Research Article
A Metadata-Based Multimodal Model for Resource Sharing of British and American Female Literary Works

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Based on the perspective of multimodal teaching theory, this study analyzes the establishment of English and American literature appreciation standard course in universities and discusses the necessity of course offering, multimodal teaching implementation, and multi-evaluation of the course, to provide ideas for English literary teaching reform and talent training in universities. In terms of the training of professional talents, to improve their critical thinking and humanistic quality, a British and American literature course in English major study holds a significant place as a mandatory course for English majors. Basic abilities such as an awareness of Western literature and culture are developed into the ability to appreciate and evaluate literary works. This study, based on the premise of standardizing spatial data and sharing data, argues that the traditional data sharing model has flaws and that a sharing mechanism based on metadata management is required. It also proposes a metadata management strategy that can be used as a model for addressing the problem of heterogeneous storage in data sharing.

1. Introduction

The courses of English and American literature generally have specific situations and attractive plots, which are bound to achieve the best results if only expressed by text. The situational nature of English and American literature courses is that readers can have a specific image in their minds by exerting their imagination and combining the content of the text. The existence of scenes such as the Eden in which Adam and Eve lived was “seen” by God himself and “climbing” into Hamlet’s splendid palace and stepping on Robinson’s sand [1–5] to see his distant gaze gives powerful life to the text and also enables the text to fuse sound, color, image, and other information, which realizes the change in text from single mode to multimode. A computer network can provide a variety of modes including text, color, sound, and image for English and American literature courses, and in this process, students’ senses such as hearing, touch, and vision are mobilized, so that students will no longer be bored in learning. It also helps students to improve their memory. British and American literature, especially the female literature, generally has fascinating and vivid figures, such as Charlotte Bronte’s Jane Eyre in pursuit of liberty, independence, self-respect, and equality, Catherine’s love tragedy in Emily Bronte’s Wuthering Heights, the happy growth process of the four daughters in March’s family in Little Women by Louisa May Alcott, and the black women in Toni Morrison’s novel The Bluest Eyes striving to survive all the difficulties and wishing to have a bright future. All have their own personalities, determined, or courageous, or humiliated, or confused at a loss [6, 7].

The following diagram shows the basic framework of this pattern construction (Figure 1). British and American literature course in English major study has an important position as a compulsory course for English majors, in terms of the cultivation of professional talents, to improve their language basic skills, cultivate the understanding of Western literature and culture, and enhance the capacity of appreciation of literary works. It is of great significance to raise college students’ humanistic quality [8]. In recent years, however, British and American literature teaching in some colleges and universities has placed too much emphasis on the reform of the basic English teaching, ignorant of the British and American literature courses in the aspect of
cultivating humanity quality, so that the significance of the English language teaching idea lags behind, simply focused on course content, teaching means, and methods. This greatly hinders the cultivation of high-quality potential teachers with professional ability and sustainable development ability that the society needs, which makes the English teaching reform deviate from the direction and not conducive to the cultivation of professional talents [9]. A multimodal basic frame diagram is shown in Figure 1.

The study arrangements are as follows:

Section 2 defines the related work of various conditions of special courses of English and American literature and determines the teaching content. Section 3 discusses the data sharing management mode and establishes a unified metadata standard for spatial data management, storage, query, analysis, and other functions. Section 4 applies the various experiments, analyzes the different data model, and concludes the results. Section 5 ends the study.

2. Related Work

According to the survey, due to the limitations of various conditions, quite a few colleges and universities offer special courses of English and American literature, which is generally offered as literature appreciation quality courses or elective courses, with fewer class hours, and the selection of teaching materials and content is limited to a certain extent. Therefore, we must proceed from the characteristics of humanistic quality course, attempt to construct a multimodal British and American literature appreciation teaching mode, namely students are taken as the main body, by means of network, on the basis of classic literature, through the mode of teaching and learning, and improve the students' ability to read and appreciate literature ability, which helps to make cross-cultural communication and integrate humanity cultivation manners [10].

(1) Using text modal to determine teaching content. The Chinese character mode of literary works has always been in the leading position. In the teaching of English and American literature appreciation course, the character mode mainly includes the text in textbooks, the text in PPT courseware, the text of students' extracurricular reading, and the text of students' homework [11]. Due to the limited class hours of quality-oriented courses and the English foundation of college students, the course of English and American literature appreciation should make a choice in the teaching content, highlighting the introduction of classic literary works and writers, and deleting the complicated discussion of literary history and literary criticism schools. Therefore, we should carefully compile English and American literature reading materials, which can be in chronological order, including the 18th century, 19th century, and modern and contemporary literature. It can also be based on the categories of works, such as poetry, drama, and novel (women, war, nature, etc.), to ensure the accuracy of text modes in teaching materials. The text in the PPT courseware used by teachers in class is a summary of the text content of the teaching material. In addition to ensuring the accuracy of the text mode, the font, size, color, and arrangement of the text of the PPT courseware should be designed to make the text mode more clear and intuitive for students to watch and understand. Extracurricular reading, as an extension of classroom reading, can also be text modal [12]. Teachers can upload the complete original content of literary works taught in class or multiple manuscripts of different works of the same author and theoretical articles about literary criticism to BB platform of campus network for students to read and appreciate after class. At the same time, to consolidate the teaching effect, teachers can assign students appropriate text modal tasks, such as writing after reading and character analysis of literary works. Students can also upload to the teaching platform for classmates or teachers to communicate and review [13].

(2) Using image and sound modes to reform teaching methods. Literary works are multimodal in nature. To read literary works, readers need to exert their powerful imagination and imagine the language words as scenes. Therefore, in the teaching of English and American literature appreciation course, the full use of image and sound mode not only forms an effective supplement to the text mode but also enables students to have an immersive feeling and deepen their understanding of literary works. Image and sound modes may be auxiliary modes of text modes in PPT courseware teaching [14]. For example, when introducing the poem To Daffodils by British romantic poet Wordsworth, students can insert a picture of daffodils into the PPT courseware. Students can observe the shape of daffodils and compare it with the description in the poem to imagine the poet's writing mood and the artistic conception expressed in the poem. This reinforces the text mode. Naturally, the choice of mode in PPT courseware should be the organic integration of text, image, and sound and should not interfere with each other and distract students' attention. With the progress of science and technology, compared with the previous "text reading era" dominated by printed words, people have entered the "picture reading era" dominated by "images" disseminated by various mass visual media such as comics, books, TV, movies, and the Internet. Young students are deeply influenced by visual culture, which should be fully utilized in English and American literature courses. The multimodal nature of film and television discourse makes it more intuitive and easy to understand than literary discourse. Many classic literary works have been adapted into film and television dramas [15]. Therefore, the multimodal integration of film and television and literary works can be carried out to broaden the teaching of British and
American literature, which is mainly based on written words. For example, when teaching the great feminist work *Jane Eyre*, students can watch the film adaptation. The novel has been adapted to the screen more than 20 times, most recently in the 2011 version, telling the ancient story from a modern perspective, which reflects the vitality and immense appeal of this literary work [16].

(3) Making use of multiple evaluation for course assessment. The evaluation of the course of appreciation of British and American literature should not be judged by the result of a final paper, but by the way of process evaluation, focusing on the learning process of students and fully reflecting the student-centered teaching philosophy. The main body of evaluation is diversified, including teacher evaluation, student self-evaluation, and group mutual evaluation. This can fully mobilize the enthusiasm of students to participate. The content of evaluation is multifaceted, including classroom evaluation and extracurricular evaluation. Class performance is both individual and group [17–19]. Extracurricular evaluation is flexible, and with the help of the powerful function of the computer, it can timely track the students’ online self-study record, the statistics of homework submitted by the network platform, interaction with classmates and teachers, and so on. The means of evaluation are various, including quizzes on literary knowledge, essays on literary works, and group performances of literary works. In the course of course assessment, students take advantage of multimodal means to actively participate in the course of teaching and learning. For example, in the group cooperative literature performance, students need to collect information on the Internet, adapt the script, write lines (mainly in text mode), and also then make the scene into PPT or prompt board (image, text mode). Finally, music, dialogue, and performance (voice, text, gesture, etc.) are completed. This process aims at training their skills of technical literacy, autonomous learning and language expression, and enhancing their teamwork, self-confidence, and self-improvement consciousness [20].

3. Data Sharing Management Mode

Sharing in the traditional management mode is the center of the data sets for management (Figure 2), a single data set of metadata specifications, and the users only through the access to the data sets obtain the corresponding metadata, which lead to the metadata redundancy. Although there is a good correlation between metadata and dataset, there is a lack of connection between metadata and dataset. This causes difficulties in data sharing. In a complex database application environment, different database systems are needed, so it is difficult to directly access different and heterogeneous data sets. In the face of geographical data with complex data types, access is unrealistic. Therefore, we must establish a unified metadata standard for spatial data management, storage, query, analysis, and other functions. A management mode based on data sets is shown in Figure 2.

With the rapid development of Internet and Web, metadata technology has gradually become one of the core technologies of distributed information computing. In Web-based data sharing solutions, geographic metadata have become one of the indispensable tools and methods to expand from a method of data description and indexing to the whole process of network information including data discovery, data transformation, data management, and data usage. Data sharing based on metadata management, first of all, according to the industry or the discipline of metadata standard, establishes the corresponding metadata database, and the database in the yuan each data set corresponds to a globally unique identifier, which can be understood as a record of metadata corresponding to a set of data, and the access to the data set is based on the access of metadata
record. The centralized storage and management of metadata have gradually replaced the traditional sharing mode with data set as the core.

The data sharing mode based on metadata management (Figure 3) maximizes the advantages of metadata and effectively uses the design idea of Web service to solve the problem of heterogeneous and remote database access in the traditional sharing management mode. Metadata are the prerequisite and basic guarantee for geospatial information sharing in digital earth. It can be said that without metadata, there would be no network sharing and global sharing of information. Only when the collection, storage, management, maintenance, release, and sales of information are realized, global information sharing can be truly realized and the global informatization function of the digital earth is fully played. A management mode based on data sets is shown in Figure 3.

In the process of establishing metadata, we should first establish geo-metadata database and then expand it into metadata of other subject models. Metadata not only solve the problems we encounter in dealing with geospatial data sharing but also solve the problems that we have difficulties in data sharing in other fields. For example, in an enterprise, there is a large amount of data every year. Faced with such a large amount of complicated data, it is difficult to carry out effective management, so we can establish a data warehouse and convert the data into useful and reliable information to support business decisions. Metadata management is an important task in the establishment of data warehouse. Metadata are the data of data, which are used to establish, manage, maintain, and use the database. Metadata database ensures the consistency and accuracy of data warehouse data and provides databases for enterprise data quality management.

OAI is a typical metadata collection framework based on the concept of harvesting. It implements the interoperation of heterogeneous resource systems through the interoperation of DC metadata. On this basis, we try to design new framework architecture to meet the needs of digital education resource sharing, as shown in Figure 4.

In this framework, after the collection and integration of the underlying metadata, users can use a unified query interface to access various metadata standard information resources on the network, avoiding repeated submission of the same query and hiding the heterogeneity of data resources. The whole model system mainly includes the following parts.

User interface: the user interface interacts with the user. It provides a unified interface, accepts the input query requests, query constraints, selected resource standards, types and types, and displays the final query results to the user. The user interface not only provides users with simple query functions but also needs to provide advanced query functions.

Query analysis and processing: the query sent by the user interface is analyzed, the parameters are decomposed, and the query keywords, the logical relationship between keywords, query constraints, and resource standards and other information are determined. This information is needed to choose a metadata repository and a standard representation for the incoming metadata. These data are used to choose a metadata repository and a standard representation for receiving metadata.

Standard conversion interface: the information sent by the query analysis processor is analyzed to determine the query scheduling processing (i.e., which metadata warehouse to query). Thus, different metadata standards are transformed and encapsulated, and the query request is handed to the corresponding metadata warehouse.

Query result processing: the query results sent by the metadata warehouse are received, the standard conversion is reversed, the repeated and redundant results are merged, organized, and deleted, and then the final query results are delivered to the user through the user interface.

TD.IDF is a widely used weight calculation method in information retrieval, which improves the singleness of the Boolean weight algorithm and ranks the importance of feature words reflecting the characteristics of topics. The main idea is as follows: if a topic concept appears frequently in a single science and technology resource, but rarely in other science and technology resources, it indicates that the topic concept has a good distinction for the science and technology resource. Among them, term frequency (TF) represents word frequency, which shows the frequency of the characteristic word TI in a single scientific and technological resource. While inverse document frequency (IDF) represents the reverse document frequency, reflecting the frequency of the scientific and technological resources.
including the feature word TI in the whole set of scientific and technological resources, which is a measure of the general reuse of the feature word in the set of scientific and technological resources. The weight value of TF.IDF is calculated by the product of the two; that is, \( W_I(t) = TF_I \times IDF_I \). Generally speaking, TF.IDF formula does not exist fixedly, but is a set of variations of TF.IDF formula. At present, formula (1) has been proved to be one of the most effective TF.IDF formulas by most systems:

\[
   w_i(t) = tf_i \times \log_2 \frac{|N|}{df_i} \quad (1)
\]

From the formula, TF represents the number of occurrences of feature word Ti in a single document, N represents the total number of documents, and female is the number of documents containing feature word TI.

As TF-IDF formula cannot directly identify feature words with similar semantics, low-weight feature words that are synonymous with high-weight words are easily filtered out. Therefore, formula (1) is improved to some degree. Firstly, it is necessary to pre-filter the extracted topic concept set with generic words to reduce noise, and then, it is necessary to replace the weighting of single feature words with the merging weighting of synonymous topic concept set; that is, the word frequency and inverse document frequency of synonymous topic concept are combined. See formula (2) for weighing the topic concept TI in a single science and technology resource:

\[
   w_i(t) = \sum_j tf_j \times \log_2 \sum_j \frac{|N|}{df_j} \quad (2)
\]
From the formula, $J$ represents the topic concept $T$, which is the combination of $J$ topic concepts, $TF$ represents the frequency of each topic concept in a single science and technology resource, $df$ represents the number of science and technology resources hit by each topic concept, and $N$ represents the total number of science and technology resources in the set of science and technology resources.

After obtaining the extracted and weighted feature set of S&T resources, we can analyze the correlation strength of S&T resources through the feature set of topics. For the correlation of scientific and technological resources, it is necessary to calculate the correlation degree of scientific and technological resources by weighted topic concept. The Euclidean distance algorithm is used to calculate the distance between scientific and technological resources in the topic vector space so as to obtain the topic correlation degree of scientific and technological resources. The specific calculation formula is as follows:

$$S_i(R_a, R_b) = \frac{1}{1 + \sqrt{\sum_{k=1}^{n} (w_{ka} - w_{kb})^2}}$$  \hspace{1cm} (3)

From the formula, it is assumed that there are $n$ topic concepts in the current set of science and technology resources, and $w_{ka}$ and $w_{kb}$ are the weights of the KTH topic concept in science and technology resources $Ra$ and $Rb$, respectively.

On the basis of realizing the basic mapping of the classification system of scientific and technological resources, the classification correlation degree of the metadata of scientific and technological resources classification can be calculated. The specific calculation method can be adopted by the method proposed in the literature [10]. The overall process is as follows:

1. The value of classification metadata of R1 and R2 is converted, which needs to be used for correlation calculation, into categories A and B under unified classification system;
2. The nearest parent node $P$ from A and B is found, and the number of nodes $NI$ and $N2$ from A and B to $P$ and the number of nodes $N$ from $P$ to the root node are obtained; and
3. The category correlation between R1 and R2 is calculated according to the following formula:

$$S_j = \frac{2 \times N}{N_1 + N_2 + 2 \times N}$$  \hspace{1cm} (4)

Through the classification and association of scientific and technological resources, it can further realize the aggregation of scientific and technological resources with similar disciplines centering on individual scientific and technological resources and complete the recommendation of relevant scientific and technological resources.

Because the screening results of different conditions have certain contradictions, it is necessary to comprehensively evaluate the importance of other sharing conditions on the basis of screening and filtering the science and technology resources that do not meet the matching conditions and then calculate the correlation degree of the sharing conditions of science and technology resources. The specific calculation formula is as follows:

$$S_g = \sum w_i S_i.$$  \hspace{1cm} (5)

From the above, $W_i$ is the weight of sharing condition. The weight of sharing feature metadata can be obtained by the machine learning method as the weight of sharing condition, and $Si$ is the correlation degree between scientific and technological resources and a certain condition.

The semantic distance between two metadata is represented by the distance between two leaves on the tree graph. Semantic similarity is related to the distance between semantics and the relative position between metadata. The formula in literature [12] is used to measure semantic similarity between metadata:

$$Sim(T1, T2) = f1(l)f2(h) = \begin{cases} e^{-\alpha l \beta h} - e^{-\beta h}, & T1 \neq T2, \\ 1, & T1 = T2, \end{cases}$$  \hspace{1cm} (6)

In formula (6), $T1$ and blink are any two metadata in the catalog information tree, $L$ is their path in the catalog information tree, and $H$ is their depth.

The semantic similarity and semantic correlation depth of any $E1i$ and $E2j$ can be obtained by the semantic similarity algorithm and semantic correlation depth algorithm of metadata. The calculation formula of semantic similarity of resources is as follows:

$$S(P1, P2) = \frac{1}{K} \sum_{i,j=1}^{n} \text{filter}(\text{sim}(e_{1i}, e_{2j})).$$  \hspace{1cm} (7)

Sim$(e_{1i}, e_{2j})$ is the similarity of any two metadata of resources $P1$ and $P2$.

The correlation depth of resources can be calculated as follows:

$$V(P1, P2) = \frac{1}{q} \sum_{i,j=1}^{n} \text{select}(vi, vj).$$  \hspace{1cm} (8)

In the formula, $vi$ is metadata $e_{1i}$, and the semantic correlation depth of $e_{2j}$ has the same meaning as $p$ in the metadata correlation depth algorithm. The greater the correlation depth, the weaker the correlation degree of resources. Therefore, the correlation degree of resources is calculated as follows:

$$U = \frac{1}{V}.$$  \hspace{1cm} (9)

The matching degree of resources $P1$ and $P2$ is as follows:

$$M(P1, P2) = aS(P1, P2) + bU(P1, P2).$$  \hspace{1cm} (10)
In the formula, \( A + b = L \) is the similarity coefficient, \( b \) is the correlation coefficient, and the value of gadolinium \( B \) is determined by users, the size of which depends on how much users care about resource similarity and correlation.

4. Experimental Results and Analysis

In the experiment, the parameters of metadata similarity algorithm and metadata correlation algorithm were set, respectively. The values of coefficients in formula (3) were \( a = 0.2, b = 0.6, \) and \( n = 5 \) in the metadata correlation depth algorithm. The value principle of these three parameters has been described in detail in the description of the algorithm, which will not be repeated here. The similarity threshold \( f \) is set as 0.2, 0.4, 0.6, 0.8, and 1.0, respectively. Since this experiment has no emphasis on similarity and relevance, the similarity coefficient \( A \) in formula (5) is set as 0.5, and the corresponding value of \( B \) is 0.5. In this study, two groups of tests are carried out for different thresholds of resource matching degree. The values of \( M \) are 0.5 and 0.8, respectively, for test experiments. In each group of tests, the data of teaching and education resources in all sample sets are queried 50 times, and the results of each query are recorded. Through the experimental results and analysis of the data in the sample set, we can draw the following conclusions: the retrieval accuracy and recall rate, and the average test results are taken as the final experimental results. Meanwhile, MDS traditional xPath-based query method is used to query the same sample set, record the query results, and compare the query results obtained by the two methods.

When \( M = 0.5 \), the comparison of experimental results is shown in Figures 5 and 6.

Figures 5 and 6 give the values of \( M \) as 0.5 and 0.8, respectively, for test experiments. Each value of \( M \) is analyzed, and then, the best one is selected. The similarity threshold off each value in each group of tests, all of the sample concentration of teaching education resources for 50 times query, record every time the query results, the resource information is obtained by the experimental results and analysis sample concentration of information resources, and it is concluded that after the retrieval precision and recall, fifty times average test results are taken as the final experimental results.

When \( M = 0.8 \), the comparison of experimental results is shown in Figures 7 and 8.

When we compare the first group of experiments with the second group, it can be seen that when the accuracy is higher at \( M = 0.8 \), the recall rate is lower than that at \( M = 0.8 \) but higher than that at \( M = 0.5 \). In Figure 8, the semantic association-based precision is slightly lower than xPath-based precision when the similarity is small, but the overall performance is better than the query method using the ATH in terms of both precision and recall. It can be seen from the above two groups of test experiments that the query method based on metadata association is applied to the grid information service system MDS, and the query efficiency is significantly improved compared with the traditional xPath-based query method. Based on the ATH, queries are based on keywords, and the precision and recall rates are independent of semantic similarity. The precision of MDS query based on semantic association increases with the increase in similarity, and the recall rate decreases with the increase in similarity. As a result, the information query approach based on semantic association may be used, which is ideal for grid environments with huge resources and can considerably enhance resource query efficiency.
5. Conclusion

The course of English and American literature appreciation is an important way to cultivate students’ humanistic quality. By appreciating classic British and American literary works, students can not only improve their language expression ability, understand Western culture, and enhance their cross-cultural awareness, but also enhance their aesthetic taste, form critical thinking, improve their personality, and upgrade their humanistic quality on the whole. Metadata are the focus of data sharing research. The mechanism based on metadata management can use network technology to solve data redundancy and waste of space resources, as well as solve the problem of resource sharing. The most important problem is to establish a unified sharing platform and formulate corresponding specifications. We should draw lessons from the experience of developing international metadata standards and pay attention to the integration with international standards from standards to systems, to make metadata design a reality. To meet the growing demand for urban informatization, economic construction, and social development for basic geographic information resources, the data will be developed from 2-dimensional geospatial frame data to multidimensional and dynamic geospatial frame data. The basic geospatial data resources of true 3D, multi-temporal, and high precision (temporal and spatial accuracy) are gradually provided to users. At the same time, it is necessary to organize and study the problems of multiscale data updating, multiscale framework data integration, historical data preservation and temporal data organization, massive spatial data management, and so on.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The author declares that he has no conflicts of interest.

References


