to promote the protection of intellectual property.

2 SIMPLIFIED ALGORITHM OF INTELLECTUAL PROPERTY NETWORK MODEL BASED ON LOCAL FEATURE DEGREE

2.1 Edge Folding Algorithm

The edge-folding algorithm is one of the geometric element deletion methods in the simplification of intellectual property network models. It is often used for dynamic simplification of models because of its simple operation, easy expansion, and easy access to viewpoint-related network simplified models. Typically, one simplification reduces one edge and two faces of the original model.

As shown in Figure 1, folding an edge can usually be divided into the following three steps:

Step1. The algorithm replaces g with the new vertex v, and deletes the triangle connected to the Edge (v_i, v_j);

Step2.The algorithm connects points connected to vertex v_j and not connected to vertex v_i to v_i;

Step3. The algorithm deletes the vertex v_j and the edge degenerate due to the deletion of v_j;

The essence of the triangular IP network model simplification is that it cannot only greatly reduce the number of geometric elements of the IP network model, but also preserve its local details. This also involves the selection of model simplification methods and error control methods. Therefore, the selection of the error measurement method of the intellectual property network model is of great significance to the control of the model simplification quality.

Figure 1: Side Folding Operation.

2.2 Simplified Algorithm for Quadratic Error Metrics

In order to better describe the reasoning process of the quadratic error metric IP network model simplification algorithm, as shown in Figure 2, the relevant symbols to be used in this section are defined as follows:

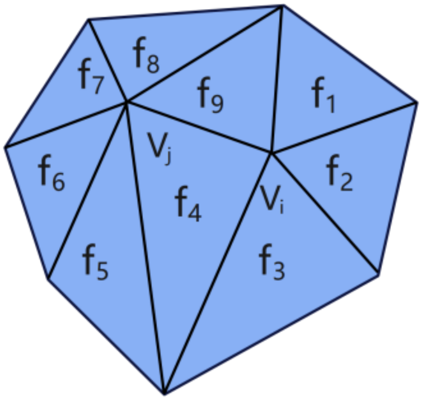


Figure 2: Topological Diagram of Intellectual Property Network Model.

Definition 1: A triangular intellectual property network model is defined as consisting of a series of vertices V= $(v_1, v_2 \dots v_n)$ and a set of triangles T= $(T_1, T_2 \dots T_n)$. The vertex v_i represents the position of the vertex in the three-dimensional coordinate system, which is represented by the triple (x_i, y_i, z_i), and the triangular patch T_i represents the index of the three vertices of the triangular patch, which is represented by the triple (v_i, v_j, v_k). The direction of the right-hand rule represented by the sequence of the triplet is the normal direction of the triangular patch, which points to the outside of the intellectual property network model.

Definition 2: Edges (v_i, v_j) represents an edge composed of vertices v_i and v_j, the direction is $v_i \rightarrow v_j$, and p represents a plane in the mesh model, usually defined as:

$$p = \left\{ (a,b,c,d)^T \mid ax + by + cz + d = 0, a^2 + b^2 + c^2 = 1 \right\} \tag{1}$$

Definition 3: Meshes$\left(v_i, v_j\right)$ represents all triangular patches adjacent to Edge$\left(v_i, v_j\right)$, Meshes(v_i) represents all triangular patches adjacent to vertex v_i, and adjacent_vertex(v_i) represents all vertices connected to vertex v_i.

In collapsing an Edge$\left(v_i, v_j\right)$ into a point v, if we assume that vertex $v_i = \left[x_i, y_i, z_i, 1\right]^T$, then the folding error Δv is the sum of the squares of the distances from vertex v to Meshes$\left(v_i, v_j\right)$, namely.

$$\begin{aligned}\Delta v &= \sum_{p \in Meshes\left(v_i, v_j\right)} \left(p^T v\right)^2 \\ &= \sum_{p \in Meshes\left(v_i, v_j\right)} \left(v^T p p^T v\right)^2 \\ &= v^T \left(\sum_{p \in Meshes\left(v_i, v_j\right)} p p^T \right) v \end{aligned} \tag{2}$$

For the convenience of calculation, Δv is usually approximated as:

$$\Delta v = v^T \left(\sum_{p \in Meshes\left(v_i\right)} p p^T + \sum_{p \in Meshes\left(v_j\right)} p p^T \right) v \tag{3}$$

In formula 3, p=$\left[a, b, c, d\right]^T$ represents the plane equation ax+by+cz+d=0 of the adjacent plane Meshes$\left(v_i, v_j\right)$ of the edge Edge$\left(v_i, v_j\right)$, and $a^2 + b^2 + c^2 = 1$, which is defined as:

$$K_p = p p^T = \begin{bmatrix} a^2 & ab & ac & ad \\ ba & b^2 & bc & bd \\ ca & cb & c^2 & cd \\ da & db & dc & d^2 \end{bmatrix}$$

K_p is a fourth-order symmetric matrix, which is called a triangular quadratic error measure matrix. The arbitrary point error matrix is

$$Q_i = \sum_{p \in Meshes\left(v_i\right)} p p^T = \sum_{p \in Meshes\left(v_i\right)} K_p \tag{4}$$

Then, the edge folding error and the total error matrix can be expressed as:

$$\Delta v = v^T Q v = v^T \left(Q_i + Q_j\right) v \tag{5}$$

The new vertex error matrix Q in formula 5 can be expressed as:

$$Q = Q_i + Q_j = \begin{bmatrix} q_{11} & q_{12} & q_{13} & q_{14} \\ q_{21} & q_{22} & q_{23} & q_{24} \\ q_{31} & q_{32} & q_{33} & q_{34} \\ q_{41} & q_{42} & q_{43} & q_{44} \end{bmatrix} \tag{6}$$

Since the folding error is $\Delta v = v^T Q v$, and the vertex error matrix Q is only related to the triangular face of the original model, it cannot be changed. Therefore, the model folding error is only related to the new vertex position, and the choice of the new vertex position will directly affect the simplification quality.

When the Edge $\left(v_i, v_j\right)$ is collapsed to the vertex v, the new vertex is usually selected in the way of v_i, v_j or $\left(v_i + v_j\right)$/2 , which minimizes the collapse error Δv. The optimal way is to take the partial derivatives of x, y and z in the above formula and make them zero according to the least squares method:

$$\begin{cases} \dfrac{\partial \Delta v}{\partial x} = 0 \\ \dfrac{\partial \Delta v}{\partial y} = 0 \\ \dfrac{\partial \Delta v}{\partial z} = 0 \end{cases} \tag{7}$$

It can be simplified to:

$$\begin{bmatrix} q_{11} & q_{12} & q_{13} & q_{14} \\ q_{21} & q_{22} & q_{23} & q_{24} \\ q_{31} & q_{32} & q_{33} & q_{34} \\ 0 & 0 & 0 & 1 \end{bmatrix} v = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \end{bmatrix} \tag{8}$$

If the matrix $\begin{bmatrix} q_{11} & q_{12} & q_{13} & q_{14} \\ q_{21} & q_{22} & q_{23} & q_{24} \\ q_{31} & q_{32} & q_{33} & q_{34} \\ 0 & 0 & 0 & 1 \end{bmatrix}$ is invertible, then the optimal new vertex is:

$$v=\begin{bmatrix} q_{11} & q_{12} & q_{13} & q_{14} \\ q_{21} & q_{22} & q_{23} & q_{24} \\ q_{31} & q_{32} & q_{33} & q_{34} \\ 0 & 0 & 0 & 1 \end{bmatrix}^{-1}\begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \end{bmatrix} \tag{9}$$

If the matrix $\begin{bmatrix} q_{11} & q_{12} & q_{13} & q_{14} \\ q_{21} & q_{22} & q_{23} & q_{24} \\ q_{31} & q_{32} & q_{33} & q_{34} \\ 0 & 0 & 0 & 1 \end{bmatrix}$ is not invertible, usually the point with the least folding cost is chosen from v_i, v_j or $\left(v_i+v_j\right)$/2 as the coordinates of the new vertex v.Although selecting the point with the smallest folding cost from the three points as the folding point has the best effect, it will increase the time complexity of model simplification and the cost performance is low. Therefore, when the matrix $\begin{bmatrix} q_{11} & q_{12} & q_{13} & q_{14} \\ q_{21} & q_{22} & q_{23} & q_{24} \\ q_{31} & q_{32} & q_{33} & q_{34} \\ 0 & 0 & 0 & 1 \end{bmatrix}$ is irreversible, the representative point v= $\left(v_i+v_j\right)$/2 is directly selected as the final folding point.

The specific algorithm is as follows:

Step1. According to the data input to the model, the algorithm records the geometric topology information of the model, and constructs basic data structures such as vertex table, face table and edge table of the model.

Step2. The algorithm calculates each triangular patch equation from the vertex and surface information of the model, and then calculates the triangular quadratic error metric matrix. Moreover, the algorithm adds the quadratic error metric matrix of all adjacent triangles of the vertex to obtain the quadratic error metric matrix of the vertex;

Step3. The algorithm minimizes the vertex quadratic error metric matrix to find the new vertex position. If the quadratic error matrix of the vertex is irreversible, the algorithm directly selects the point-to-midpoint as the folding point, and then calculates the folding error of each edge from the folding point and the quadratic error matrix of this point, and sorts them according to the folding cost;

Step4. The algorithm selects the edge with the smallest folding error from the constructed edge sequence for folding, and then updates the folding error of all edges around the new vertex. After that, the algorithm deletes the deleted or degenerate edges in the edge sequence, and inserts the new edge into the ordered sequence of the original edge;

Step5. If the simplified model meets the requirements, end, otherwise the algorithm continues to Step3.

2.3 Simplified Algorithm of Intellectual Property Network Model Based on Quadratic Error Measure of Local Characteristic Degree

In this section, an improved quadratic error metric based on an intellectual property network model simplification algorithm is proposed. The quadratic error measure only considers the distance metric in the simplification process. Although it maintains the overall shape characteristics of the model well, the simplified model may over-simplify local areas, and important details such as inflection points, creases and sharp edges in the original model are lost. To solve this problem, this paper changes the cost of edge folding by introducing edge length, local area area and curve curvature, etc., and then controls the order of edge folding, so as to improve the simplification accuracy of the model and finally obtain better visual effects.

1. Curve curvature

In a 3D network, the vertex normal vector is an important parameter to describe the detailed characteristics of the model, and is widely used in the simplification algorithm of the intellectual property network model. In order to maintain the global characteristics of the intellectual property network model while maintaining the detailed characteristics of the model, the change rate of the vertex normal vector. In many model simplifications, the normal vectors of the triangular facets are generally used instead of the normal vectors of the network vertices. However, the result of this drawing is that the model will appear blocky, which will cause the visual effect of the surface of the model to appear unsmooth, and the local area of the model will appear very abrupt. In order to obtain a good visual effect, this paper adopts the average normal vector of the vertex field as the normal vector of the point, which is defined as follows:

$$N_v = \sum_{p \in Meshes(v)} N_p / m \tag{10}$$

The intellectual property network model simplification algorithm based on curve curvature uses the maximum curvature of all edges of the vertex neighborhood as the discrete curve curvature of the point. It defines the v_i-point curvature as:

$$K(v_i) = \max\left\{K\left(Edge\left(v_i, v_j\right)\right), v_j \in adjacent\_Vertexs\left(v_i\right)\right\} \tag{11}$$

In differential geometry, the curvature of a curve is usually expressed as:

$$K(s) = \lim_{\Delta s \to 0}\left|\frac{\theta_t}{\Delta s}\right| \tag{12}$$

Among them, θ_t is the angle between the tangent vectors at both ends of the curve. As shown in Figure 3, the angle θ_t of the tangent vector is equal to the angle θ_n of the normal vector. To sum up, the curvature of the actual edge can be replaced by the approximate curvature, and the curvature of the Edge (v_i, v_j) is approximately defined as:

$$K\left(Edge\left(v_i,v_j\right)\right)=\frac{angle\left(N\left(v_i\right),N\left(v_j\right)\right)}{\left\|v_i-v_j\right\|} \tag{13}$$

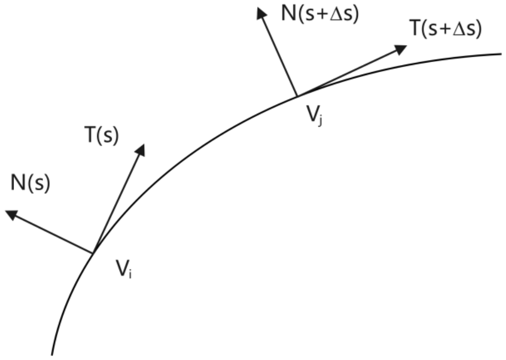


Figure 3: Curvature calculation of the curve.

2. The area of the local area

For a certain area of the same intellectual property network model, the difference in the triangulation method will have a great impact on the quadratic error matrix of the area, as shown in Figure 4. For the same triangular area, two different triangulation methods are used. If the error matrix of each triangular patch is Q, the triangulation method of Mode 1 is adopted, and the error matrix of this area is 4Q. When the triangulation method of Mode 2 is adopted, the error matrix of this area is 6Q, which is obviously wrong. For the same area of the surface model, we want the computation of the quadratic error measure to be independent of the network layout. Therefore, we introduce the area of the local area as a weight to improve the above problem.

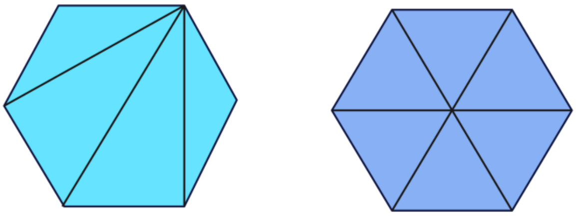


Figure 4: Different triangulation methods of local area.

Taking the average value of the area of triangular patches within the vertex domain as the area of the local area of the vertex, the area of the local area can be expressed as:

$$S\left(v_i\right)=\sum_{p\in Meshes\left(v_i\right)} S_p/n \tag{14}$$

3. Side length

For most 3D intellectual property network models, in order to fully describe the detailed features of the model, more 3D networks are often used to express the detailed features. Moreover, less 3D nets are used in flat areas, and even two triangular nets can be used to represent a quadrilateral plane. As shown in Figure 5, if this surface is simplified, it will bring a large model simplification error, resulting in a large visual deviation. In order to avoid this over-simplification problem, we introduce edge length to control to improve the quality of model simplification.

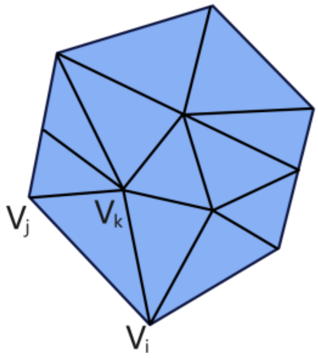


Figure 5: Intellectual Property Network Model.

If it is assumed that the coordinates of the two ends of the folded Edge (v_i, v_j) are (x_i, y_i, z_i) and (x_j, y_j, z_j) respectively, then the edge length L_{ij} can be expressed as:

$$l_{ij} = \sqrt{(x_i - x_j)^2 + (y_i - y_j)^2 + (z_i - z_j)^2} \tag{15}$$

If w_i denotes the local eigenfactor of vertex v_i, then

$$w_i = l_{ij} * \frac{S(v_i)}{K(v_i)} \tag{16}$$

$$w_j = l_{ij} * \frac{S(v_j)}{K(v_j)} \tag{17}$$

First, the folding cost of each edge in the intellectual property network model is calculated according to the quadratic error measurement algorithm. Then, the edge length, the area of the local area and the curvature of the vertex curve of the intellectual property network model are used as the model detail feature constraint factors, so the new edge folding cost is:

$$\Delta' v = v^T Q' v \tag{18}$$

$$Q' = w_i Q_i + w_j Q_j \tag{19}$$

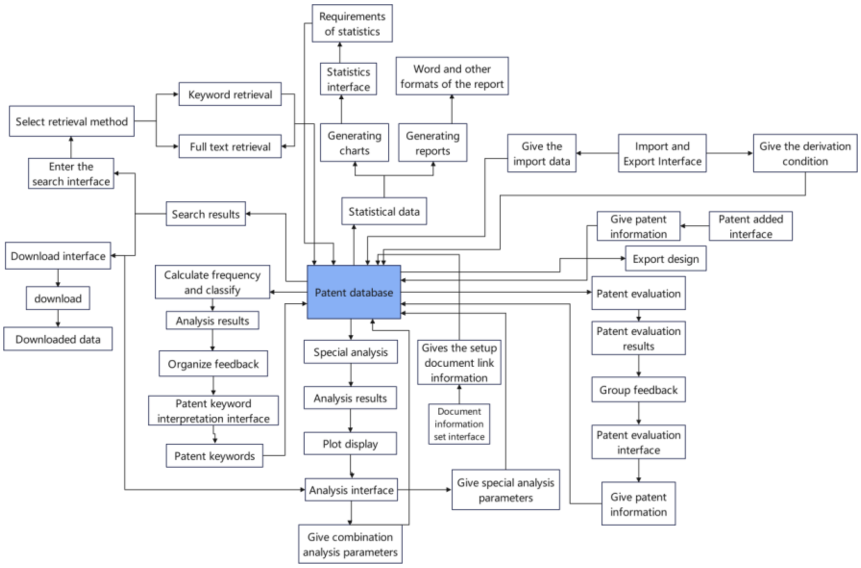
In the formula, the vertex error matrix Q of the original intellectual property network model is obtained by formula 3-4. If formulas 16 and 17 are used, it is a simplified algorithm of the quadratic error intellectual property network model based on feature preservation.

This error metric fully considers the problems of loss of details of the intellectual property network model and oversimplification of the network during the simplification process of the intellectual property network model. Moreover, it introduces the curvature of the vertex curve to improve the loss of model details, introduces the area of local area to improve the problem that the folding error caused by the different triangulation methods of the original model is quite different, and the over-simplification problem in the process of model simplification is improved by introducing the side length.

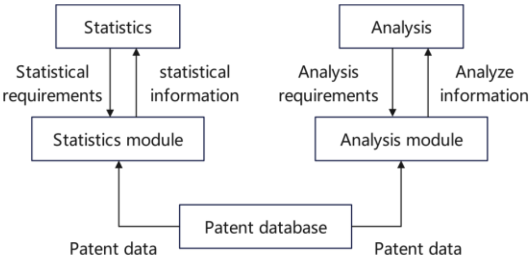
Experiments have found that in order to retain more detailed feature areas of the intellectual property network model, the number of patches in the flat area of the model is often simplified. However, too much simplification of this area will often change the shape of the triangle and appear many narrow and long triangles, which will affect the surface quality of the model. Although the introduction of side length improves this phenomenon to a certain extent, there are still many narrow and long triangles. To prevent oversimplification of a region, after an edge is collapsed, the quadratic error matrix of the two end points is superimposed on the new vertex. Then, the folding cost of the edges around the new vertex is updated, and the error formed by the folding edges is passed on, so as to better ensure the smoothness of the plane around the simplified edge, and correspondingly improve the quality of model simplification.

3 INTELLECTUAL PROPERTY MANAGEMENT AND PROTECTION

After integration and induction, the use functions are divided into three categories, namely intellectual property information retrieval, management and analysis, foreground browsing and background management. Through this system, users can retrieve and download, analyze statistics and import and export, and the operation is simple and practical. The data flow diagram of intellectual property information retrieval, management and analysis functions is shown in Figure 6(a), and the data flow diagram of the analysis module is shown in Figure 6(b).



(a) Data flow diagram of intellectual property information retrieval, management and analysis functions



(b) Data flow diagram of the analysis module

Figure 6: Intellectual Property Management System.

There are many key elements of intellectual property analysis, and all the information reflected in intellectual property can basically be used as the key elements of intellectual property analysis. The most common ones are: intellectual property name, intellectual property application number, intellectual property public number, intellectual property announcement number, intellectual property authorization number, intellectual property applicant and inventor, intellectual property priority date, application date, public seven days, date of announcement, date of registration, country of applicant, country of application, country of designation, category of intellectual property, abstract, full text of intellectual property, claims, priority number, reference of intellectual property, related intellectual property, intellectual property agent, etc., as shown in Figure 7.

Figure 7: Schematic diagram of the function of the analysis module.

The effectiveness of the intelligent property management and protection system proposed in this paper is verified, and the system performance is analyzed by the clustering method to obtain the clustering results shown in Figure 8.

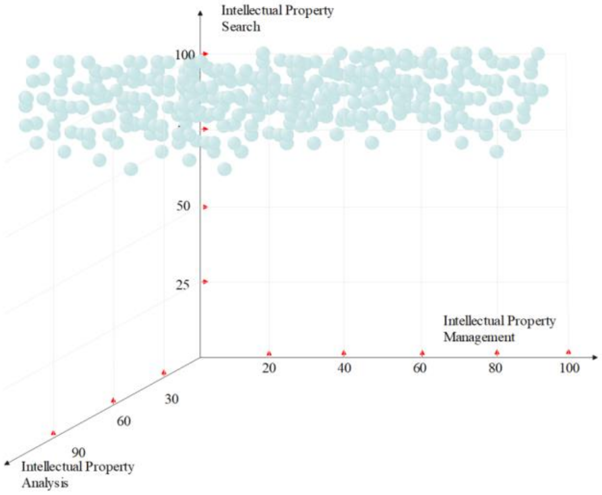


Figure 8: Cluster Analysis of Intellectual Property Management and Protection Systems.

From the clustering results in Figure 8, it can be seen that the intellectual property management and protection system proposed in this paper can effectively improve the protection effect of intellectual property.

4 CONCLUSION

Intellectual property is an excellent achievement created by human intelligence, an important strategic resource for economic and social development, and a key factor determining the comprehensive competitiveness of a country and a region. The competition of technology and economy in the world in today's era is largely reflected in the competition of intellectual property. The government's emphasis on intellectual property is not only fulfilling its international obligations, but also the need to speed up its own development and improve its innovation capability.To attach importance to intellectual property is to respect knowledge, to value and encourage innovation, to protect productivity, and to promote continuous social progress. At present, the international financial crisis is still spreading, which has caused a strong impact on the real economy. Under this situation, the government's management of intellectual property is particularly important.This paper combines the intelligent algorithm to analyze the transformation and performance of intellectual property management and protection in China in the era of big data. From the clustering results, we can see that the intellectual property management and protection system proposed in this paper can effectively improve the protection effect of intellectual property.China's construction industry. It highlights the importance of innovation, collaboration, and security in a rapidly evolving sector, all while embracing the power of big data and digital art to communicate these concepts in a visually engaging way.

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