Application of Multimedia Service based on Artificial Intelligence and Real-time Communication in Higher Education

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Abstract: In order to improve the application effect of multimedia services in higher education, this paper combines artificial intelligence technology and real-time communication technology to improve the multimedia teaching mode in colleges and universities to improve the efficiency of multimedia teaching in colleges and universities, and proposes a new estimation method of neighborhood parameters and intrinsic dimensions. Moreover, this paper uses SVD to analyze the intrinsic dimension of each subset in the minimum subset coverage under different neighborhood parameters of the dataset. In addition, this paper obtains the eigen-dimension of the manifold where the dataset is located and the range of the neighborhood parameters suitable for the manifold learning method by counting the change of the eigen-dimension with the neighborhood parameters. Finally, through research, this paper verifies that the real-time communication and multimedia service based on artificial intelligence proposed in this paper has obvious application effect in higher education.

Keywords: artificial intelligence; real-time communication; multimedia services; higher education.

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1 INTRODUCTION

At present, China's higher education has entered the stage of popularization. Whether from the perspective of early warning theory or from the perspective of target theory [13], it means that compared with the stage of elite higher education and mass higher education (hereinafter referred to as the stage of elite and mass), the concept, function and management of higher education have changed and are different. In other words, the stage of popularization of higher education (hereinafter referred to as the stage of popularization) has its own qualitative characteristics, and the standard and experience of the original elite and popularization stage cannot be used to measure and guide higher education in the popularization stage [6]. From the perspective of higher education research, higher education research should firmly grasp the main characteristics of large-scale, diverse, individualized and socialized higher education in the popularization stage [16], and focus on research and solve the main contradiction between the people's growing demand for high-quality higher education and the insufficient supply of higher education based on reality. Once the main features and main contradictions are grasped, higher education will have a solid foundation for the overall stable and orderly development in the popularization stage, and the solutions of other problems and secondary contradictions will also have a basis.

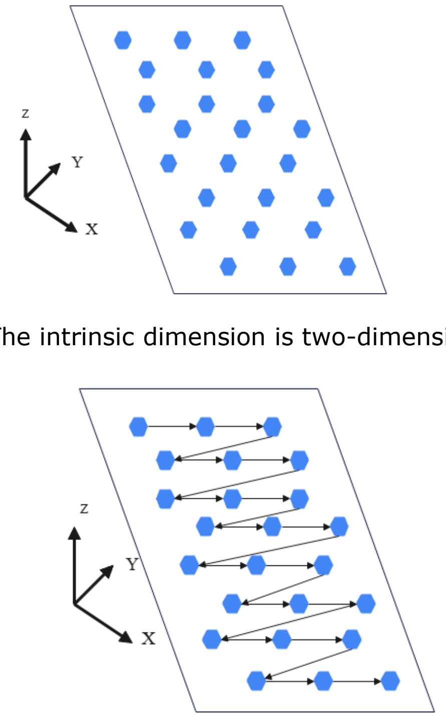
Generally speaking, higher education researchers are divided into academic school (theoretical school) and practical school (action school). The former refers to researchers who live in higher education disciplines (departments, colleges, departments) and are specialized in the production of higher education knowledge, and are also engaged in the work of cultivating specialized talents in this discipline. Such people are mainly represented by those who have been trained in educational disciplines. The latter mainly refers to the action researchers in the front line of higher education management, who do not necessarily live in specialized higher education research institutions, and generally do not undertake the training of specialized talents in higher education disciplines [15]. They work in higher education research that focuses on changing higher education practice rather than undertaking theoretical research. Such personnel mainly refer to university teachers and professional managers (including some university presidents) with non-educational backgrounds. The above two categories can be further subdivided according to the type of school in which the researcher resides or the field of research they are engaged in [7]. For example, the academic and practical schools of research universities, applied universities, and vocational colleges. Of course, in reality, there are also some researchers who combine theoretical and practical expertise, but only a relatively small number. In theory, the classification of research subjects is conducive to improving the level of specialization and refinement of research. Different types of researchers have their own expertise and cooperate with each other to form a complete and organic research pattern, and jointly promote the prosperity of higher education research. Sadly, this is not the case in reality. The academic school is often regarded as a professional researcher or a high-level researcher, while the practical school is regarded as a low-level researcher, and is even excluded from the mainstream circle of research or practice intentionally or unintentionally [1]. The artificial divisions coupled with the existing institutionalized forces have resulted in the division of the overall strength of higher education research, and even some of the research strengths are at risk of being lost, mainly due to the isolation or neglect of practical researchers. The reasons for the isolation or neglect of the Practical School are more complex. First, the influence of traditional academic concepts [14]. It is generally believed that technology is the transformation of science, and application is the practice of theory. According to this logical extension, the practical school that focuses on the study of "technical application" is considered to have a lower research level than the academic school that focuses on the study of "science" and "theory", and thus constitutes the status of "practice school is lower, and academic school is the status" in reality. There are stereotyped images of uneven research levels and different levels of "superiority" [11]. Second, the impact of academic standards. The academic school takes knowledge production and dissemination as the criterion of research level; the practical school takes the application of knowledge to change practice as the criterion of research level. Due to the different emphasis, the two evaluation criteria are not comparable. However, the academic school has a greater right to speak in the entire academic community (in a broad sense, characterized by the production, dissemination and application of theoretical knowledge, but with emphasis on the first two aspects), or in other words, the academic school belongs to the academic community (in a narrow sense, with theoretical knowledge production and application) Characterized by dissemination), the practice school belongs to the practice community (characterized by applied theoretical knowledge or practical knowledge production), the status of the former is unspokenly regarded as higher than the latter, thus strengthening the value orientation of theoretical knowledge production and dissemination , even institutionally solidified as the only academic criterion, and the diversity of academic standards is eliminated [10]. The status of the practical school is naturally low or lost. Finally, the impact of academic organizations. The academic school relies on educational degree sites and higher education research institutions to obtain academic and administrative rationality and obtain an institutional identity. This academic organization and institutional identity are administrative and substantive; while the practical school often lacks higher education research to rely on. Academic institutions may be subordinate to functional departments or professional teaching units engaged in non-higher education research work, thus lacking academic support. The isolation or neglect of the practice school does not meet the needs of the popularization stage [10]. First of all, the deepening of higher education development and reform in the popularization stage requires the guarantee of an integrated research force. The characteristics of large scale, diversity, individualization and socialization in the popularization stage have brought many challenges to the research and practice of higher education. For example, large-scale student groups will inevitably bring about direct or indirect changes in education and teaching, curriculum reform, management techniques, etc. These changes require both academic contributions—providing theoretical guidance and practical contributions—proposing school-based plans, only when the academic school and the practical school together build a complete research force can it be sufficient to deal with various challenges and unknown risks [17]. If it is believed that the academic school is above the practical school or can be replaced, and the practical school's role is optional or its role is invisibly reduced, this is the development and reform problem brought about by higher education in the popularization stage. extremely disadvantageous. Especially in the stage of popularization, the deeper the reform of higher education, the more complex the contradictions and the more interest groups involved, the more it is necessary to build a complete research force to deal with it, and the dispersion or division of research forces will not help to fully respond to various changes. Secondly, the development and reform of higher education in the popularization stage should be based on practical results [9]. Higher education is a field of practice, and higher education research is a field of practical research. The theoretical and practical circles have become more and more aware of this point of view and have taken action [5]. Not only that, some unresolved hard-bone issues in the elite and popular stage are also coerced into the popularization stage in the torrent of the times, and they need to be solved [2]. "More practical solutions to problems, less empty theoretical analysis" is a strong call in the popularization stage. If the research only aims at the construction of concepts, propositions and theories, and is far from reality, it will be difficult to be effective, and it will inevitably be severely criticized if it deviates from the attributes of the field of higher education practice. In the elite and popular stage, higher education research is regarded as a "fruitless flower". The original intention is to directly criticize and criticize "not producing representative and influential theories", and it does not include "theories that are flashy, empty and useless, unable to Effectively guiding practice” joke [3]. As such, this criticism should not be repeated during the popularization stage. In the stage of popularization, higher education research must pay attention to the power of the practice school, face and set foot in practice, and solve some old shortcomings. Only in this way can research be valuable. Thirdly, the development and reform of higher education in the popularization stage requires more case-by-case strategies. In the popularization stage, the personalized development of colleges and universities has become an unavoidable problem [8]. Individuation is not only the school's performance in terms of school-running model, characteristics, management system and mechanism, but also the plans adopted in the face of development and reform that conform to the school's conditions. In the elite and popular stage, the academic school focuses on exploring general and universal theories, while the practical school tends to look for specialized and individualized technical solutions, but the latter is prone to being "unreasonable". accuse. In the stage of popularization, more and more college administrators tend to explore school-based strategies. "One school, one policy" is the most vivid outline of this research and exploration. The inevitable requirement of individualized development is also the realistic need of deepening the reform of the higher education system [4]. Therefore, the practice school should not be isolated or ignored. On the contrary, the practice school should be supported to provide more direct assistance for the personalized development of colleges and universities. The above three reasons may also apply to higher education research in the elite and popular stages, but the demand for them is stronger and more specific in the popular stage [12].

This paper combines artificial intelligence technology and real-time communication technology to improve the multimedia teaching mode in colleges and universities, improve the efficiency of multimedia teaching in colleges and universities, and promote the reform of modern teaching mode.

2 MULTIMEDIA DIMENSION RECOGNITION ALGORITHM MODEL

2.1 The Concept and Definition of Intrinsic Dimension

At present, the most accepted definition of eigen-dimension in academic circles is: if a set of high-dimensional data is located on a low-dimensional manifold, the dimension of this manifold is the eigen-dimension of this set of high-dimensional data. Reference is given as follows for an example where the intrinsic dimension of a given set of data is difficult to determine. As shown in Figure 1(a), there is a set of data points (red circles) in three-dimensional space, and these points are just distributed on a two-dimensional plane. According to the definition of the aforementioned intrinsic dimension, it can be considered that the intrinsic dimension of this group of data points is 2. However, as shown in Figure 1(b), we can interpolate a spline from this set of data points. According to the definition of manifold, this spline is a one-dimensional manifold embedded in three-dimensional space (or two-dimensional space), so it can be considered that the intrinsic dimension of this set of data points is 1.



(a) The intrinsic dimension is two-dimensional

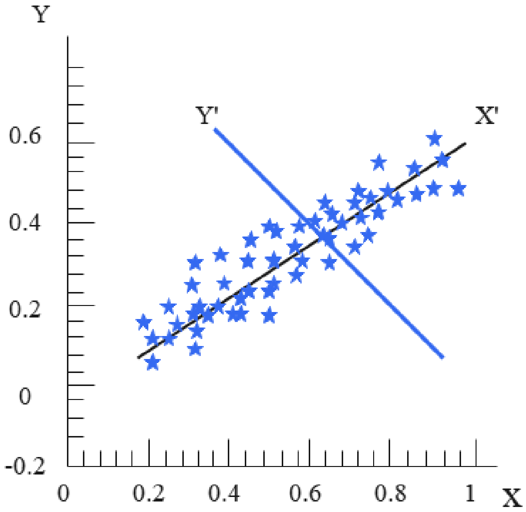
(b) The intrinsic dimension is one-dimensional

Figure 1: Intrinsic dimension.

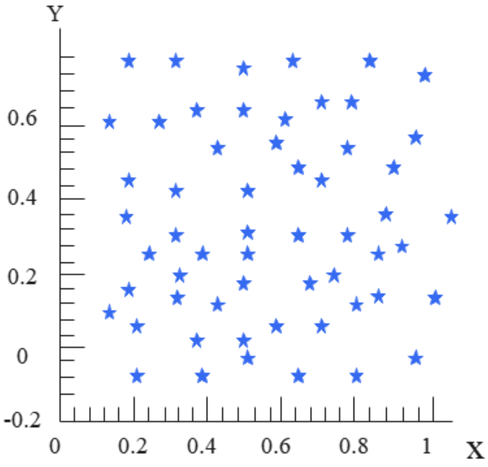
For the data scatter in Figure 1, although it is difficult to give a strict intrinsic dimension, it is usually considered that its intrinsic dimension is 2 from the point of view of convenient data processing. It is troublesome to establish a curvilinear coordinate system on the spline in Figure 1.1(b) and then obtain the coordinate values of these scattered points in the curvilinear coordinate system

2.2 Dimensionality Reduction Methods for Typical Linear Data

The POD method is called Principal Component Analysis (PCA) in statistics, and it is called K-L (Karhunen Loeve) transform in signal processing. The principles of POD methods directly felt from different disciplinary perspectives are also different. From a statistical point of view, the basic principle of the POD method is to use a linear combination of a set of data to describe the variance structure of this set of data as much as possible. From the perspective of linear algebra and geometry, the basic principle of the POD method is to find a new set of bases for the space spanned by a set of vectors in a high-dimensional space to make the projection of the original vector on the few dimensions of this set of bases as large as possible. Because the geometric meaning is clear, the second principle is more intuitive and easier to understand. The geometric meaning of the POD method is described below with a simple example. As shown in Figure 2(a), there is a set of two-dimensional data points distributed on the two-dimensional X, Y rectangular coordinate plane in an approximate band shape. Performing POD operation on this set of data will establish a new two-dimensional Cartesian coordinate system X', Y' at the center of these data points. In this new coordinate system, the projection of most data points on the X' coordinate axis is much larger than the projection on the Y' coordinate axis, so the X' coordinate axis is called the main axis. The two-dimensional data points in Figure 2(a) are approximately distributed in a slender band, and it can be clearly seen that the intrinsic dimension is approximately 1, so the POD method can be used for dimensionality reduction. But for the two-dimensional data points in Figure 2(b), it is obvious that the POD method cannot effectively reduce the dimension. The reason is that its intrinsic dimension is the same as the dimension of the two-dimensional space in which it is located.



(a) POD method can effectively reduce dimensionality



(b) POD method cannot effectively reduce dimensionality

Figure 2: Schematic diagram of eigen-orthogonal decomposition of a set of data on a two-dimensional.

In addition to being used to reduce the dimensionality of data that can be written directly as a vector, in recent years the POD method has also been extended to reduce the dimensionality of the complex governing equations of specific time-varying physics (it should be called order reduction to be exact). The mathematical derivation process of the POD method for different applications is also different in complexity. The purpose of using POD method in this paper is to quickly predict some physical fields in aircraft design (such as flow field, surface pressure distribution, etc.). Therefore, this paper presents the POD mathematical derivation process for extracting the fundamental mode of the physical field. We set $\left\{U^{(i)}(x): 1 \le i \le N, x \in \Omega\right\}$ to be N snapshots and Ω to be the physical region where the physical site is located. Before officially starting the POD operation, the snapshot needs to be centrally pre-processed, that is, each snapshot is subtracted from the average of all snapshots:

$$\tilde{U}^{(i)}(x) = U^{(i)}(x) - \bar{U}(x) \tag{2.1}$$

$\bar{U}(x)$ is the average of all snapshots. If $\tilde{U}^{(i)}(x)$ is regarded as a vector, then the vector set $\left\{\tilde{U}^{(i)}(x): 1 \le i \le N, x \in \Omega\right\}$ can be stretched into a linear space Ψ. According to the basic principle of POD, the sum of the modulo lengths of the projection vectors of all snapshots on the primary fundamental mode must be greater than the sum of the modulo lengths of the projection vectors on the secondary modes. Therefore, the problem of solving the main fundamental modes can be transformed into the following constrained extreme value problem:

$$\left.\begin{aligned} &Max\frac{1}{N}\sum_{i=1}^{N}\left|\left(\tilde{U}^{(i)},\Phi\right)\right|^{2} \\ &\left(\Phi,\Phi\right)=1 \end{aligned}\right\} \tag{2.2}$$

Since the space Ψ is formed by snapshots $\left\{\tilde{U}^{(i)}\left(x\right):1\leq i\leq N,x\in\Omega\right\}$, each fundamental mode Φ can be expressed as a linear combination of all snapshots, namely:

$$\Phi=\sum_{i=1}^{N}a^{(i)}\tilde{U}^{(i)} \tag{2.3}$$

Obviously, only the coefficient $a^{(i)}$ in the above formula can be obtained to obtain the fundamental mode Φ. By substituting formula (2.3) into formula (2.2), we can get:

$$\left.\begin{aligned} &Max\frac{1}{N}\sum_{i=1}^{N}\left|\left(\tilde{U}^{(i)},\sum_{i=1}^{N}a^{(i)}\tilde{U}^{(i)}\right)\right|^{2} \\ &\left(\sum_{i=1}^{N}a^{(i)}\tilde{U}^{(i)},\sum_{i=1}^{N}a^{(i)}\tilde{U}^{(i)}\right)=1 \end{aligned}\right\} \tag{2.4}$$

The above equation is usually solved by the famous Lagrange multiplier method. In addition to the Lagrange multiplier method, the reference gives a novel solution method as follows. First, a kernel function is defined as follows:

$$K\left(x,x^{'}\right)=\frac{1}{N}\sum_{i=1}^{N}\tilde{U}^{(i)}\left(x\right)\tilde{U}^{(i)}\left(x^{'}\right) \tag{2.5}$$

and the following operator:

$$R\Phi=\int_{\Omega}K\left(x,x^{'}\right)\Phi\left(x^{'}\right)dx^{'} \tag{2.6}$$

By performing the inner product operation on $R\Phi$ and Φ, we can get:

$$\begin{aligned} \left(R\Phi,\Phi\right)&=\int_{\Omega}R\Phi\left(x\right)\Phi\left(x\right)dx \\ &=\int_{\Omega}\int_{\Omega}K\left(x,x^{'}\right)\Phi\left(x^{'}\right)dx^{'}\Phi\left(x\right)dx \\ &=\frac{1}{N}\sum_{i=1}^{N}\int_{\Omega}\int_{\Omega}\tilde{U}^{(i)}\left(x\right)\tilde{U}^{(i)}\left(x^{'}\right)\Phi\left(x^{'}\right)dx^{'}\Phi\left(x\right)dx \\ &=\frac{1}{N}\sum_{i=1}^{N}\left|\tilde{U}^{(i)},\Phi\right| \end{aligned} \tag{2.7}$$

In the case where the modulo length of Φ is limited to unit 1, it is obvious that only the two vectors $R\Phi$ and Φ are parallel and in the same direction to maximize the value of the inner product operation of $\left(R\Phi,\Phi\right)$, namely:

$$R\Phi = \lambda\Phi \tag{2.8}$$

By expanding the above equation, we get:

$$\sum_{i=1}^{N}\left[\sum_{k=1}^{N}\left(\frac{1}{N}\int_{\Omega}\tilde{U}^{(i)}\left(x'\right)\tilde{U}^{(k)}\left(x'\right)dx'\right)a^{(k)}\right]\tilde{U}^{(i)}\left(x\right)=\sum_{i=1}^{N}\lambda a^{(i)}\tilde{U}^{(i)}\left(x\right) \tag{2.9}$$

By carefully observing the above formula, it can be found that the above formula is actually an expansion of the eigenvalue of a matrix, that is, the above formula is equivalent to:

$$CV = \lambda V \tag{2.10}$$

Among them, C is an N×N matrix, which is usually called the snapshot covariance matrix, and the element of i-th row and j-column is $C_{ij}=\frac{1}{N}\int_{\Omega}\tilde{U}^{(i)}\left(x'\right)\tilde{U}^{(k)}\left(x'\right)dx'=\frac{1}{N}\left(\tilde{U}^{(i)},\tilde{U}^{(j)}\right);V=\left[a^{(1)},a^{(2)},\cdots a^{(N)}\right]^{T}$. Obviously, C is a symmetric non-negative definite matrix, so it has a complete set of eigenvalues $\lambda^{(1)},\lambda^{(2)},\cdots\lambda^{(N)}$. If this set of eigenvalues is arranged in descending order, it must satisfy $\lambda^{(1)}\geq\lambda^{(2)}\geq\cdots\geq\lambda^{(N)}\geq 0$. If the eigenvector corresponding to the i-th non-zero eigenvalue is assumed to be $V=\left[a_{1}^{(i)},a_{2}^{(i)},\cdots a_{N}^{(i)}\right]^{T}$, then:

$$\Phi^{(i)}=\sum_{j=1}^{N}a_{j}^{(i)}\tilde{U}^{(j)} \tag{2.11}$$

In order to satisfy the condition of $\left(\Phi,\Phi\right)=1$, the modulo length of each eigenvector needs to be scaled, and each eigenvector should meet the following conditions after scaling:

$$\left(V^{(i)},V^{(i)}\right)=\frac{1}{N\lambda^{(i)}} \tag{2.12}$$

The reasons for this scaling are as follows:

$$
\begin{aligned}
\left(\Phi^{(i)},\Phi^{(i)}\right) &= \int_{\Omega}\Phi^{(i)}(x)\Phi^{(i)}(x)\,dx \\
&= \int_{\Omega}\sum_{j=1}^{N}a_j^{(i)}\tilde{U}^{(j)}(x)\sum_{j=1}^{N}a_j^{(i)}\tilde{U}^{(j)}(x)\,dx \\
&= \sum_{j=1}^{N}a_j^{(i)}N\sum_{j=1}^{N}\left(\frac{1}{N}\int_{\Omega}\sum_{j=1}^{N}\tilde{U}^{(j)}(x)\tilde{U}^{(j)}(x)\,dx\right)a_j^{(i)} \\
&= \sum_{j=1}^{N}a_j^{(i)}N\sum_{j=1}^{N}C_{ij}a_j^{(i)} \\
&= N\lambda^{(i)}\left(V^{(i)},V^{(i)}\right)
\end{aligned}
\tag{2.13}
$$

So far, a set of orthonormal basis $\left\{\Phi^{(i)}(x): 1 \le i \le N, x \in \Omega, M \le N\right\}$ of the linear space Ψ spanned by $\left\{\tilde{U}^{(i)}(x): 1 \le i \le N, x \in \Omega\right\}$ has been obtained, where M is the number of non-zero eigenvalues of matrix C. The remaining question is: how to tell which base modes are primary and which are secondary?

The sum of the squares of the projected modulo lengths of all snapshots on the ith fundamental mode is:

$$
\begin{aligned}
\sum_{j=1}^{N}\left|\tilde{U}^{(j)},\Phi^{(i)}\right|^2 &= \sum_{j=1}^{N}\left|\left(\tilde{U}^{(j)}(x),\sum_{j=1}^{N}a_k^{(i)}\tilde{U}^{(k)}(x)\right)\right|^2 \\
&= \sum_{j=1}^{N}\left|\left(N\sum_{k=1}^{N}a_k^{(i)}\frac{1}{N}\left(\tilde{U}^{(k)}(x),\tilde{U}^{(j)}(x)\right)\right)\right|^2 \\
&= \sum_{j=1}^{N}\left|\left(N\sum_{k=1}^{N}C_{jk}V_k^{(i)}\right)\right|^2 \\
&= \sum_{j=1}^{N}N\left|\lambda^{(i)}V_j^{(i)}\right|^2
\end{aligned}
\tag{2.14}
$$

Therefore, whether a fundamental mode is important can be judged indirectly by the magnitude of the eigenvalues corresponding to the fundamental mode. If the obtained M fundamental modes are arranged in descending order of their corresponding eigenvalues, the generalized energy contained in the first S fundamental modes is defined as:

$$
En_s = \sum_{i=1}^{M}\lambda^{(i)} \Big/ \sum_{j=1}^{N}\lambda^{(j)}
\tag{2.15}
$$

The core idea of using POD dimensionality reduction is to remove the secondary fundamental modes and retain only the main fundamental modes. The specific number of main fundamental modes to be retained can be determined according to the well-known 99% generalized energy criterion. After the main fundamental modes are determined, any snapshot can be approximated by the linear superposition of these main fundamental modes. The specific mathematical expression is:

$$U^{(i)} \approx \sum_{j=1}^{N} b^{(j)}\Phi^{(i)} + \bar{U}(x),(P \ll N) \tag{2.16}$$

The linear superposition coefficient $b^{(j)}$ can be obtained by the least square method, and the specific solution method will be introduced in the subsection of this paper. The above formula shows that each snapshot can be well described with only P parameters, that is, POD achieves dimensionality reduction for all snapshots.

It should be specially pointed out that the inner products used in all the above derivations are the inner products defined on the square integrable space, and the corresponding norm or modulus length is also induced by the inner product on the square integrable space. In fact, the most familiar inner product defined on Euclidean space can be regarded as a special form of inner product defined on square integrable spaces. When the above-mentioned POD derivation process needs to be used to reduce the dimension of the conventional vector data set, it is only necessary to replace the inner product with the inner product on the Euclidean space.

2.3 SVD Method and its Basic Properties

SVD is the English abbreviation of Singular Value Decomposition, usually translated as singular value decomposition. As an important matrix factorization method, SVD has been widely used in the fields of image recognition, text recognition and signal processing.

Singular value decomposition theorem: For any m×n matrix A, if its rank is $r\left(r \le min(m,n)\right)$, there must be an m-order orthogonal square matrix U and an n-order orthogonal square matrix V such that:

$$U^T AV = \Sigma \tag{2.17}$$

Or:

$$A = U\Sigma V^T \tag{2.18}$$

Σ is an m×n matrix, and its first r-order sub-formula σ is a diagonal matrix whose diagonal elements are all greater than zero, and other elements in Σ are all zero, that is:

$$\sigma = diag\left(\sigma_1,\sigma_2,\cdots\sigma_r\right) \tag{2.19}$$

$$\Sigma = \begin{vmatrix} \sigma & 0 \\ 0 & \sigma \end{vmatrix} \tag{2.20}$$

At the same time, the elements on the diagonal of σ also satisfy $\sigma_1 \geq \sigma_2 \geq \cdots \geq \sigma_r > 0$, and the matrix U and the matrix V satisfy $U^T U = I$ and $V^T V = I$ respectively.

If $U = [u_1, u_2, \cdots, u_m]$ and $V = [v_1, v_2, \cdots, v_n]$, then u_i and v_i are called the left singular vector and right singular vector of matrix A, respectively, and the elements on the diagonal of Σ are called the singular values of matrix A. When $r < min(m,n)$, the following conclusion can be drawn from equation (18): in the process of using Σ, U , V to reconstruct the matrix A , part of the information of these three matrices can be completely ignored so that the reconstructed matrix is still equal to A . The proof process is as follows:

$$A = U \Sigma V^T = \begin{vmatrix} \sigma_1 u_{11} & \sigma_2 u_{12} \cdots \sigma_r u_{1r} & 0 \cdots 0 \\ \sigma_1 u_{21} & \sigma_2 u_{22} \cdots \sigma_r u_{2r} & 0 \cdots 0 \\ \vdots & \vdots \quad \ddots \quad \vdots & \vdots \ddots \vdots \\ \sigma_1 u_{m1} & \sigma_2 u_{m2} \cdots \sigma_r u_{mr} & 0 \cdots 0 \end{vmatrix} \tag{2.21}$$

The elements on row i and column j of A can be obtained as:

$$a_{ij} = \sum_{k=1}^{r} \sigma_k u_{ik} v_{jk} \tag{2.22}$$

That is:

$$A = \sum_{i=1}^{r} \sigma_i u_i v_i \tag{2.23}$$

It can be seen from the above formula that when the dimensions m and n of the matrix A are large, but the rank r is relatively small, it only needs to store r real numbers, r m-dimensional vectors and r n-dimensional vectors to completely retain the information of the entire matrix. This is very meaningful for signal transmission, image compression and other professions. Further, if only the approximation of the matrix A needs to be obtained, then only the singular values with larger numerical values and their corresponding left and right singular vectors can be used in formula (23), namely:

$$A \approx \sum_{i=1}^{r} \sigma_i u_i v_i \quad (k < r) \tag{2.24}$$

The above formula is the basic principle of using the SVD method for data dimensionality reduction.

3 INTELLIGENT COMMUNICATION MULTIMEDIA TEACHING MODE

This paper proposes a new architecture of multimedia real-time communication network, as shown in Figure 3. By building cross-operator and cross-region layered overlay networks and services, it can meet the real-time audio/video service requirements of vertical industries.

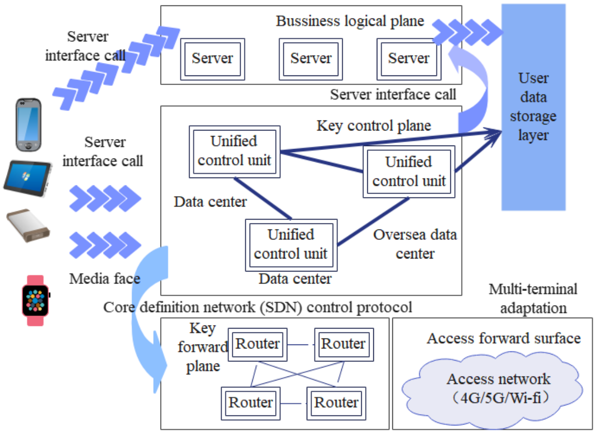


Figure 3: A new architecture of multimedia real-time communication network.

Considering the new business requirements in the future, more new functions and message interaction requirements will be brought, and the call process will be further complicated. Moreover, benefiting from a more simplified and flatter new architecture, the message interaction of a typical call flow in the new multimedia real-time communication system can be reduced to within 20 message interactions or service calls. The schematic diagram of session control and dynamic routing is shown in Figure 4.

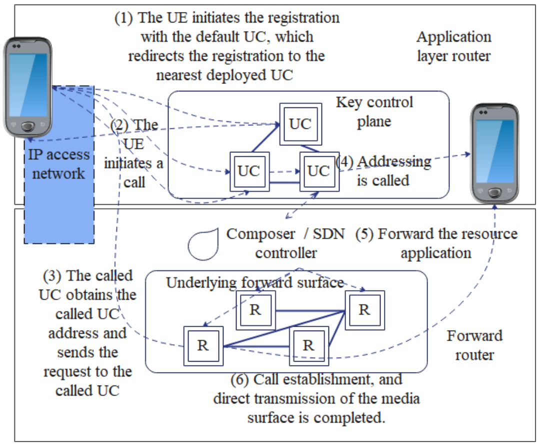


Figure 4: Schematic diagram of session control and dynamic routing.

The network topology of the broadband multimedia communication satellite system is shown in Figure 5.

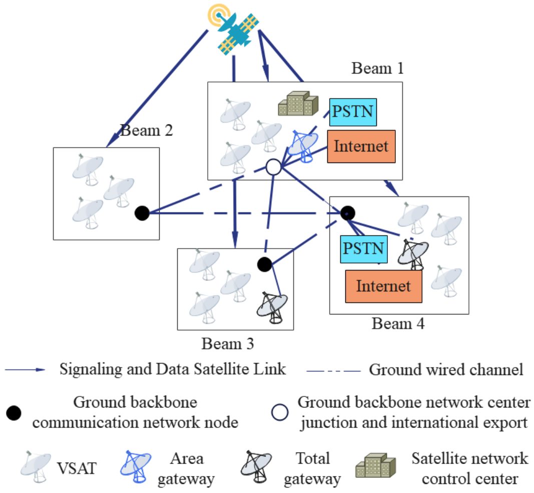


Figure 5: Schematic diagram of multimedia satellite communication system.

According to actual needs, the monitoring system mainly includes system interconnection functions, human-computer interaction functions, management functions, monitoring functions and auxiliary functions, as shown in Figure 6.

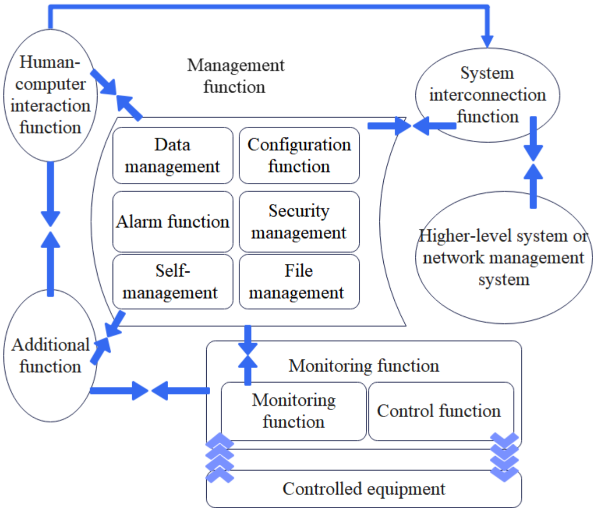


Figure 6: Functional structure of the monitoring system.

The multimedia communication system is constructed above, and it is applied to higher education. The system effect is verified through simulation experiments, and the statistics of multimedia real-time communication errors are shown in Figure 7.

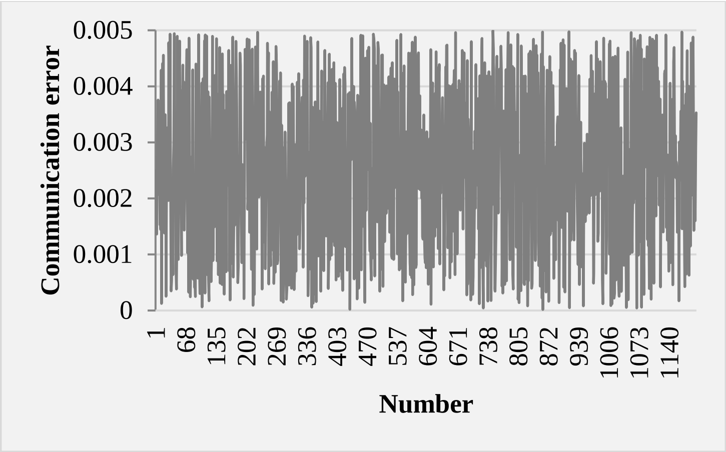


Figure 7: Communication error of multimedia services based on artificial intelligence and real-time communication in higher education.

The above verifies that the multimedia real-time communication technology can play an important role in higher education, and then the simulation effect of the system in this paper is evaluated and the educational effect is calculated, as shown in Table 1

NO	*Educational effectiveness*	*NO*	*Educational effectiveness*	*NO*	*Educational effectiveness*
1	*82.16*	*18*	*83.45*	*35*	*87.12*
2	*88.40*	*19*	*86.98*	*36*	*88.26*
3	*82.48*	*20*	*88.23*	*37*	*85.44*
4	*85.30*	*21*	*86.37*	*38*	*84.51*
5	*83.40*	*22*	*82.50*	*39*	*86.68*
6	*84.02*	*23*	*85.44*	*40*	*83.18*
7	*85.63*	*24*	*83.37*	*41*	*82.71*
8	*85.90*	*25*	*87.73*	*42*	*86.03*
9	*82.35*	*26*	*88.32*	*43*	*88.31*
10	*82.58*	*27*	*83.93*	*44*	*86.70*
11	*87.00*	*28*	*83.85*	*45*	*84.34*
12	*83.62*	*29*	*85.66*	*46*	*88.12*
13	*86.19*	*30*	*86.36*	*47*	*83.37*
14	*87.49*	*31*	*83.44*	*48*	*85.23*
15	*84.66*	*32*	*86.30*	*49*	*85.60*
16	*84.50*	*33*	*84.65*	*50*	*87.49*
17	*88.08*	*34*	*83.06*	*51*	*87.49*

Table 1: The application effect of multimedia services based on artificial intelligence and real-time communication in higher education.

Through the above research, it is verified that the multimedia service based on artificial intelligence and real-time communication proposed in this paper has obvious application effect in higher education.

4 CONCLUSION

Higher education research should strengthen self-research, reflect on the research subject, research domain, research value and research method, and comprehensively improve the ability to guide and serve the practice of higher education. The former problem has attracted the attention of the academic circles, and a number of achievements have also been formed. However, the latter issue is far from attracting enough attention, and it is urgent to strengthen research. In the stage of popularization, the main body of higher education research should change from isolation to cooperation, the research field should change from macro to small and micro, and research methods should be changed from methodological to practical orientation. This paper combines artificial intelligence technology and real-time communication technology to improve the multimedia teaching mode in colleges and universities to improve the efficiency of multimedia teaching in colleges and universities. Finally, through research, this paper verifies that the real-time communication and multimedia service based on artificial intelligence proposed in this paper has obvious application effect in higher education.

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