

# The Construction of the Chinese Gazetteer Information System: The Integration Application of Authority Control, Gazetteer and GIS

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## Abstract

*Discussions of administrative place names in China involve spatial-temporal transitions through the past dynasties. These place names are mirrors of specific political, economical, and social attributes of each time. As time passes by and the environment changes, an understanding of administrative place names is helpful in contextualizing historical knowledge. Therefore, to reflect the reality of historical records, history researchers demand an integrated information system of temporal axis and spatial axis.*

*For a long time, major developments of geographic information in Library Information Science have been in gazetteer, geographical headings and authority control. Scholars mainly focus on the temporal sequence, and the description of properties and attributes of place names. But the spatial concepts and spatial-temporal definition are often disregarded. The recent tendency of Geographic Information Science is toward the development of GIS techniques, which focuses on presenting the spatial concept of a specific period, as the temporal sequence and analysis of place names' characteristics and attributes are still omitted.*

*This paper, from the perspectives of these three disciplines, intends to integrate the demands, disposal and application of the Chinese gazetteer information system. First of all, to utilize from the metadata of the place names, we would like to discuss the practicable model, which acts to organize and systemize the four-dimension variable structure (4D structure) of the administrative place names in China. At the same time, the application of GIS techniques can provide users with integration mechanism of gazetteer and thesaurus. With the combination of real images, type-drawings and orientation, we can establish a plural Gazetteer Information System. The Second key subject of this paper focuses on the development of the Gazetteer Information System, such as the catalog system of place names, the metadata of maps, and the map-text integrated searching system. And the last, We think further about these three disciplines intergrations.*

## I. The Study and Framework of the Chinese Gazetteer Information System

### Introduction

Gazetteer has played an important role in the history study. Through the information of place names, the historians are guided to organize, discover and clarify the context of historical knowledge.

For a long time, the development of library and geography information technology seems insufficient for the demand of history study. But with further cooperation, the history study and the development of library and geography information technology are complementary with each other. Therefore, in this article, we will focus on the differentiation of Chinese gazetteer. Secondly, we will integrate the organization of gazetteer in the library information science with the development trend of geography information technology, and the effective demand from the history researchers. Thirdly, we will discuss the feasible model of the gazetteer system and the practical problem of the establishment of the system. Finally, we will discover the possibility of the integration application of multi-organization technology in the gazetteer information.

The meaning of gazetteer is the common language code, which is agreed by people with the specific direction, range and fixed feature of the area. Gazetteer is also a visual cognition of the surroundings around human beings. Between different languages, places, eras and behavior characteristics, the naming method that people adopt will also be varied.<sup>[1]</sup> Therefore, we have to realize that the information content of every place name is multi-attributed. In the case of history study of China, we also need to confess that it is a great challenge to establish the systematic geography information model because of the huge dimensionality and the long history of China. In this study, the human geography will be applied as our major point of view, and the scope of discussion will be focused on the political geography.<sup>[2]</sup> The political geography will be used to define the Chinese Gazetteer and distinguish the district of China.<sup>[3]</sup> Our goal is trying to trace back the context and attribute of Chinese Gazetteer of the Ming and Qing dynasty from the current district of Modern China.

In the first part of the article, the library information science, geographical information science and history study, which are

related to the place name, will be integrated and combined together. The demand, processing and application of the different three academic fields will be inspected carefully. The discussion will lead us to the possible and practical geographic information system model of establishment. Hence, from the view of information organization, we will deal with the issue of the gazetteer information metadata study and the application for the current geography information system. Through this effort, we may establish the backbone of the Chinese gazetteer information system. In the second part of the article, we will start from the framework we have established. The technology of spatial coordinates and computation maps of geography information science, will be applied in this discussion. The operation technology and the relational database will be combined together to make use of the development of the practical information system. With the cogitation, we look forward to the Chinese gazetteer information system with spatial-temporal context and multiple applicable functions.

### The Analysis of Gazetteer Information

The Physical geography and human geography are the two major productions of the geographical research development.<sup>[4]</sup> The name of a place, depending on its attribute and content information, can be divided into physical or human place name. Since the original intention and the evolvement of a place name are influenced by the both surrounding and the transition of human factors,<sup>[5]</sup> the environmental meaning of a place name can be subdivided in the below two categories from the view of the toponymy:

1. Physical place name: mainly named after the environment, such like the topography or hydrology. Examples of the physical place name are mountain, river, basin, hill, and plain.

2. Human place name: mainly subdivided into two different modes-  
(1) Physical factor  
(2) Human factor

From the view point of history evolvement, we notice that the naming of place names may not adopt singular principle. The change of natural or human environment can be the factor of the variation of place names. Under the interaction of these multi-principles, the place names are not always in complete accord with the official version of the administration compartment. Many place names are only the local or popular names, and the misunderstanding of the place names when the exploration was conducted by the government are also inclusive.

Besides the principles above-mentioned in the article, if we intend to launch the research in connection with the place names from the view of political geography, the following points should be also consider:

1. The nation divides its territory into different areas vertically in order to satisfy the demand of administration management. The administration district is the production of this goal. These vertical administration districts are governed by the nation and have its own distinction between responsibility and accountability.

2. The factors of administration district are dimensionality, boundary, shape, geographic area, and geographic location. The dimensionality and boundary are the most important two factors

above all.

3. When the authority of nation or the administration management frame changed, the government would harmony with the new administration management framework and to make the territory information plan once more to improve the effective management.<sup>[6]</sup>

4. Even the district is conducted by the administration management frame, but it also conditioned by development of economics and population. The balance of resource is considered as well in the administration district plan. As we take administration district as an academic topic, it is a comprehensive scientific issue and is related closely to geography, statistics, hypsography, sociology, politics, law, economics, sociology, folklore and history.<sup>[7]</sup>

According to the above points, we may generalize the variation attributes of political geography place name information:

1. The variability of name term: The multiple name principles, language and administration account for the variability of name term.

2. The variability of subordination (relation change): The administration district features are accountable for the variability of subordination. This kind of subordination is affected by the change of administration management frame.

3. The variability of vertical frame (spontaneous change): the variability of vertical frame also arises from the administration district, mainly affected by the economical and population change from the interior of the district.

4. The variability of dimensionality: the administration features are accountable for the variability of dimensionality. Boundary, shape, geographic area and geographic position are inclusive.

### The Metadata of Gazetteer Information

Respecting the massive geographic production related to the development of geographic information system, the researchers of geographic information field have found that the users of information system face the problem of controlling and do not knowing how to master and apply the current data. Therefore, the researchers have advanced the concept of metadata to improve the understanding and management of the existing information system.<sup>[8]</sup> Then, the researchers integrate the development of library information organization for a long time, to promote the concept of authority control for the purpose of information retrieval. Furthermore, the researchers would also inspect the organization and management of gazetteer information and the concept of metadata has become the necessary theoretic framework for the establishment of the place name information. The metadata of gazetteer information combine the conceptual and structural theory of geographic information science, library information science, and the users' view points toward the new gazetteer information. Through the developing and researching of the place name metadata, we have referred to the following international standards:

1. The Gazetteer metadata - ADL(The Alexandria Digital Library Gazetteer Content Standard(ADL GCS))<sup>[9]</sup>; and we also integrate other metadata(ADL Feature Type Thesaurus).<sup>[10]</sup>

2. Digitalized gazetteer metadata - CSDGM([Content Standards for Digital Geospatial Metadata \(CSDGM\)](#))<sup>[11]</sup>

3. Integrated authority metadata - MARC21<sup>[12]</sup>
4. International standard - ISO 19115:2003 Geographic information– Metadata<sup>[13]</sup>

Metadata, used for describing the information content, quality, state and other features of the data, has three major functions: To organize and maintain the information, to offer the catalogue of data and help analyze the data, to provide the information to assist the transfer of data. Metadata aid users divide and understand the data. Additionally, through the metadata, the owner and organizer of the data can convey the definition and analysis of the data to the users. With the complete metadata, the information and knowledge can be transmitted to the academics and public.<sup>[14]</sup>

We may generalize the feature of each metadata form:

ADL GCS: It is a metadata designed for any place name. The goal of ADL GCS is to develop the complete Gazetteer.

CSDGM: It is a metadata designed for the preserved geographic information which exists in a tangible form. The goal of CSDGM is to develop the searching tool for the geographic information.

MARC21: It is a metadata designed as the searching tool for the gazetteer. The goal of MARC21 is to proceed with the authority control.

ISO 19115:2003: It is a general and limitless metadata and can be applied for any kind of geographic information. ISO 19115:2003 can be the referential standard and the base for the development of the specific purpose.

Therefore, before we protocol the place name information metadata, the purposes of development should be defined first. What is the main use of the metadata and what kind of transmitted purpose can be expected? For example, the target and the range of the metadata are needed to be clarified. The target of the place name information metadata is the object which is going to be described and classified. The object could be a real item such like map, or the concept as place name and terrain. The range is the content of the metadata. It could be the collections which are preserved by the museums, an area, a country, the entire world or the specific field.

As we research the international standard metadata models which are in common use by the academics, we may conclude that no matter what purpose of the metadata is, the description of the geographic information is the main content of the metadata. In other words, place names, as the description of the geographic terms are the basic but the most important part of the metadata. The relationship or the combination of the temporal or spatial factors can be presented in name terms or systems among different times. This kind of relationship or the combination also can be the change of the geographic area. The scholars spare no efforts to establish the related models of “concept-place name”, “concrete-space”, “change-time” through the redaction of metadata. With these effort, every aspect of geographic information can be required by the users and satisfy the user’s demand.

### The Analysis of Chinese Gazetteer Information

In this study, we would like to define the Chinese gazetteer. The Chinese gazetteer is defined as the place names which are marked in the Chinese language and characters, and the place

names are also the administration districts which are constantly identified and divided by the nation in all the past dynasties of the Chinese history. With this understanding of our research, we may analyze the features of Chinese gazetteer as the following:

1. The Chinese gazetteer are given and identified by the Chinese over a long period of time.
2. The history of Chinese gazetteer has already continued from the early stage of Chinese history to the present time.
3. The spatial range of the Chinese gazetteer is developed in the political border of the Chinese dynasties.
4. The Chinese gazetteer is the administration district of the Chinese nation.
5. The Chinese gazetteer is created and used in the Chinese language and characters.

Therefore, in this section, we intend to analyze the Chinese gazetteer information with the following three levels:

- 1.The question of gazetteer(Temporal and Spatial factors)
- 2.The question of administration district (categories)
- 3.The question of Chinese administration place names (From the Qing dynasty to the present) (multi-factors-temporal and spatial factors; categories.)

In the aspect of categories, the Chinese administration place name is restricted. The most important factors of the Chinese administration place name are the time and space. China possesses a long history and the change of dynasties happened in an hourly frequency. In the aspect of temporal factor, the first question that we may notice is the alteration of dynasties’ territories, division of administration districts and the administration systems. But we also find out that the cases of the continuation of the administration place name. Hence, we notice that the evolution of the administration place name is traceable. In the aspect of spatial factor, the most common questions are the change of the country’s territory and the alteration of the administration district’s border. If we take the dynasty as the standard to divide the evolution of administration district, the most obvious point of the division of administration district is the change of the administration district system. Chen Rui-Ling has categorized *the history table of Chinese administration district classification* in her master academic dissertation.<sup>[15]</sup> According to Chen’s point, from Chin dynasty to the present, the Chinese administration systems were divided into 4 classes during the most time of the Chinese history. Every dynasty’s administration district shared the common points, but the differences also existed. In our research, we take the time as the standard instead of the dynasty, in order to analyze the Chinese administration place name as careful as possible. In the preface of *the Evolution of the Administration District of the Ching Dynasty*, edited by Niou Ping-Han, and the author points out:

*The Qing dynasty was the last feudal dynasty of the Chinese history. The dynasty has lasted more than 260 years and been ruled by 10 generations of the Manchu royal family. The early stage of the Qing dynasty, especially the regime of the Kang Xi, Yong Zheng, and Qian Long, the Manchurians’ nation conquered the northern, northwestern, and southwestern frontier of China. The expansion of this era has settled the broad territory which was formed and developed since several millenniums ago. In this feudal and united country which was composed of multi-ethnic groups, different*

ethnic groups communicated , support with each other, and established closer relationship in political, economical and cultural aspects. This history affected modern China in every level of society. The great change of Qing dynasty's administration district system was the result of the unique history background.<sup>[16]</sup>

Therefore, in this article, we will focus on the time range from the Qing dynasty to the present time specifically and analyze the

Chinese administration place name of this stage. We will also take time as our standard for the analysis of the information evolution of Chinese administration place name. The following two aspects will be used to analyze the information evolution of Chinese administration place name:

- (1) The administration systems

**Table 1 : The administration systems**

Dynasty		First class	Second class	Third class	Fourth class	notes
Qing	Class name	Province	Prefecture	County	The town or village under the county level	1.The administration system of Ching dynasty is in accordance with Niou Ping-Han's <i>the Evolution of the Administration District of the Ching Dynasty</i> . 2.The Dao class is a censorial institute more than a administration institute. 3.Because of lack of historical materials, the administration of Tibet's Chinese administration is remained unclear. <sup>[17]</sup>
	Administration division unit	Province General Before the Feng-tian, Ji-lin, and Heilong Jiang provinces are established in 1906 General Before the Xinjiang province was established in 1884. General The tribes of Khalkha Mongol The minister of handling affair Qinghai, Tibet and Altai region	Prefecture Direct-controlled state Direct-controlled vice Nauarchia Before the establishment of Fengtian, Jilin and Heilong Jiang province in 1906 councilor Before the Xinjiang province was established in 1884. Provincial Tusi (Yunan province) Frontier and military guard office (directly subordinate to the Dusi) Tribes (Counselor Minister) The tribes of Khalkha Mongol The leagues and banners of Inner Mongolia) the five tribes of Qinghai	County State Ting City guard officer Before the Feng-tian, Ji-lin, and Heilong Jiang provinces are established in 1906 Tusi (Yunan province) Committee, directorate, Tun (In the southern Sichuan) Military guard office Banner The tribes of Khalkha Mongol The Banner of Inner Mongolia Banner (Qinghai) Tibetan Tusi		
The early republic era	Class name	Province	Dao	County		Before the R.O.C.'s constitution was enacted. <sup>[18]</sup>
	Administration unit	Province	Dao	County		
The wartime period.	Class name	Province	County	rural Township		Between the enactment of R.O.C.'s constitution to the establishment of People's Republic of China in 1949. <sup>[19]</sup>
	Administration unit	Province Region Direct controlled municipality Special Administrative Region	County (province) Provincial city (province) Province controlled city (province) Arrangement bureau Administration bureau (province) League and banner League and banner District (direct	County controlled city Urban township Rural township District		

Dynasty		First class	Second class	Third class	Fourth class	notes
			controlled city)			
The People's Republic of China	Class name	Province	Prefecture	County	rural township	The PRC' administration division is accordance with <i>The Brief Volume of the Administraion district division of the Republic of China 2002.</i> <sup>[20]</sup>
	Administration unit	Direct controlled municipality Province Autonomous areas Special Administrative Region	Prefecture-level city Prefecture Autonomous prefectures League	District County-level city County Autonomous county banner Autonomous banner Special district Forest district	County-level district Urban township Rural township Autonomous township Subdistrict	
The Republic of China, Taiwan	Class name	Province	County	Rural township class		The administration division of Taiwan is accordance with the ROC government. The administration division during the Japanese colonization period is based on the historical materials.
	Administration unit	Province Direct controlled municipality	County -provincial city District(Direct controlled municipality)	Rural township Urban town County- level city		

(2)The administration place name

The Chinese administration place names own a long history. The temporal and spatial change of the administration place names are as the following: (most examples are chosen from the Qing dynasty)

A. Rename: The Tatung prefecture of Shanxi province was renamed as Yangho in 1648, and was renamed as Tatung again in 1651.

B. Re-subordinate: Xin County was subordinate to the Taiyuan prefecture of Shanxi province originally. The county was subordinate to the Baode direct controlled state of Shanxi province in 1724 and re-subordinated to the Taiyuan prefecture in 1730.

C. Elevation of status: Guhuai town was elevated to Pingyu County in 1851.

D. Establishment (birth): In 1725, the government established the Shuoping prefecture which governed Zuoyun county, Pinglu county. At the same time, Shuo state, Yoyu County(established after the Yoyu wei was dissolved), Mayi county(was dissolved and merged into Shuo state in June, 1801) was subordinated to the Shuoping prefecture from Tatung prefecture.

E. The change of territory: As the example we just mentioned, the Tatung prefecture was smaller because of the change of subordination.

F. Disappearance (Death): Mayi County was dissolved and merged into Shuo state in 1801.

G. Homonym: In the early Ching dynasty, the Dinghai County was subordinated to Ningbuo prefecture, Zhejiang province. In 1687, Dinghai County was renamed as Jenhai county. A new Dinghai county was established in the Zhoushan islands.

H. Synonym: the Tatung prefecture of Shanxi province was renamed as Yangho prefecture in 1648.

To sum up, the Chinese administration place name can be compressed into four dimension changing structure as the following:

1. The change of place name: The same place bears plural terms (like administration place name, abbreviation, folk name, alternative name, etc.) at the same time.

2. The change of time: The same place bears different terms at different time.

3. The change of territory: The territory of the same place changes as the time goes by.

4. The change of subordination: The same place is subordinated into different administration district. The vicerealty of a specific district may change. Even the administration district itself may be promoted or adjusted.

To summarize briefly, no matter the Gazetteer, Authority control, or the GIS, the establishment of the place name information systems has three different demands:

1. Simple demand: Only the change of place name is needed.

2. Detailed demand: The change of place name, the change of time, and the change of subordination are needed.

3. Complex demand: The change of place name, the change of time, the change of territory and the change of subordination are needed.

### The Research and Redaction of the Metadata of Chinese Gazetteer

When we integrate, analyze, and redact the metadata of the Chinese gazetteer, our first consideration is to satisfy the goals, purposes and demands. The goals which are related to the redaction of metadata are the following: To confirm the system model which lays a foundation of the integration of time and space; to integrate and combine the informational demand and knowledge from geography, humanity and social science and the library information science; to satisfy the users' channel. In the aspect of purposes: to ask the establishment of the Chinese gazetteer information clearly, to integrate the gazetteer and authority control, and to apply the GIS technique. In the aspect of demand, we look forward satisfying the four dimension of changing structure of Chinese administration place name

information: the change of place name, time, territory and subordination. Therefore, the metadata of Chinese gazetteer shall include the complete historical evolution, context, analysis, related information, the complete contents or attributes of a specific place of any time period, the territory of a specific place of any time period. Furthermore, according to the structure and contents of database, we may compress the image layers of different Chinese administration systems of every time period.

The redaction of Chinese gazetteer metadata shall be guided by the following four principles:

1. The relational database structure: Because the temporal factor has to be included in the analysis of Chinese gazetteer information and the relationship between the attributes are complex and intricate. Therefore, the application of relative database and taking gazetteer and the attributes as the subject of the database. Furthermore, we may relate the temporal axis and administration system in a regular method. Through these efforts, we may compose these factors as the relative database of Chinese gazetteer.

2. Multiple gradation structure: In this research, the object is

### **The Establishment of Chinese Gazetteer Database (Information Description)**

After the redaction of the metadata of Chinese gazetteer information, besides the definition and relation of every element, we shall put more emphasis on the analysis of the each element of the metadata and make Chinese gazetteer become a complete and available information record. Furthermore, we should integrate and combine the records of Chinese gazetteer information into an available structure for the database. In our research, unless the temporal range is restricted to the Qing dynasty to the present, the spatial range is also limited to discuss the administration units which are larger than the county level, which is based on Tan Chi-xiang's research.<sup>[24]</sup> Hence, our Chinese gazetteer information database focuses on the administration units which are larger than the county level and put no emphasis on the administration unit smaller than the county level. Even the data of the Ming and Qing dynasty's military control area and special administration unit are so few and the related researches are quite difficult to be conducted, we would still like to try our best to catalogue the information database of Chinese gazetteer. In order to maintain the uniqueness of each record, we would apply the current place name as the major entry of the database.

When describing the Chinese gazetteer information, the descriptive rules should be developed at the same time. The descriptive rules should follow the elements of metadata and conduct the research and redaction according to the metadata. The definition of elements, the rule of element description and the example should be included in the detailed descriptive rules. Because the detailed descriptive rules are developed with the establishment of the database, we shall describe the snapshot of the redaction of the descriptive rules as the following points:

1. The division of the administration system: Beyond the county level, there are three classes and be described in each own database.

2. The flexible major entry: The current place names will be the

restricted to the administration unit which is not smaller than the level of county. According to the historical research, there are only three administration unit larger than the county at most. Therefore, we would like to apply the multiple gradation structure and divide the database into three parts: the first class database, the second class database, and the third class database. Among three different parts of the Chinese gazetteer information database, the series connection will be established. Through the multiple gradation structure, the administration division which is shown by these different parts of the database would be in unanimity, and the context of place name information would be more conscientious and careful.

3. The metadata comparison of authority control database structure: Because the authority control of the common place name information system is more special than other types of databases, we would analyze the model of the authority control database and compare our model with the international authority data in MARC21.

4. Furthermore, we would like to apply place name and time to correspond with the correct image layers.

major entry of description. But when the current place name changes into the historical place name, a new basis will be established. The original major entry will be adjusted as the referential entry, which is what to be called "flexible major entry".

3. The principle of flexible entry trace back: The time will be taken as the axis of each entry. The current place name is applied to trace back the evolution and establish the entries of database.

4. The Principle of the establishment of flexible entry: Basically, there is no necessary to establish a referential entry when the place name changes. But when it comes to the change of time, subordination and the territory, a referential entry should be established. In other words, when the subordination relation, the territory, the temporal factor of the neighborhood administration changed, we will establish a new referential entry. If the elevation of status is changed, the whole record will be moved to the new level of the database.

### **The Brief Summary**

Besides the structure and the content of the gazetteer information, the demand and environmental analysis of the database system should be considered in the process of the establishment of metadata at the same time. In fact, there is no better or clearer method than maps and image layers to show the information of gazetteer. The major goal of the establishment of information is to apply the textual description of historical materials to piece up the obscure and disappearing spatial image layer information in the current of history. Furthermore, we integrate and combine the variation of time and space in a systematic context. In other words, we would like to adopt the textual materials to clarify the image geographic information and to chart an active modern Chinese historical map.

## **II. The Establishment and Function Introduction of Chinese Place Name Information System**

Base on the concepts we have mentioned, the establishment

of the information system is under proceeding. The gazetteer and map information databases are established individually. And through the design of the describing system, the database provides the service of online input, editing, and image uploading. Through the correspondence of information between the two databases, the image-text corresponding integrated searching system can be accomplished furthermore.

## The Establishment of place name information database system

### 1. The establishment of metadata form

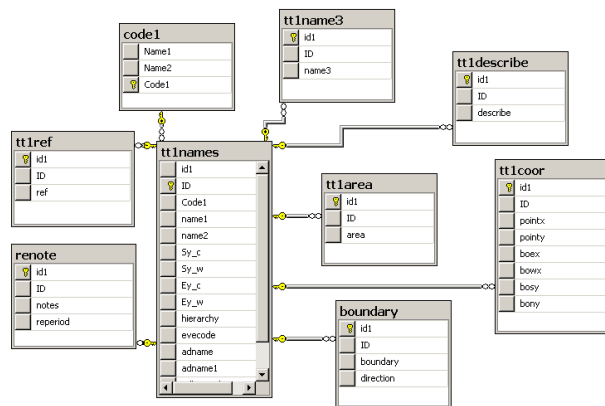
Depend upon the input contents of each entry from the databases, we may differentiate and definite its form of metadata, singular or multiple value, the link between the differentiation, the qualification of searching key, or the set of searching for other databases.

### 2.The Establishment of the database

We will create an Excel file which is based on the standard place name and transform the term. Then, through the interface of Microsoft SQL Server 2005, we will upload and input the data into the SQL database. The SQL Server 2005 Management Studio contains various functions like server maintenance, database creations and maintenance, browse models, build queries using query editor, process models and structures, assign object permissions, backup and restore database. The SQL Server 2005 is just suitable for the demand of the establishment of the database. Because the entry from each excel file is different from each other, the revise must be done first. Then, we will encode the information depend upon the group and system of each data, and then integrate and differentiate the multiple value entries. In order to accord with the principle of the Database Normal Form, the repetitive information groups will be merged. These processes can be done by the SQL Server 2005 Management Studio syntax.

### 3.The Setting of Database relationship

After the differentiation, the information file will encoded by the serial and category number, and set the Primary Key and Foreign key to connect the major file individually. The following is the Entity Relationship Diagrams:



### 4.The establishment of the descriptive interface of gazetteer information

The descriptive interface of gazetteer information is controlled by the hierarchical menu. The related databases will be combined in order to ensure the data which belong to the multiple systems can be constructed systematically. The descriptive system applies the web applications of Visual Studio 2005: which is an object oriented programming design based on the ASP.NET. Through the application of server control tag, we may design the aspx dynamic webpage and search, add, correct, and delete the data through the links between the databases. In the webpage we should also display the materials which is correspond to the excel file, includes place name, synonyms, description on the historical evolution, district, space coordinates, the neighboring district, the date of the neighboring district information, references, notation etc.. As considering the influence which are caused by the correction of relative databases, the add-up model of foreign key has to be set up. The following is the overall set of the procedure and link of our current descriptive webpage of the gazetteer information database.

#### (1)The searching of the major entry of gazetteer:

Through the Hierarchical menu, we may choose a province first. Then we may input the code of place name, specific name or the specific name of the administration district. Furthermore, we may search the information which is already documented in the database with a keyword retrieve.

名称	地区	开始年代(西历)	结束年代(西历)	所属上级地名	所属下级地名
北京市	市				
天津市	市				
河北省	省				
山西省	省				
内蒙古自治区	自治区	1922	1933		
辽宁省	省	1956			
黑龙江省	省	1956			
江苏省	省	1969			
运城	县	1956	1961		
运城	县	1536	1913		
运城	县	1956	1956		
运城	县	1913	1913		

名称	地区	开始年代(西历)	结束年代(西历)	所属上级地名	所属下级地名
运城	县	1949	1949	运城	省
运城	县	1947	1949	运城	省
运城	县	1945	1947	运城	省
运城	县	1943	1945	运城	省
运城	县	1942	1943	运城	省
运城	县	1940	1942	运城	省
运城	县	1938	1940	运城	省
运城	县	1935	1938	运城	省
运城	县	1934	1935	运城	省
运城	县	1933	1934	运城	省

#### (2)The edit and add of the primary described file:

a. Besides the data already catalogued and documented, we will reestablish the data according on the latest gazetteer information. The standard place name will be listed as the major entry and input the database, set up the code of group, and to constitute the basement of the place name group.

b. To retrieve the specific name through keyword from the webpage. The result will be specific location or the group of place name information which is retrieved by the ID as we click the button of entry, the information will be listed and sorted automatically.

建別碼	地名	地名	地名	地名	地名	地名
3507429	莆田	莆田	1949	1949	福建	省
3507430	莆田	莆田	1947	1949	福建	省
3507431	莆田	莆田	1945	1947	福建	省
3507432	莆田	莆田	1943	1945	福建	省
3507433	莆田	莆田	1942	1943	福建	省
3507434	莆田	莆田	1940	1942	福建	省
3507435	莆田	莆田	1938	1940	福建	省
3507436	莆田	莆田	1935	1938	福建	省
3507437	莆田	莆田	1934	1935	福建	省
3507438	莆田	莆田	1933	1934	福建	省

c. We may browse, correct, add and delete the data with the bottom of "Edit Place Name"

序號	1784
地名	莆田
地名	莆田
建別碼	3507432
群組號	074
起始年代_中曆	民國32年
起始年代_西曆	1943
結束年代_中曆	民國34年
結束年代_西曆	1945
層級	
群屬層級	
字代碼	空間領域調整
群屬_地名	福建
群屬_連名	省
link	
<a href="#">編輯</a> <a href="#">新增</a> <a href="#">刪除</a>	

序號	1784
地名	莆田
地名	莆田
建別碼	3507432
群組號	074
起始年代_中曆	民國32年
起始年代_西曆	1943
結束年代_中曆	民國34年
結束年代_西曆	1945
層級	
群屬層級	
字代碼	空間領域調整
群屬_地名	福建
群屬_連名	省
link	

The edit of place name major file

(3)The set model of adding group of place name:

a. The coding and add up model:

Place ID= Province ID (00) + Group ID (000) + Serial Number (000)

Province ID (00) = dbo.province.pcode

Group ID (000) = dbo.code1.code1, as the serial number of the standard place name. (add up automatically)

b. We will choose the general names of the database menu and select one specific name from these general names. As we choose the province, we will receive the last new place name ID of the current group automatically. Then, plus one after the place name ID and we will get a new place name ID. The new adding term of the group will be input in the specific name entry.

地名	莆田
地名	莆田
建別碼	福建省 3507449
群組號	074
起始年代_中曆	
起始年代_西曆	中曆
結束年代_中曆	
結束年代_西曆	中曆
層級	縣
群屬層級	府
字代碼	改名
群屬_地名	
群屬_連名	
link	

(4)The automatic sieve of the subordinate system:

According to the general name we have chosen and searched in district system file, the database will sieve and list every general which is corresponded to the subordinate system for further searching.

地名	莆田
地名	莆田
建別碼	福建省 3507449
群組號	074
起始年代_中曆	
起始年代_西曆	中曆
結束年代_中曆	
結束年代_西曆	中曆
層級	縣
群屬層級	都府領旗
字代碼	縣
群屬_地名	縣
群屬_連名	縣
link	自治區

(5)The Set of other menu:

The start date of the Chinese calendar will be reduced automatically by the synopsis of Chinese and The Gregorian calendar. The code of evolution event will also be provided by the menu as the way to input the data.

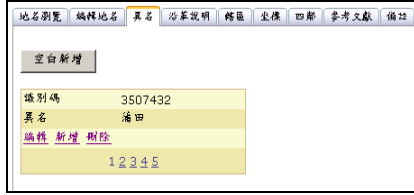
地名	莆田
地名	莆田
建別碼	福建省 3507449
群組號	074
起始年代_中曆	民國55年
起始年代_西曆	1966
結束年代_中曆	民國69年
結束年代_西曆	1980
層級	縣
群屬層級	府
字代碼	改名
群屬_地名	改名
群屬_連名	改名
link	自治區

(6)The Edit and add of the data:

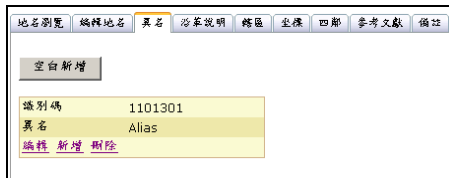
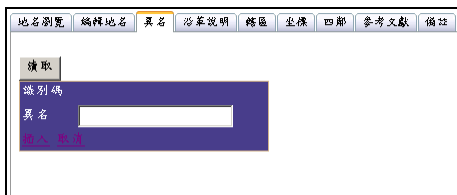
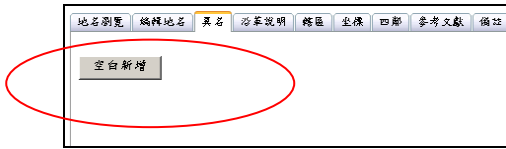
a. According to the data already documented in the database, we may retrieve list of the individual place name or the group of place name.

b. After choosing a place name, the foreign key connects each individual file and show the retrieve on the web panel. Then, we may use this interface to browse, correct and add new data..





c. Before adding and cataloging a new place name, a foreign key must be created first. Therefore, "Add new data" button is applied for providing the catalogue use.



The Map description and Upload webpage



The Retrieve page of the description information for the map

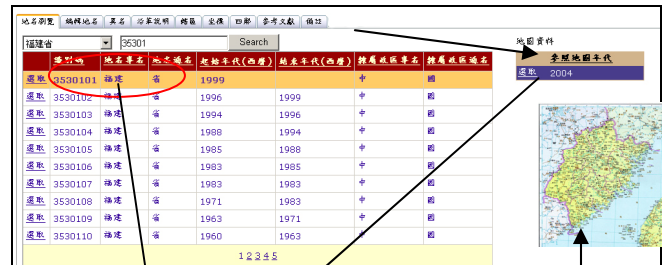
### The Integrated Retrieve for image and textual material information

The place name and the date of the neighboring will be the key to retrieve the data. The result will link to the area and date information of the map database. Every image accords with the retrieve terms will be listed.

### The Establishment of the Map Database System

In order to catalogue the metadata and to integrate and display the maps which are related to the place we are searching for, we scan and document the maps which date back to the Ming and Qing dynasty. Therefore, we arrange the images of modern maps (the chorography, the attached graph of document, the map volume etc.) at one time, but also record the detailed gazetteer information from the maps as the reference to check out the relative location of the place name which is written in the textual materials at the same time.

Through the set of metadata form, the map database also provides the management model and descriptive interface of SQL server. The data which are already scanned will be uploaded to the database system and to match with the description of metadata. The described map information can be browsed and corrected, the reduction of each map is also provided in the interface.



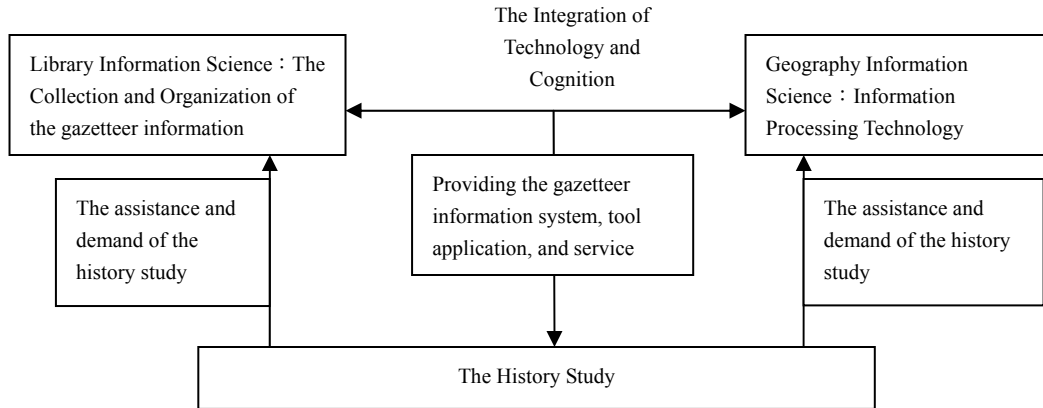
The Map and Textual Material Integrated Retrieve Model

### III. The Further thinking

#### The necessity of the Integration of multi-academic fields

From Qing dynasty to the present days, the establishment, merge, dissolve, and evolution of the administration district are complex and labyrinthine. Many related articles or tool books only focus on the singular or few aspects on the systematic integration. The demand for the integration between temporal and spatial evolution still is not satisfied, and the holistic research tool is still under developed. When conducting the research of history and humanities and social studies, such like history, historical

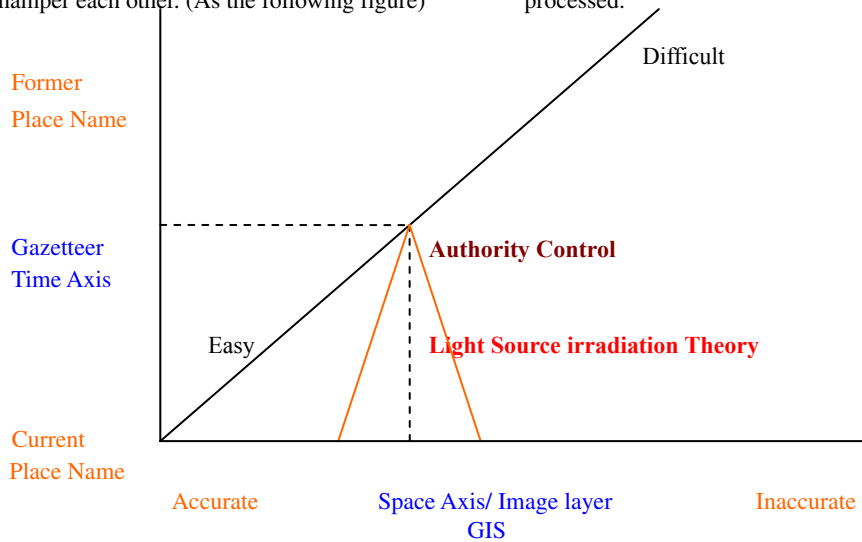
geography, toponymy, and the charting of the historical maps, the researchers face inconvenience and must collect and analyze a huge amount of materials. Even with these efforts, the researchers can generalize and obtain some little progress. If we may combine the information collection and organization from the library information science, the information processing technology from the geography information science and the conversance of the materials from the history study, the demand of the establishment of the Chinese gazetteer information system can be satisfied. Therefore, the integration between three major academic fields is necessary for the development of the Chinese gazetteer information system.



#### The Difficulty of Material Collection of Chinese Gazetteer Information

The gazetteer referential tool books from the history study, the program record of territory information, maps, chorography, cadaster, and the contract are the expectable resources of the Chinese gazetteer information. But as the time goes by, the difficulty of obtaining this information is higher than before. This is the reason that the gazetteer, authority control and the GIS application would hamper each other. (As the following figure)

As the time goes by, it is more and more difficult to trace back the former place name and to obtain the relative attribute information in the gazetteer. In the aspect of the establishment of GIS layer, we also face the same problem. As we can hardly collect the earlier history materials for the specific place, it is difficult for us to establish accurate spatial information of administration districts. Therefore, the authority control is hard to be advanced to the level of improving the searching efficiency, even the authority control itself is nearly impossible to be processed.



## Note & References

- [1] Shih Qing-De The Study on the Map Gazetteer Information Database System. (Journal of Cartography: 2,1991),pp.3.
- [2] There are two major fields in the geography, the Physical and the Human geography. The Human geography includes Political geography, economic geography, population geography and cultural geography. The Administration division geography is the study which focuses on the structure arrangement of the country, and put much emphasis on the research on the administration division.
- [3] See 2. Chen Rui-Ling "How to Model the Spatiotemporal Data Structure for the Change of Administrative Divisions, China (Master Degree Thesis. Department of Geography, National Taiwan University, 2003) ,pp.6.
- [4] See 2. Chen Rui-Ling "How to Model the Spatiotemporal Data Structure for the Change of Administrative Divisions, China (Master Degree Thesis. Department of Geography, National Taiwan University, 2003) ,pp.1-2.
- [5] Huang En-Ming and Zen Zheng-Xiong The Study on the Establishment and Analysis Model of the Map Gazetteer Database (Journal of Cartography: 11,2001),pp.4.
- [6] See 2. Chen Rui-Ling "How to Model the Spatiotemporal Data Structure for the Change of Administrative Divisions, China (Master Degree Thesis. Department of Geography, National Taiwan University, 2003) ,pp.6-7.
- [7] Xu Zhe-Ming The Investigation of the Administration Division and the Evolution of the Administration District Gazetteer (Journal of Cartography: 7,1996), pp.39.
- [8] Alexandria Digital Library Project, Guide to the ADL Gazetteer Content Standard version 3.2, 26 February 2004, <<http://www.alexandria.ucsb.edu/gazetteer/ContentStandard/version3.2/GCS3.2-guide.htm>> (1 January 2005).
- [9] Linda L. Hill, James Frew, Qi Zheng, "Geographic Names : The Implementation of a Gazetteer in a Georeferenced Digital Library;" D-Lib Magazine 5:1 (January 1999):1-19.
- [10] FGDC, Content Standard for Digital Geospatial Metadata (CSDGM), 21 March 2003, <<http://www.fgdc.gov/metadata/contstan.html>> (1 January 2005).
- [11] Library of Congress, MARC 21 Concise Authority: Introduction, 20 December 2004, <<http://www.loc.gov/marc/authority/ecadintr.html>> (10 January 2005).
- [12] INCITS, InterNational Committee for Information Technology Standard : Geographic information-Metadata(ISO/FDIS19115), 23 March 2003, <[http://www.ncits.org/ref-docs/FDIS\\_19115.pdf](http://www.ncits.org/ref-docs/FDIS_19115.pdf)> (10 January 2005).
- [13] See 15. FGDC, Content Standard for Digital Geospatial Metadata (CSDGM), 21 March 2003, <<http://www.fgdc.gov/metadata/contstan.html>> (1 January 2005).
- [14] See 2. Chen Rui-Ling "How to Model the Spatiotemporal Data Structure for the Change of Administrative Divisions, China (Master Degree Thesis. Department of Geography, National Taiwan University, 2003) ,pp.8-10.
- [15] Niu Ping-Han *The Evolution of the Administration District of the Ching Dynasty* (Beijing: China Map Press, 1990), pp.1.
- [16] See 23. Niu Ping-Han *The Evolution of the Administration District of the Ching Dynasty* (Beijing: China Map Press, 1990), pp.1-2.
- [17] See 11. Xu Zhe-Ming The Investigation of the Administration Division and the Evolution of the Administration District Gazetteer (Journal of Cartography: 7,1996), pp.40-42.
- [18] See 25. Xu Zhe-Ming The Investigation of the Administration Division and the Evolution of the Administration District Gazetteer (Journal of Cartography: 7,1996), pp.40-42.
- [19] Ministry of Civil Affairs of the People's Republic of China, *The Brief Volume of the Administration district division of the Republic of China 2002* (Beijing: China Map press, 2002), pp.1
- [20] Department of Land Administration, Minister of Interior, Republic of China, Taiwan Place Name Information System, 25 February 2005, <http://placesearch.moi.gov.tw/?cid=104>
- [21] See 2. Chen Rui-Ling "How to Model the Spatiotemporal Data Structure for the Change of Administrative Divisions, China (Master Degree Thesis. Department of Geography, National Taiwan University, 2003) ,pp.8

## Author Biography

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