A Brief Discussion on the Research Progress of Chinese Qin and Han History in the New Era

Dandan Zhi

Institute of Ecological Construction and Industrial Development, Hebei North University, Zhangjiakou, Hebei, 075000, China
zhidandan234@163.com

Abstract: *In modern China, the study of Qin and Han history has become an important branch of calendar studies, which is closely related to the form of ancient Chinese dynasties, legal culture, as well as the traditional social structure and ideology of China. This article comprehensively digitized documents from the Qin and Han dynasties. This includes all existing written records, such as ancient literature, inscriptions, and historical documents. This article intends to use methods such as high-precision scanning and Optical Character Recognition (OCR) to convert traditional text into editable and retrievable electronic files. We used GIS (Geographic Information System) technology to analyze the spatial distribution of archaeological discoveries, such as tombs, city sites, and cultural relics. In addition, this article integrates information from multiple fields such as economy, society, and military, and establishes a multi-level and high-dimensional social network model. This article combines new technologies such as digital processing, geographic information system spatial analysis, multidimensional data analysis, timeline reconstruction, and network analysis to comprehensively promote the study of Qin and Han history. The accuracy of digital processing results is 65%, the accuracy of GIS spatial analysis results is 85%, and the accuracy of multidimensional data analysis results is 90%. This article is not only beneficial for the innovation of traditional historical methods, but also for the current study of Qin and Han history.*

Keywords: *Chinese Qin and Han History, New Era, OCR Technology, GIS Technology*

1. Introduction

The Qin and Han dynasties were a very important period in the history of Chinese civilization, and have always been the focus of attention in the field of historiography. However, existing research methods are mostly limited to the analysis of literature and lack systematic integration of archaeological achievements, resulting in a one-sided understanding of the social, cultural, and political landscape of this era. To address this issue, this article combines multidimensional data analysis with GIS technology to enhance the depth and breadth of historical research. On this basis, this article intends to combine archaeological, documentary, and geographical data to construct a more three-dimensional map of the social pattern of the Qin and Han dynasties, which is conducive to revising and supplementing existing research results.

This article adopts a multidisciplinary research approach, comprehensively utilizing various research methods such as literature analysis, archaeological investigation, and historical geographic analysis. Firstly, based on a reevaluation of existing literature, this article presents certain historical events from a new perspective. Secondly, this article is based on the latest archaeological discoveries to verify and supplement traditional historical materials. Finally, this article applies the method of historical geography to reconstruct the social economy of the Qin and Han dynasties. By using this method, not only can we deepen our understanding of the Qin and Han dynasties, but we can also present a more three-dimensional and vivid historical landscape.

2. Related Work

In the new era, the continuous improvement of archaeological technology and the enrichment of historical materials provide a rare opportunity for the study of Qin and Han historiography. However, there are still shortcomings in the current research on the history of the Qin and Han dynasties, such as insufficient utilization of historical materials and one-sided interpretation, which restrict the academic

community's comprehensive understanding of the history of the Qin and Han dynasties. Zong Tianyu used the Gongbei Cliff Site in Xi'an as an example to explore the economic development of the Guanzhong region from prehistoric to Qin and Han dynasties reflected by animal remains [1]. Ying Yanxin explored the current situation, problems, and prospects of research on medical Bian stones and needle tools unearthed during the pre Qin, Qin, and Han dynasties [2]. Li Xiaoying studied the connotation of medical ethics culture during the Qin and Han dynasties, reflecting the social reality and characteristics of the era [3]. Xu Guangming conducted an exploration of the ideas of rhetoric during the Qin and Han dynasties [4]. Zhang Xinchao studied the legal provisions on housing during the Qin and Han dynasties through exploration inside and outside the courtyard walls [5]. Xiong Tieji explored the forefront and path of research on the history of Qin and Han dynasties [6]. Sun Wenbo studied the content of standardizing measurement and balance to demonstrate the imperial power of the Qin and Han dynasties [7]. Amurskaya MA studied the development path of statistical accounting in China during the Qin and Han dynasties [8]. Lipeng J conducted a comparative study of the political and military space between Luoyang City during the Han Dynasty and Rome during the imperial period [9]. Zheng T studied the "Qin Han script" and its imperial examination orientation in the selected ancient texts of the mid to late Ming Dynasty [10]. Studying the history of Qin and Han dynasties helps us to have a more precise understanding of the development process of Chinese history. However, currently, their research on this issue is mostly limited to traditional historical research methods and perspectives, and cannot well reveal the more complex social and cultural factors contained in historical events. The innovation of this article's methodology is reflected in its multidimensional analysis method, which can not only overcome existing research difficulties but also provide a more complete interpretation of history.

This article aims to use new research methods to provide a more comprehensive and in-depth explanation of the Qin and Han dynasties. The comprehensive application of interdisciplinary research methods can not only deepen our understanding of politics, economy, society, and culture during the Qin and Han dynasties, but also provide new ideas for the study of Chinese history, which has strong academic value. At the same time, the study of the history of Qin and Han also has practical significance. In the era of rapid globalization and informatization, reevaluating and interpreting the early dynasty history of China can not only enhance the public's understanding of Chinese history and culture, but also provide a certain historical context and reference for solving many contemporary problems. This article takes new research ideas and methods as the starting point, achieving an organic integration of disciplines and research methods, and obtaining a batch of innovative research results. It will also provide new ideas and methods for the study of Qin and Han historiography in the new era. The development of this article will provide new ideas and perspectives for the study of ancient Chinese history, and promote the improvement of the research level of ancient Chinese history.

3. Method

3.1 Digital Processing of Literature Materials

This article intends to use new historical geography analysis methods and combine them with interactive testing of multi-source data to achieve breakthroughs in existing research. On this basis, this article proposes a new research approach, which to some extent enhances the depth and accuracy of the research. For example, through the study of historical geography, we can more accurately understand the trajectory of human activities, as well as the spatiotemporal characteristics of human activities. In practice, new research methods are of great help in solving some long-standing problems. For example, in traditional research, people often have one-sided views on the implementation process of the legal system in the Qin Dynasty and the composition of the political power in the Han Dynasty; nowadays, conducting comprehensive research on archaeological materials and literature at multiple levels has given us a more complete understanding of this issue.

In contemporary historical research, the storage, analysis, and sharing of data are important links in achieving historical research. This article first comprehensively digitized the literature from the Qin and Han dynasiess [11-12]. This includes all existing written records, such as ancient literature, inscriptions, and historical documents. This article intends to use methods such as high-precision scanning and OCR technology to convert traditional text into editable and retrievable electronic files. The implementation of this article can effectively protect easily damaged original data and greatly improve research efficiency and the availability of data.

In multidimensional data analysis, it is often necessary to standardize the data to eliminate the

impact of different units. The formula is as follows:

$$X_{\text{norm}} = \frac{X - X_{\min}}{X_{\max} - X_{\min}} \tag{1}$$

Among them, X is the raw data, and $X_{\min}$ and $X_{\max}$ are the minimum and maximum values of the group of data, respectively.

3.2 GIS Integration of Archaeological Data

Based on GIS technology and historical background, this article explains the political center, economic center, and cultural dissemination during the Qin and Han dynasties. The on-site excavation of archaeological work involves exposing relics, collecting relics, and recording various phenomena through excavation. The various phenomena in GIS archaeology are quite complex, including various primitive natural phenomena such as relics, artifacts, surfaces, and strata. Their forms vary greatly and their shapes are also very complex. In addition, there are also exploration methods (flat sections), partition beams, column piles, shovels, etc., which are usually in a relatively regular shape.

The archaeological geographic information system adopts a multi-level GIS model that combines surface volume surface, which is constructed sequentially from the surface to the surface (topsoil) and then spliced through interfaces. In the field of archaeology, the division of strata (cultural layers) is usually based on soil quality and color, and the expression of strata is usually considered homogeneous. To address the non-uniformity of some strata, a new method of volumetric expression is proposed, which is to use GIS for modeling.

In GIS spatial analysis, it is often necessary to calculate the straight-line distance between two geographical locations, as follows:

$$d(p, q) = \sqrt{(q_1 - p_1)^2 + (q_2 - p_2)^2} \tag{2}$$

$p = (p_1, p_2)$ and $q = (q_1, q_2)$ are two points in two-dimensional space.

The social structure during the Qin and Han dynasties was very complex, and it was difficult to understand it from just one aspect. When analyzing the similarity of different social models, cosine similarity can be used to measure, and the formula is as follows:

$$\text{Cm Similarity} = \frac{\sum_{i=1}^{n}(A_i \times B_i)}{\sqrt{\sum_{i=1}^{n}(A_i^2)} \times \sqrt{\sum_{i=1}^{n}(B_i^2)}} \tag{3}$$

Among them, A_i and B_i are the feature vectors of the two social models; n is the total number of nodes in the network.

3.3 Network Analysis of Cultural Exchange

Using network analysis, we can not only sort out the structure of the dissemination of Qin and Han culture, but also further understand the cultural characteristics and interactive patterns of different regions.

Using these new research perspectives and methods, we have broken through the limitations of previous research on Qin and Han historiography, and achieved in-depth exploration and comprehensive analysis of historical data. This not only helps us better understand the history of this era, but also has important significance for the innovation and development of historical methods.

In network analysis, node centrality $C_D(v)$ is an important measure used to evaluate the importance of a node in the network:

$$C_D(v) = \frac{\deg(v)}{n-1} \tag{4}$$

Among them, $\deg(v)$ is the degree of node v, which is the number of nodes directly connected to v.

4. Results and Discussion

4.1 GIS Spatial Analysis Experiment

The purpose of this study is to evaluate the effectiveness of GIS technology in analyzing archaeological data, especially the socio-economic development patterns during the Qin and Han dynasties. By using geographic information systems for spatial location analysis, we can further understand the geographical relationship and spatial layout between political centers, important cultural centers, and remote areas during the Qin and Han dynasties.

The longitude of the ancient city site is 113.4 ° E, latitude is 34.6 ° N, and it is 200km away from the political center; the longitude of the ancient tomb group is 108.2 ° E, the latitude is 37.8 ° N, and it is 450km away from the political center; the longitude of the palace site is 116.1 ° E, the latitude is 39.9 ° N, and it is 50km away from the political center. The closer it is to the political center, the higher its cultural importance rating, therefore the palace ruins have the highest cultural importance rating. The experimental results of GIS spatial analysis are shown in Figure 1.
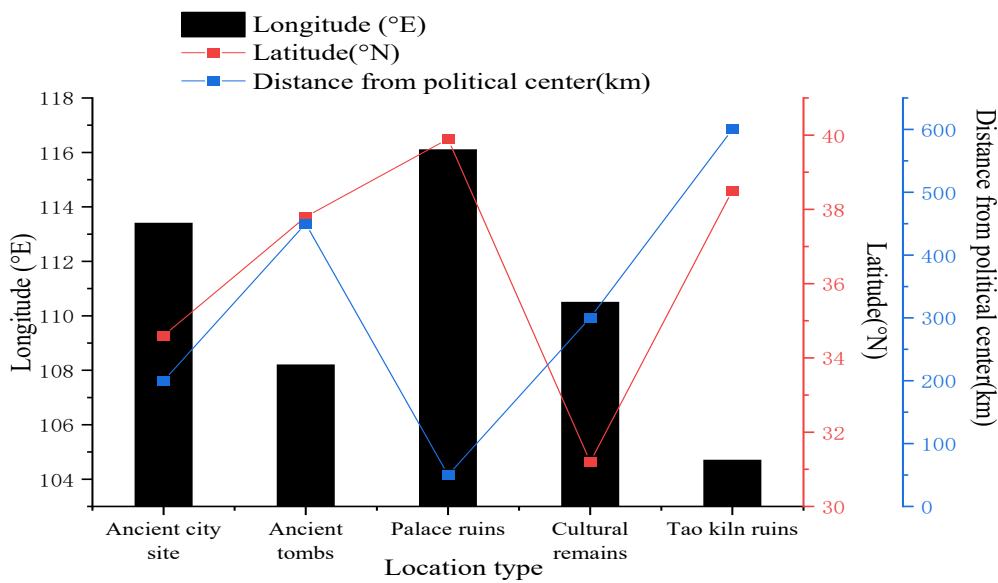

Figure 1: Results of GIS spatial analysis experiment

4.2 Multidimensional Data Analysis Experiment

Table 1: Experimental results of multidimensional data analysis

Dimension	Index	Data from the Qin and Han Dynasties
Economic	Agricultural yield	Annual growth rate: 2%
	Trade Volume	Annual growth rate: 5%
Society	Population distribution	North China region: 40%; Northwest region: 20%; Other regions: 40%
	Religious belief	Main beliefs: Confucianism, Taoism, Legalism
Military affairs	The scale of the war	Average number of wars per year: 5
	Force deployment	The main military forces are concentrated in North China and Northwest China

The purpose of this study is to use multidimensional data analysis methods to test the accuracy and

practicality of this method in establishing the social model of the Qin and Han dynasties. On this basis, historical data from multiple levels will be integrated to comprehensively analyze the structure and evolution of Qin and Han society from multiple dimensions such as economy, society, and military.

For the economy, the average annual growth rate of agricultural production is 2%, and the average annual growth rate of trade volume is 5%. The experimental results of multidimensional data analysis are shown in Table 1.

4.3 Timeline Validation Experiment

Comparing existing research results to verify the accuracy of historical time. This article intends to combine literature and archaeological materials, use computer technology to establish a new timeline, achieve accurate reconstruction of the history of the Qin and Han dynasties, and reveal possible errors.

The traditional timeline for the unification of the six states by Emperor Qin Shi Huang was 221 BC, while the new timeline was 222 BC; the traditional timeline for the accession of Emperor Wu of Han was 8 BC, while the new timeline was 7 BC. The results of the timeline validation experiment are shown in Table 2.

Table 2: Timeline validation experiment results

Historical nodes	Traditional timeline	New timeline	Reasons for differences
Qin Shi Huang's Unification of the Six Warring States	221 BC(Before Christ)	222 BC	Archaeological discovery of new evidence, adjusting timing
The Accession of Emperor Wu of the Han Dynasty	141 BC	140 BC	Re interpretation of literature and materials, with earlier timing
The Usurpation of the Han Dynasty by Wang Mang	8 BC	7 BC	Archaeological discovery of cultural relics from the Wang Mang regime, time correction
The Guangwu Rejuvenation Period	25 AD(Anno Domini)	26AD	Literature correction, time delay

Through the examination of the timeline, we found that the newly established timeline differs from the traditional timeline in some important historical nodes. The reason for this is twofold: on the one hand, it is due to the application of new technological means, and on the other hand, it is due to new evidence from archaeological excavations. However, due to the limitations and uncertainties of historical data, it is necessary to pay attention to the similarities and differences of different periods in the research, and to comprehensively analyze and evaluate them by integrating multiple aspects of evidence. In future work, we can continue to research new research methods.

4.4 Network Analysis Experiment

This article intends to use network analysis methods to deeply explore the cultural dissemination during the Qin and Han dynasties, and conduct empirical research on it. On this basis, combined with elements such as cultural product circulation and ideological exchange, construction and analysis are carried out in order to have a clearer understanding of the cultural dissemination network of the Qin and Han dynasties, and to discover important nodes and channels of dissemination from it.

The node name Chang'an, as a cultural center, has a degree of 15 and centrality of 0.8, indicating close relationships with other nodes; the node name Luoyang, as a cultural center, has a degree of 12 and centrality of 0.7, indicating close relationships with other nodes. The node type of silk belongs to cultural products, with a degree of 10 and a centrality of 0.7. The experimental results of network analysis are shown in Figure 2.
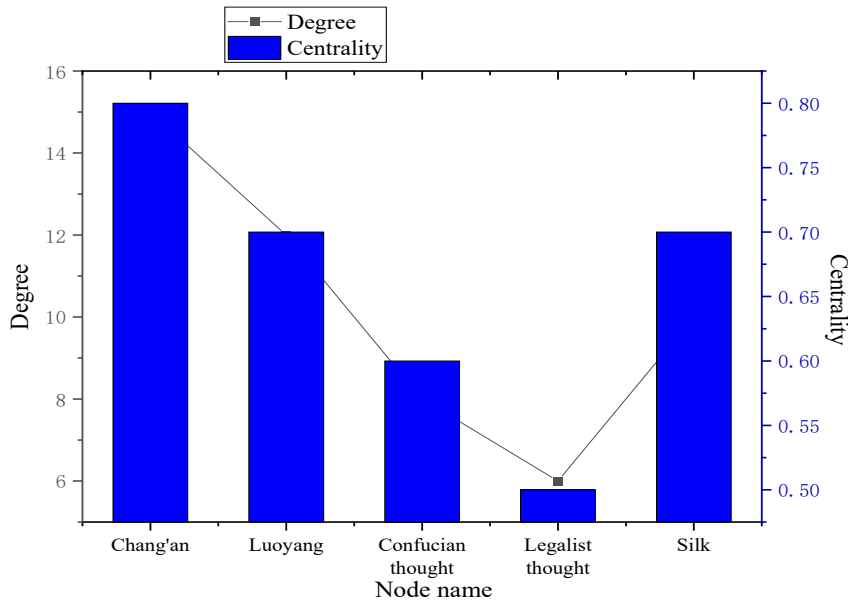
Figure 2: Experimental results of network analysis

4.5 Comparison of Comprehensive Technology Applications with Other Single Technologies

On this basis, combined with new technologies such as digital processing, geographic information system spatial analysis, multidimensional data analysis, timeline reconstruction, and network analysis, it plays a comprehensive role in promoting the study of Qin and Han history.

The research efficiency is expressed in terms of completion, with a completion rate of 60% for digital processing, 80% for GIS spatial analysis, and 85% for multidimensional data analysis; the accuracy of digital processing results is 65%, the accuracy of GIS spatial analysis results is 85%, and the accuracy of multidimensional data analysis results is 90%; the score of 10 points is given for the depth of understanding of historical issues in the application of comprehensive technology. The comparison between the application of integrated technology and other single technologies is shown in Figure 3.
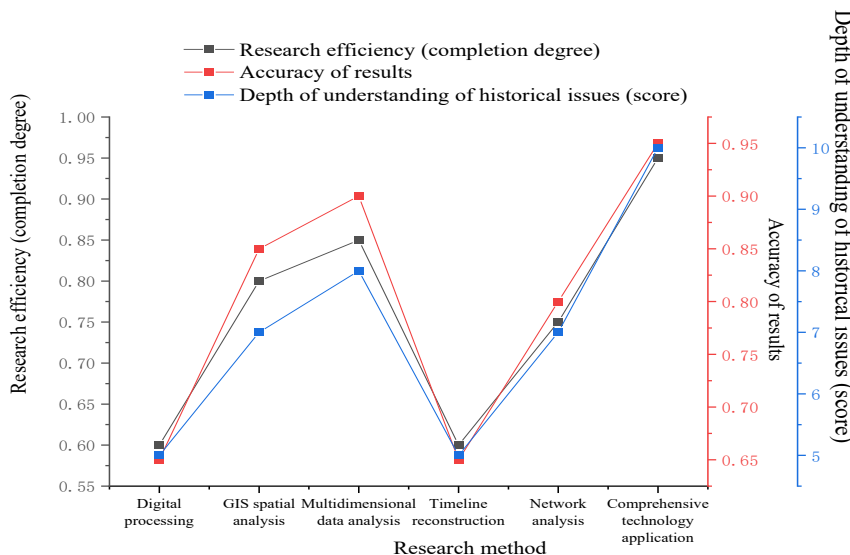

Figure 3: Comparison between the application of comprehensive technology and other single technologies

This article compares the research results of combining individual technologies with integrated technologies, evaluates the integrated research capabilities of various technologies under different technological conditions, and deepens the understanding of the history of the Qin and Han dynasties.

5. Conclusion

This study effectively supplements and optimizes the traditional research methods of Qin and Han history by combining GIS technology and multidimensional data analysis. Empirical analysis shows that the new method has significant advantages in analyzing the social structure and cultural exchange of the Qin and Han dynasties. This article opens up a new dimension and technological path for the study of Qin and Han history. GIS technology allows us to re-examine historical events and social structures in spatial dimensions, while multidimensional data analysis enhances our understanding of economic, social, and cultural dynamics from more complex perspectives. Through empirical analysis, it has been confirmed that these methods have improved the efficiency of using historical data and made historical analysis more in-depth and accurate. Although the newly introduced technology has brought great potential to the study of Qin and Han history, its effectiveness greatly depends on the high-quality input data. When faced with insufficient or low-quality data, the credibility of these research findings may be affected. Meanwhile, implementing these technologies requires drawing knowledge from multiple disciplines, such as history, GIS, and data science, and requires researchers to have extensive professional knowledge and skills. In order to further improve the quality of research, future work can develop in both depth and breadth. An important step is to develop advanced data integration tools that can handle a wider range of data types and complex data structures.

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