# Research on the Modeling of Regional Cultural Transmission Rate in Mobile Social Network Environment

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**Abstract.** Regional culture belongs to the category of local characteristic culture, which is greatly influenced by local history, regional and human factors, so there are big differences. In the context of the era of converged media, the analysis of regional cultural dissemination and its discourse structure based on the perspective of media culture has certain practical significance. Analyze the regional cultural dissemination in the current media context, and put forward suggestions on how to realize the effective dissemination of regional culture. The rise and development of media culture in the new era is the epitome of cultural transformation. Based on regional cultural dissemination and the construction of discourse, it is hoped that the main cultural consciousness can be awakened, and the cultural autonomy and active position in the transformation process can be mastered. On the one hand, it is necessary to avoid the fate of assimilation of regional culture, on the other hand, under the condition of changing the current situation of homogenization of contemporary culture, analyze the harmony but difference of regional culture and strive for more space for its development.

**Keywords:** Mobile social network · Regional culture · Cultural communication

## 1 Introduction

With the development of information technology and the popularity of the network, the scale of data in the network is growing, and the audience's dependence on the network information is gradually increasing, but they have to face the problems of slow retrieval and difficult understanding of information [1]. Information visualization technology, supported by computer, realizes the visualization of abstract data through graphics and images, reveals the connotation and potential structure of information, makes the audience bid farewell to the irregular data heap, and reduces the cognitive burden. Guided by the idea of information visualization, this paper designs the information visualization model of regional cultural resources, and explores a new idea for the dissemination of regional culture [2]. Taking the regional cultural resources as the specific object, the


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visualization model of regional culture is designed from different angles, different levels and different dimensions, which provides practical experience for the application of information visualization technology in the field of regional culture communication.

Reference [3] puts forward a model of regional cultural transmission rate based on protocellular machine. The model considers that cultural competition and integration are inevitable under the background of globalization, and immigration significantly speeds up the process of cultural transmission and integration. Cultural change is an evolutionary process in a complex social system. According to the process of cultural transmission, the affected population can be divided into small rectangular units, and the time can be divided into multiple units to build a cultural transmission rate model. Reference [4] proposed a culture transmission rate model based on mobile social network. By forming a temporary group, the cultural information in mobile social network can be transmitted to others. And for practical considerations, it is expected to form a star network topology among mobile social network users to improve the speed of cultural transmission.

However, the traditional model of cultural communication rate still can not meet the needs, so this paper puts forward the modeling research of regional cultural communication rate in the mobile social network environment, extracts the characteristics of regional cultural information, clarifies the relationship of regional cultural information communication, constructs the regional cultural communication model, and realizes the high-speed transmission of regional culture.

## 2 Modeling of Regional Culture Transmission Rate

### 2.1 Characteristics of Regional Cultural Information Based on Multimedia

Once the research of regional cultural resources is separated from the initial environment of culture, it will cause the separation of the whole concept, which is a kind of damage to the characteristics of regional cultural resources. Therefore, it is necessary to study the regional cultural resources "region". Based on the reference information visualization reference model and map cube model, combined with the regional characteristics of regional cultural resources, a visualization model based on regional characteristics is proposed. The research of spatial geographic location is an important aspect of information visualization. The visualization of spatial location can clearly judge the spatial distribution of research information. At present, there are many researches on spatial geographic location. The typical research is that electronic map and virtual structure can be obtained. The combination of information visualization technology and geospatial information conforms to the thinking mode of the audience, so as to make the information visualization technology combined with geospatial information, so as to meet the thinking mode of the audience The visualization results have the advantages of large amount of information, intuitive image and various forms. The theory, method and technology of converting data into graphics or images on screen and interactive processing are made by using computer graphics and image processing technology. The main research fields are: scientific computing visualization, data visualization, information visualization and knowledge visualization. The objects, technologies, purposes, methods and application fields studied in these four fields are different, but they are not independent from each other. The four visualization technology relationships are shown

in the figure. As a research field of visualization, information visualization includes many characteristics of data visualization, information graphics, knowledge visualization, scientific visualization and visual design, and develops and advances on this basis (Fig. 1).

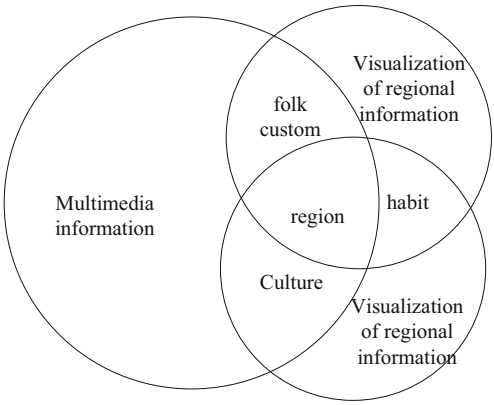


**Fig. 1.** Visualization of regional cultural information characteristics

Information visualization is an interdisciplinary field, which aims to study the visual presentation of large-scale non numerical information resources, and help people understand and analyze data by using graphics and image technology and methods [2]. The continuous upgrading of information software and hardware and the exponential growth of network resources and digital information have brought unprecedented opportunities to the development of information visualization. Information visualization as a discipline has gradually grown up. Information visualization concept map, information visualization is a kind of cross activity between data, computer and users, and its core is data exploration. Data exploration is mainly to achieve four purposes: to express information vividly, that is, to express abstract data in a visual way; to discover new knowledge; to identify various possible laws of information in terms of structure, pattern, trend, relationship, etc.; through exploration, human beings can obtain useful information from the vast ocean of data, so as to discover knowledge in information and learn from knowledge Seek a decision, as shown in the figure (Fig. 2).

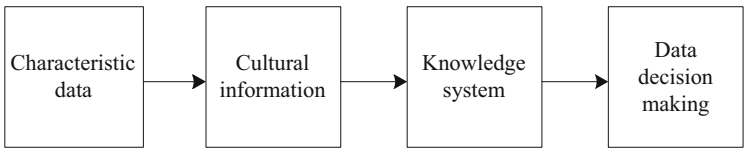


**Fig. 2.** Collection and processing process of regional cultural information characteristics

The research object of information visualization focuses on abstract data set, and often uses graphics to express the relationship of abstract data. Its purpose can be simply described as "interpretation with graphics". The relationship and common graphics expressed by information visualization are shown in the Table 1:

**Table 1.** Communication relationship of regional cultural information

| Relationship | Features |
|---|---|
| Quantitative relationship | Bar chart, pie chart, curve chart and comparison chart |
| spatial relationship | Map, celestial map |
| Time relationship | Time line, flow chart |
| Organizational relations | Organization chart |

According to different classifications, information visualization has different classification methods [5]. At present, the common classification standards include information type, information visualization technology and deep data arrangement. Information visualization classification information table, as shown in the table (Table 2).

**Table 2.** Classification of cultural information based on multimedia technology

| Classification dimension | Classification results |
|---|---|
| Information type | One dimensional information, two-dimensional information, three-dimensional information, multidimensional information, time series information, hierarchical information, network information |
| Information visualization technology | Three dimensional technology, icon based technology, pixel positioning technology, hierarchical technology, chart based technology, hybrid technology |
| Deep data arrangement | Map type, information type, interactive and exploratory type |

Starting from the filtering of the original data, effective information is analyzed and extracted from the original data; the mapping process is to map the screened effective information into standard data with dimensional structure; the visualization process is to complete the interactive view which is easy for the audience to operate; the feedback process reflects the impact of user behavior on the visualization process [6]. The information processing process of information visualization is the process of changing the information state, from the original scattered state to the final structured relational state. The processing structure of information visualization reduces the cognitive burden of the audience, so that users can quickly understand the information and find the rules, correctly interpret the information, master and apply the rules, and improve the cognitive level and insight [7].

### 2.2 Regional Culture Communication Model

Regional culture has rich connotation. According to the conditions of region, time, nationality, knowledge, art and human, we can analyze the following attributes of regional cultural resources. Cultural resources have their own geographical environment for generation, development and prosperity, and cultural objects are different due to their geographical location, climatic conditions, folk customs and living habits [8]. According to the subordination of location type, from high to low, it adopts "country", "province", "city", "county (District)", "township (town)" and "village". As shown in the figure. The design of regional cultural information visualization model needs a complete workflow as guidance [9]. This paper refers to the general steps of visualization data mining and design in the book information visualization and knowledge retrieval, and designs the workflow diagram of regional culture information visualization model construction, as shown in the figure (Fig. 3).

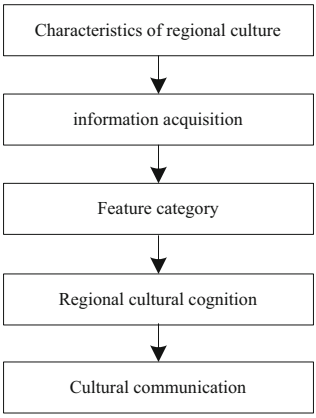


**Fig. 3.** Workflow of constructing the visualization model of regional cultural information

Every cultural resource is left over from history and has a distinct or hidden brand of the times. This paper analyzes the origin time of regional cultural resources, and understands the breeding, formation and development of culture according to the time sequence of feudal dynasties. Through cultural relics, economic conditions, production relations, social forms, major events and important figures to reflect the Era Connotation of cultural resources. China is a multi-ethnic country, because each nation has its own national background, national beliefs, national language, national habits and so on, there are great differences in regional culture. At the same time, due to the differences between nationalities, it also enriches the content of regional culture. To explore the regional culture from the perspective of geographic information and realize the interaction between human and image is in line with the audience's way of thinking. The audience can participate in controlling the flow of information and the way of visualization. This will help the audience to understand and infer the relationship between regional culture and information, and improve the cognitive level from initial knowledge to decision-making.

The content of regional research can be divided into three aspects: address data, including address number, address name and subordination, which is the attribute given by human beings to geographical space, and is helpful to the management and identification of geographical location; human geography, the special "regional" characteristics of regional cultural resources are mainly determined by its special initial environment, which includes not only macro resources, but also macro resources It also includes the micro food structure and crop varieties and other factors; the form of expression, information visualization technology for the expression of geospatial information, mainly using two parts of virtual space and electronic map (Fig. 4).

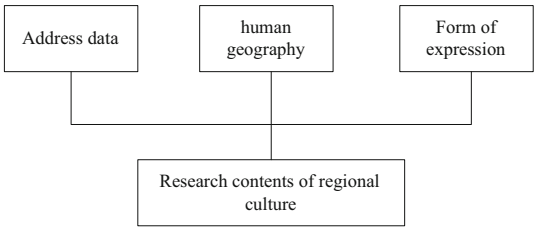


**Fig. 4.** Types of regional cultural communication information

The knowledge of regional culture can be divided into two kinds: one is the origin of regional culture, which is formed with the emergence of regional culture; the other is social science knowledge and natural science knowledge related to the formation, evolution, perfection and dissemination of regional culture. The knowledge of regional culture is extensive and profound. The other five attributes of regional culture can be used as a breakthrough in the study of knowledge. Taking "intangible cultural heritage" as an example, the forms of artistic expression of cultural objects are different. Culture can be divided into ten categories: folk story, folk literature, folk music, folk dance, opera, folk art, folk acrobatics, folk handicrafts, folk custom and traditional medicine. The artistry of regional cultural resources can be classified according to subordination, as shown in the figure (Fig 5).

The development of modern science and technology reflects a transformation process from "entity thinking" to "relationship thinking". From the perspective of cognitive law, logical information is easier for people to recognize. As a system, information visualization model is the reflection of information objects in various relationships. Information relationship is the association rules between research objects. Association analysis, as an important research in data mining, paves the way for the early research of information visualization. Analysis of regional cultural resources, information relations are mainly divided into the following two kinds. The internal information relationship of the object. This kind of relationship is mainly reflected in the hierarchical relationship within the object, which mainly includes: the subordination of geographical location, the inclusion of time attribute, the subordination of organizational structure, the relationship of characters, the generic relationship of cultural types, etc. These two locations belong to subordination in geographical location, and are the internal information relationship of objects.

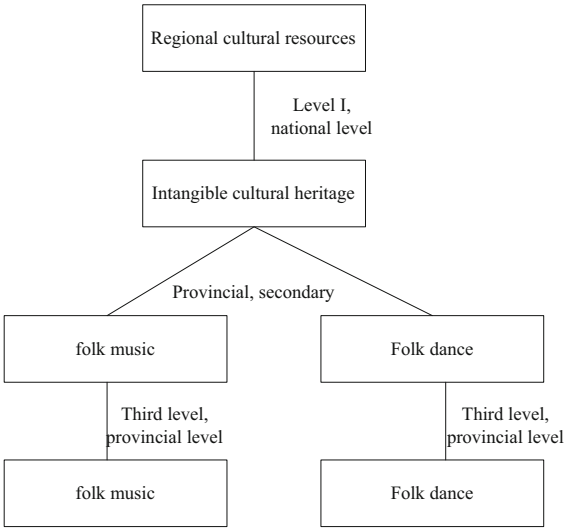


**Fig. 5.** Analysis of regional culture transmission rate

The cross information relationship between objects is expressed as the relationship under constraint binding, which mainly refers to the same genus relationship. It mainly includes: region, time and category, intangible cultural heritage also includes identification level and application batch.

### 2.3 The Realization of Regional Culture Communication

With the popularity of the network, network communication has become the mainstream of information communication. At present, there are many digital resources related to regional culture. However, in the design of traditional digital resources, the visual experience, interactive needs and cognitive burden of the audience on resources are not considered. The concept dynamic system of n participating enterprises can be given by the following equation:

$$D_1 x_i = F_{ii}(x_i, \theta_i) + \sum F_{ij}\big(x_i, x_j\big), i, j = 1, \ldots, n, \tag{1}$$

$$F_a(x_i, \theta_i) = -h_i(x_i - \theta_i) \tag{2}$$

$$F_{ij}\big(x_i, x_j\big) = \mu_{ij} B\big(x_j - x_i\big) \tag{3}$$

$$B(u) = u \cdot \exp\big(-(u/\lambda)^{\beta}/\beta\big) \tag{4}$$

The model is transformed into a social impact network model driven by linear resultant force

$$F_{ij}\big(x_i, x_j\big) \to \begin{cases} \mu_{ij}\big(x_j - x_i\big), \left|x_j - x_i\right| \le \lambda \\ 0, \text{ otherwise} \end{cases} \tag{5}$$

The simplified analysis can be obtained:

$$D_r x_i = -(x_i - \theta_i) + \sum_{j=1, j\neq i}^{n} k_{ij} B\left(x_j - x_t\right), i = 1, \ldots, n \tag{6}$$

The linear dynamics of the evolution of the concept of cooperation are as follows:

$$\begin{cases} D_i x_1 = -h_1(x_1 - \theta_1) + \mu_{12}(x_2 - x_1) \\ D_1 x_2 = \mu_{21}(x_1 - x_2) - h_2(x_2 - \theta_2) \\ \theta_1, \theta_2, h_1, h_2, \mu_{12}, \mu_{21} \in (0, 1) \end{cases} \tag{7}$$

The steady-state values of the concept of cultural communication are as follows:

$$\begin{cases} \tilde{x}_1 = (\theta_1 + \theta_1 \mu_{21}/h_2 + \theta_2 \mu_{12}/h_1)/(1 + 2k) \\ \tilde{x}_2 = (\theta_2 + \theta_1 \mu_{21}/h_2 + \theta_2 \mu_{12}/h_1)/(1 + 2k) \end{cases} \tag{8}$$

The equilibrium value of concept difference is as follows:

$$\tilde{x}_1 - \tilde{x}_2 = \theta/(1 + 2k) \tag{9}$$

The difference of conceptive concession is as follows:

$$(\theta_1 - \tilde{x}_1) - (\tilde{x}_2 - \theta_2) = (\mu_{21}/h_2 - \mu_{12}/h_1)\theta/(1 + 2k) \tag{10}$$

Information visualization technology is applied to the dissemination of regional culture to improve the disadvantages of traditional culture dissemination, present an intuitive interactive interface for the audience, shorten the search time and reduce the cognitive burden. After fully analyzing the technical characteristics and visualization objectives of information visualization, a visualization model based on network dissemination of regional culture resources is designed. The basic architecture of the model is shown in Fig. 6:

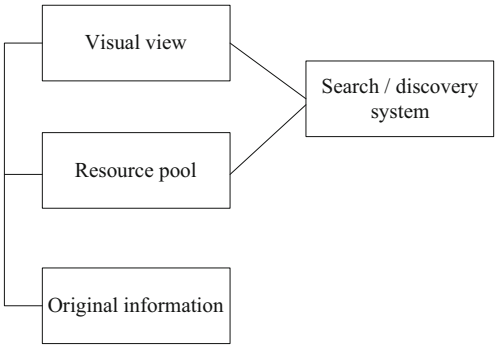


**Fig. 6.** Basic architecture of information network communication model

The main work of the model is simply summarized as the transformation process from original information to visual view. The model provides various services to the

audience through visual view, and at the same time, the visual view can interfere with and affect the situation of resource base and original information; the resource base mainly stores and manages various digital objects, and the digital objects of the resource base are standard data obtained after the visual design of the original data, and can directly map the views; The main function of search / discovery system is to complete the retrieval request of the audience and realize interaction.

## 3 Analysis of Experimental Results

In order to verify the actual application of the regional culture propagation rate model in the mobile social network environment, the experiment is carried out in the following environment: Net Framework 3.5; operating system: Window XP; Web server: Internet information services 6; development language: C #, action script; database: SQL Server 2005; integrated development tools: Visual Studio 2008, flash. Based on the above experimental environment, comparative detection is carried out to analyze the cultural transmission rate of social networks in different geographical environments. The specific detection results are shown in the following figure (Fig. 7):

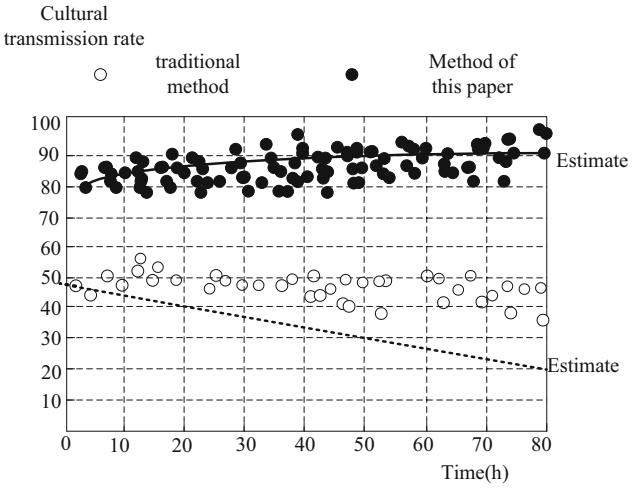


**Fig. 7.** Comparison of cultural communication efficiency under different methods

Based on the above comparative analysis results, the prediction model of regional culture propagation rate under this method can more accurately predict the data in the actual application process, and the prediction results are basically consistent with the actual distribution, which proves that the regional culture propagation rate model under the mobile design network environment proposed in this paper has a high accuracy in the actual application process, which is further improved The results are shown in the following figure (Fig. 8):

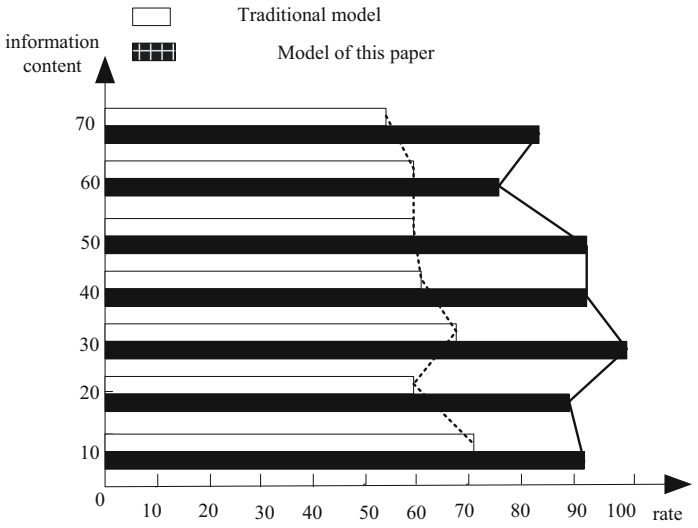


**Fig. 8.** Comparison results of regional culture rate estimation

Based on the above detection results, compared with the traditional methods, the regional culture propagation rate model in the mobile design network environment proposed in this paper has higher timeliness in the practical application process, which can more quickly carry out the culture propagation and control prediction, and fully meet the research requirements.

## 4 Concluding Remarks

Combined with the mobile design network environment, this paper designs and develops a cultural communication model that conforms to the cognitive law of the audience. The design process of the model is a combination of theory and practice, concept and technology. Under the comprehensive guidance of the visual model technology system, the research work determines the development and operation environment of the model and the technical system to be followed, processes the information structure of the intangible cultural heritage content, designs the attribute database according to the intangible cultural heritage information attribute model in the previous paper, and finally designs the attribute database The realization of client visual display system is described in detail.

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