Research on Toponym Culture Excavating and Spatial Distribution Visualizing of Chinese Poetry—Take'Frontier-Jiangnan'Poetry as an Example

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Abstract: Based on the classification of thematic poems and taken space information as the research angle, this paper analyses the toponyms contained in the poetry data and carries on the excavation of culture connotation. The spatial distribution of toponyms is analyzed by the research method of designing the database of thematic poems and establishing the visualization platform, this paper analyses the cultural connotation of the toponyms in the poetry of 'Frontier' and 'Jiangnan', which are important representatives of ancient Chinese poetry, and show the spatial distribution of toponyms in the poetry of Frontier-Jiangnan, at the same time, the influence factors of the spatial patterns of the two kinds of poems are analyzed.

1. Introduction

The current study of poetry used to pay more attention to the time dimension, but in the spatial dimension of poetry text often contains a variety of meanings given by the authors. The toponym described in the poetry imply the aesthetic judgment and preference of the creators, as well as their pursuit and hope for creation. For scholars who study poetry, the culture of toponym in poetry can excavate more valuable connotations such as regional culture, political center, gathering point and transfer of cultural center, etc. This study utilizes data analysis and information science to conduct quantitative analysis by amounts of data of the toponym in 'frontier' and 'Jiangnan' poetry.

2. The collecting and integrating of place names and thematic poems

All the poetry data source of our project can be dated from the poems in Complete Tang Poems, Complete Song Poems, and Complete Song-Ci. Among them, Complete Tang Poems is the largest existing collection of poetry which contains a total of 900 volumes and more than 48,900 poems in all. While Complete Song Poems contains 72 volumes of poems and express some different themes and emotions compared to those in tang dynasty. Through the acquisition of the literature resource mentioned above, we collect the information of nearly 14,000ancient poets in the tang and song dynasties, 1564 ci-writers in the song dynasty, 55,000 tang poems, 260,000 song-ci and 21,000song poems.

As for the integrating process of thematic poetry,we design the keyword set iteration method to search and classify poems with toponyms contained in the database and to enrich the keyword set of toponym during the iteration process.In this way,the thematic poems can be selected systematically from the poetry database and the list of geographic names can be expanded thus the integrity and comprehensiveness of the data source the research based on can be promised.

3. Construction of "Frontier-Jiangnan Poetry Database

The paper used the method of iteration for keyword, Integrating and collecting poems containing

frontier fortress toponyms and Jiangnan toponyms. In the database, the E-R model based on database design method to complete the conceptual design of the system database and logic design. On the basis of fully considering the content and subject matter of ancient poetry and combining with the toponym or toponym image embodied in its poetry, three attribute tables are designed in the attribute database: toponym table of thematic poetry(include main fields as ancient toponyms,current toponyms and provinces information and latitude&longitude), information table of thematic poetry and author information table. The construction of database can provide a solid foundation for the visualization platform.

The relationship between the toponym table of thematic poetry, information table of thematic poetry and author information table can be shown in the figure below, which displays the connection of time and space.
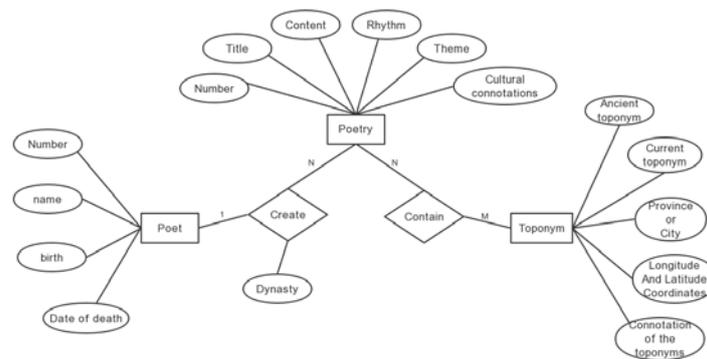

Fig.1. E-R of the three entities

4. Toponyms Cultural Connotation Excavation

4.1 Toponyms cultural connotation inference model based on image keyword

Since the motivation, style, or any external conditions or emotional color of the poet, poetry can all be endowed with unique connotation, there is possibility of interaction between the connotation of the poems and the toponyms, like a poet expresses the connotation of a poem by describing the customs of a certain place, which may either express the sadness of dying or express the ambition of serving the country. In this case, the connotation of the poem can be assigned to the toponyms and form part of the culture of the toponyms. The following figure shows the construction idea of this model:
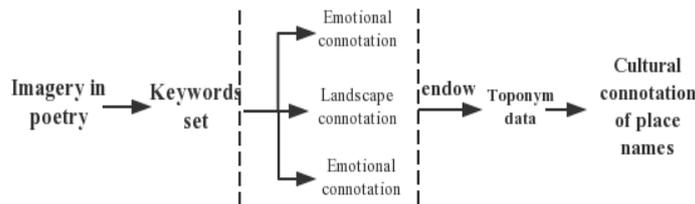
Fig.2. Structure of toponym cultural connotation

Taking frontier poetry as an example, a keyword list of poetry image can be constructed.

Table I Image of frontier poetry

Connatation	Images
war&garrison	JiaogongQigu, Tieji, Zhengren, Jiangjun, Jingu, Jingqi, Xiaogu, Hujia, Jiao
frontier scenery	Bianting, Fenghuo, Husha, Shuofeng, Saiyun, Luori, Qiuyue, Xueshan, Damo, Gucheng
foreign culture	Huqin, Pipa, Qiangdi, Putao, Huren, Luguan
farewell&yearn	Song, Bie, Si

By using this table, we can search the poetry with image keywords in the poetry database, so we can endow the poetry with corresponding images which have the connotation of 'war&garrison' and endow these connotations with the descriptive toponyms in these poetry according to the toponyms contained in the poetry. The connotation of a toponyms are not only given by a poem, but also established on the condition that the toponyms have a certain number of poems with the same connotation, so as to exclude the contingency and obtain more reliable results.

4.2 Application and Summary of Toponym Cultural Connotation Excavation

Different toponyms are extracted from the selected poem records, and their distribution in the thematic connotative poems is statistically analyzed. Because of the different degree of spread and application of different toponym, each toponym is mentioned in the poetry with different frequency of magnitude. To calculate the percentage of the times of the toponyms mentioned in the poems on different topics to the total times of the toponyms mentioned, as the important basis to infer the cultural connotation. Two connotations with high percentage of matching toponyms are selected as representative connotations. If there are two connotations with equal percentages or less than 5% of the difference, both are selected as representative connotations.

By ranking the percentage of toponyms within each cultural connotation, the representative toponyms are obtained. The statistical results are shown.

Table II Partial statistics on the ranking of the percentage of toponyms within each connotation

toponym	war& garrison	frontier scenery	foreign culture	farewell& yearn	no.	war& garrison	frontier scenery	foreign culture	farewell& yearn
Yangguan	29.41%	19.61%	1.96%	49.02%	1	Yuyang	Xiaoguan	Liangzhou	Xizhou
Guanshan	38.89%	25.93%	7.41%	27.78%	2	Yuguan	Jibei	Yumen	Yangguan
Yinshan	42.22%	21.11%	11.11%	25.56%	3	Yanran	Yumen	Luntai	Shuofang
Yanran	52.31%	16.92%	0.00%	30.77%	4	Longtou	Yuguan	Yinshan	Longtou
Tianshan	48.33%	25.00%	6.67%	20.00%	5	Tianshan	Guanshan	Jiaohe	Xiaoguan
Mayi	37.50%	21.43%	8.93%	32.14%	6	Yunzhong	Tianshan	Mayi	Yunzhong

The statistical results show that each connotation has its representative toponyms. For example in the connotation of 'war&garrison', the larger percentage of toponyms is Yangguan, Yuguan and so on. *'Foreign cavalry coming in from Jiluo mountains, beacon smoke rising from the garrison at Yuyang'* and *'Courser galloping near the frontier fortress, Yumen pass has been closed tightly* 'can be found in the poem *Going to Join the Army* written by Tang dynasty poet Li Aang. According to historical facts, the separatist regimes of Turkic people and Khitan people in the Tang dynasty invaded the present-day Hebei region. Yuyang was one of several military units set up by the Tang government, and Yumen was an important pass linking the western regions. So they are considered to be representative of the garrisons.

5. Visualization analysis of geographical toponyms distribution of poetry

5.1 Construction of visualization platform for poetry and toponyms

The establishment of the visualization platform provides a reliable basis for the spatial pattern analysis of frontier fortress and Jiangnan poetry and toponyms. In addition the extension function will be added to provide more relevant researchers with help in the future, and the platform can even be put into simple teaching use.

This platform is developed with Java programming language and accessed through the websites. In order to assist our research and meet the needs of more users, it has functions like searching poetry and toponyms, map display and basic data analysis.

The design of user interface aims to provide intuitive and convenient operation. The culture of poetry and toponyms is mainly for scholars to use, and also to meet the browsing and learning needs of ordinary users.

From the map of the Tang dynasty, the toponyms mentioned in frontier poetry can be shown.

Each of the toponym point are linked to corresponding detailed information about the toponyms and poetry.

Fig.3. System home page and Visualization of frontier poetry in Tang dynasty

5.2 The visualization of toponym frequency statistics

In order to know the distribution of thematic poems, the statistics of the number of each type of poetry is used to make the hierarchical statistical graph based on the visualization platform result (Fig.6.) to show the spatial mode of number of the thematic poetry. 105 frontier toponyms belong to 13 province and 39 Jiangnan toponyms belong to 6 province are marked out in the order of magnitude. In this way the quantity distribution of the frontier and Jiangnan area is generated.

Fig.4. The hierarchical statistical map of frontier and Jiangnan toponyms

In general, the distribution of frontier and Jiangnan poetry present the spatial distribution feature that the frontier region with a pattern of linear dispersion while the Jiangnan region with a pattern of symmetric gathering' which can vividly reflects the contrast between the wide range distribution of frontier poetry and the local aggregation of Jiangnan poetry. The linear dispersive distribution pattern of the frontier poetry mainly reflects in the line composed of "tianshan - xizhou - yuguan - yangguan - mayi - yinshan"and a sporadic point called guanshan.The area with the line "tianshan - xizhou - yuguan - yangguan - mayi - yinshan" included,there are a total of 513 frontier poems with toponyms.And in guanshan,as a separate scattered point,contains 145 frontier poems.

The symmetrical spatial distribution pattern of Jiangnan area is completely different for the scope of toponym in Jiangnan is significantly smaller compared to the frontier area and also due to local aggregation. The majority of Jiangnan poetry are in Jiangsu, Zhejiang, Hunan province. Symmetry is mainly reflected in the symmetrical distribution between the 'wuling - dongting - xiaoxiang – xiangjiang' cluster and 'jinling - taihu - xihu – kuaiji' cluster with a center point called yuzhang. Among them, the gathering area of 'wuling - dongting - xiaoxiang – xiangjiang' contains 4,052 Jiangnan poems, and the gathering area of 'jinling - taihu - xihu – kuaiji' contains 5,266 ones.

5.3 Factors Influencing the Spatial Pattern of Toponym in 'Frontier-Jiangnan'Poetry

5.3.1 Geographical factors

The toponym in the frontier poetry are mainly distributed in the hinterland of northwest China and parts of north China. Because of the arid climate in the hinterland and the limitation of water source, the residential area and the city are usually distributed as a dot or a belt, which results in the dispersion of toponym in the frontier poetry. In contrast, Jiangnan poetry is mainly located in the middle and lower Yangtze River. The river network is closely spaced across the plain, the terrain is flat and the climate is pleasant, resulting in the accumulation of Jiangnan poetry.

5.3.2 Historical factors

Since the Qin and Han dynasties, the surrounding ethnic minorities have formed independent governments and the war in the north frontier continued to break out. In particular, the border situation deteriorated during Emperor Tanggaozong Times. Beiting(present-day Xinjiang Jimsar County), Shuofang(present-day Ningxia Lingwu) and other places as important military towns, while Yumen(present-day Gansu Dunhuang), Yanmen(present-day Shanxi Daixian County) and other passes as a transportation gateway. The rise of Jiangnan poetry is closely related to the prosperity of Jiangnan Culture and the transfer of economic center. Especially by the Song dynasty, the southern economy had completely overtaken the northern region. With the simulation of economy,the private schools flourished and the town develped so scholars and families gathered in places like Hangzhou. In this case, comparitively developed cities and towns form poles and are more concentrated in distribution.

6. Conclusion

This paper complete the construction of thematic poetry database and realize the geographic names' connotation mining so that the research on thematic Chinese ancient poems and toponym connotation can be combined and a more comprehensive and novel-angle conclusion can be reached. In addition, with the toponym cultural connotation and other attributes in the thematic poetry database, the information about the thematic poems except the spatial distribution pattern of toponym can also be display completely. In this way, the spatial distribution pattern of frontier and Jiangnan toponym can be combined with other information about the poems so that the base of some more comprehensive research on the geographical literature contents can be provided to the experts for further study.

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