The Digital Map of Hydropower Station in China

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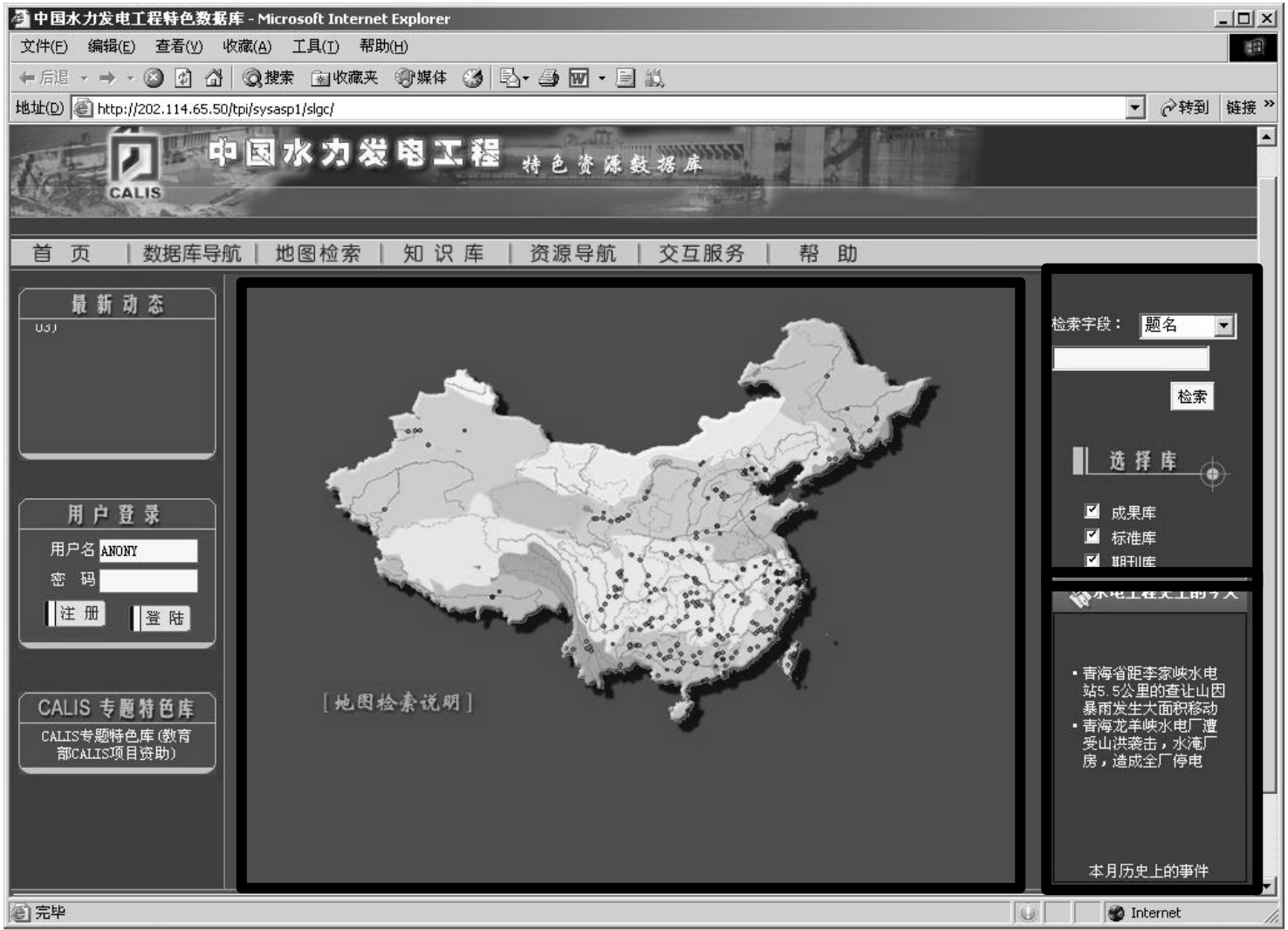
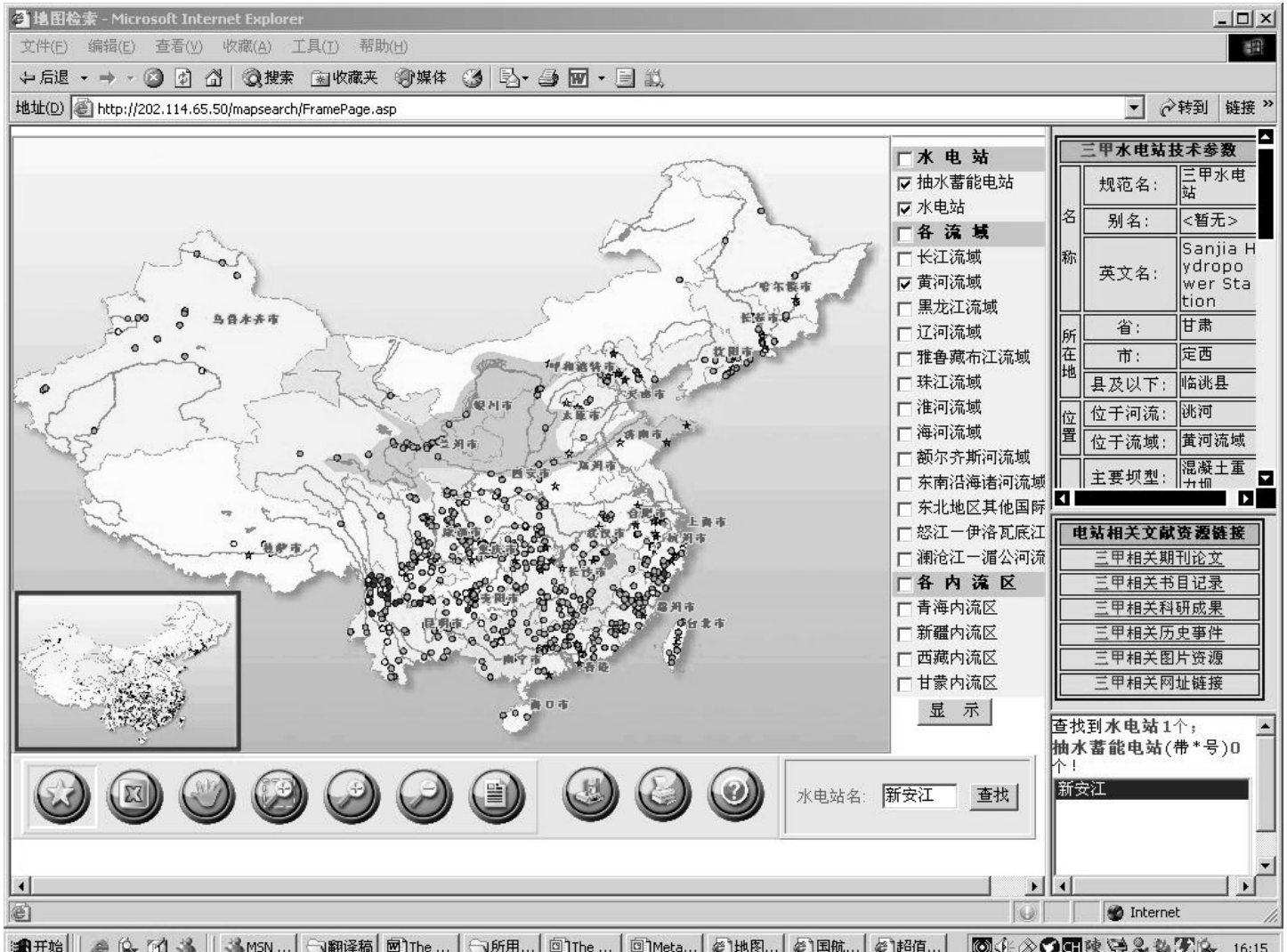
1. Introduction

- **“The digital map of hydropower stations in China” is a important component of the project named “China Hydroelectric Engineering”**
- **This project has been founded by CALIS（ China Academic Library Information System）**
- **It is undertaken by Wuhan University Library.**

The project home page http://202.114.65.50/slgc/



The main page of digital map



The goal of this project

- **To collect the knowledge and accomplishment in the field of hydroelectric engineering in China completely;**
- **To offer information service for professional education, scientific research and the industrial production in this field**
- **To introduce the development of hydroelectric engineering in China for the global users via the Internet.**

2. The the collection (1/6)

- There are more than 370 thousands records in this project database
  - The Chinese journals
  - The technical parameters
  - The standard and specification
  - The history records
  - Other digital resources

2. The the collection (2/6)

The Chinese journals

- **To organize 290 titles of Chinese journal that published come from 1911 to 2005.**
- **The subject field of these journals is in hydraulic engineering**
- **More than 350,000 articles have been digitized**

  Metadata 1949-1988
  Fullpaper 1911-1948 ; 1989-2005

These digital resources reflect the academic feature of hydroelectric engineering in China.

2. The the collection (3/6)

The Technical parameters

- **There are 16,606 parameters have been digitized in this project, they are engineering characteristic parameter and equipments performance parameter about China's hydropower stations**

These resources reflect the technical feature of hydropower station in China

2. The the collection (4/6)

The standard and specification

- **There are more than 900 metadata of the standard and specification**
- **These technical documents is using in the field of hydroelectric engineering now and have been promulgated by the national, department and enterprise.**

2. The the collection (5/6)

The history records

- **We have collected more than12,000 items of the news, report, affairs and pictures, which about the history of China hydroelectric engineering**
- **These resources are collected from journals, books, Internet and some special collections.**

These resources record the process of development in the field of hydroelectric engineering in China.

2. The the collection (6/6)

Other digital resources

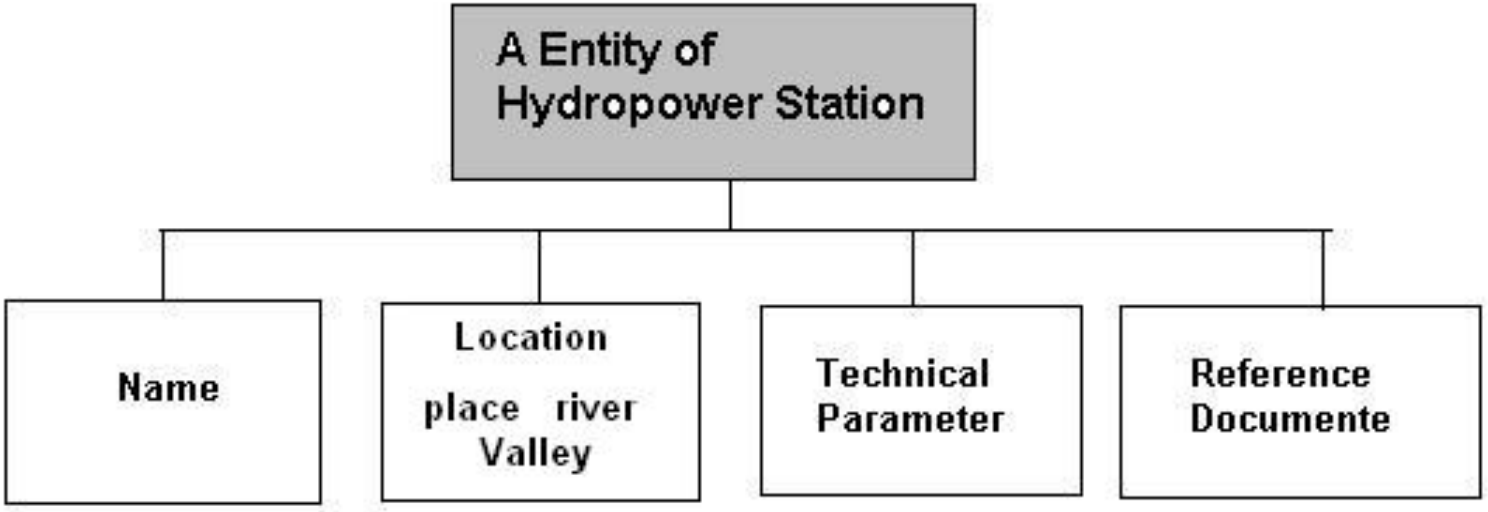
- Vocabulary
- Knowledge
- The scientific research accomplishment
- The pictures
- Bibliography
- Audio and video resources
- Spatial data

3. Analyzing the geographic feature of the resources (1/10)

- **Usually the geographic feature of data has two kind of form --the spatial and attribute. In GIS the spatial data means “where” and the attribute data means “what”.**
- **In this project, the center topic are very close to the hydropower station in China, and each hydropower station has a typical feature, that is all of them have geo-location itself (place, river, valley). We can set up a entity to describe this geographic feature.**

3. Analyzing the geographic feature in digital information (2/10)

The entity model of hydropower station



- This entity model has four kinds of elements: the name, the location, the technical parameters and the reference documents.

- The element of location has typical characteristic of geography, and it should been described by the spatial data. (Vector & Raster)

About the spatial data

Spatial is the data that have some form of spatial or geographic reference which enables them to be located in two- or three- dimensional space (*Heywood et al., 1998*)

‘where’

Spatial data have two forms:

- Vector
- Raster

3. Analyzing the geographic feature in digital information (4/10)

About the spatial data (Vector data)

- Vector data can be subdivided into points, lines and areas

  Point--- To represent the place of hydropower station located in. There are more than 500 hydropower station in this system.

  Line --- To represent river. Including the large and middle size rivers.

  area --- To represent valley. There are 17 valleys in the system

- Digitizing frequently produces vector data. In this project, we don't do digitizing to make the vector data but purchase them from other vender, which is "The national district electronic map" with the ratio is one to one hundred and thousands (1: 100,000). We just use a part of place data and a part of river data (the big and middle size).

3. Analyzing the geographic feature in digital information (5/10)

About the spatial data (Raster data)

- Raster data are usually produced rapidly by scanning

  We have made the raster data by scanning the map.
  (the China's valley's map and China territory map)

  Scanning the map of valley (China) ----JPEG

  Scanning the map of China territory ---- JPEG

We can use the GIS software to make these raster into vector through the way of registerb

3. Analyzing the geographic feature in digital information (6/10)

About attribute data

Attributes provide information about 'what' a feature is. In GIS spatial data always come with accompanying attributes.

‘what’

Attribute data

- The engineering characteristic parameters
- The equipment performance parameters

These parameters are extracted from “the Chinese Yearbook of Hydroelectric Engineering”

3. Analyzing the geographic feature in digital information (7/10)

By purchasing and scanning we have held the spatial data and attribute data in the project database, these information can be used to show the hydropower stations, rivers and valleys on the digital map vividly.

Research resources

- Besides the spatial data and attribute data we have another kind data in this project—the research resources (thesis, books, standard, accomplishment etc.)
- We can define research resources — 'How'

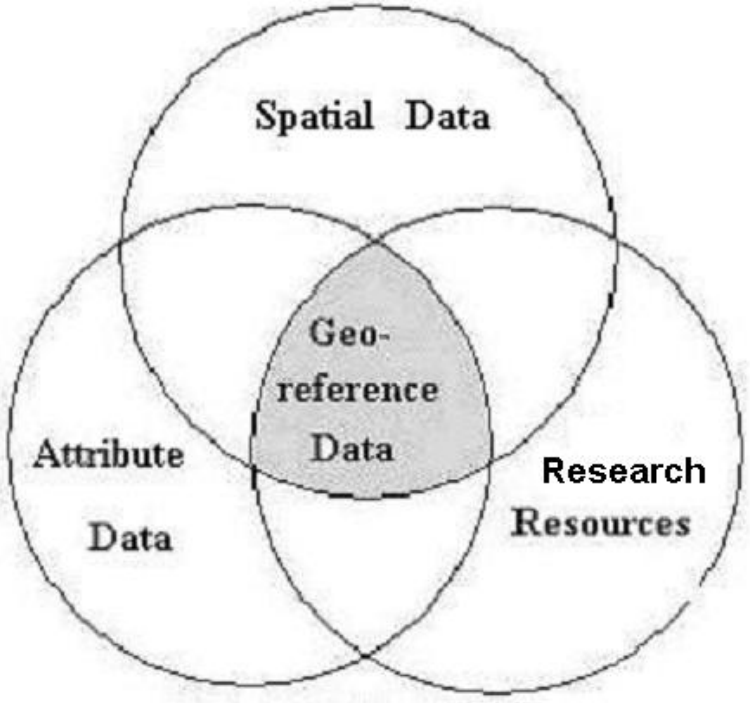
Where --- spatial data --- a hydropower station located in

What --- attribute data --- technical parameters

How --- research resources --- accomplishment

—This is the relationship between spatial data and research resources

Established the relation model

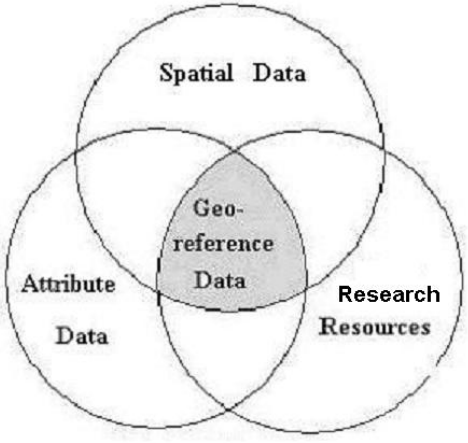


The relation model

The object in the geo-reference area should be a set of accomplishment, which will be relative with some hydropower station.

3. Analyzing the geographic feature in digital information (10/10)

A sample of the relation model



The object is:

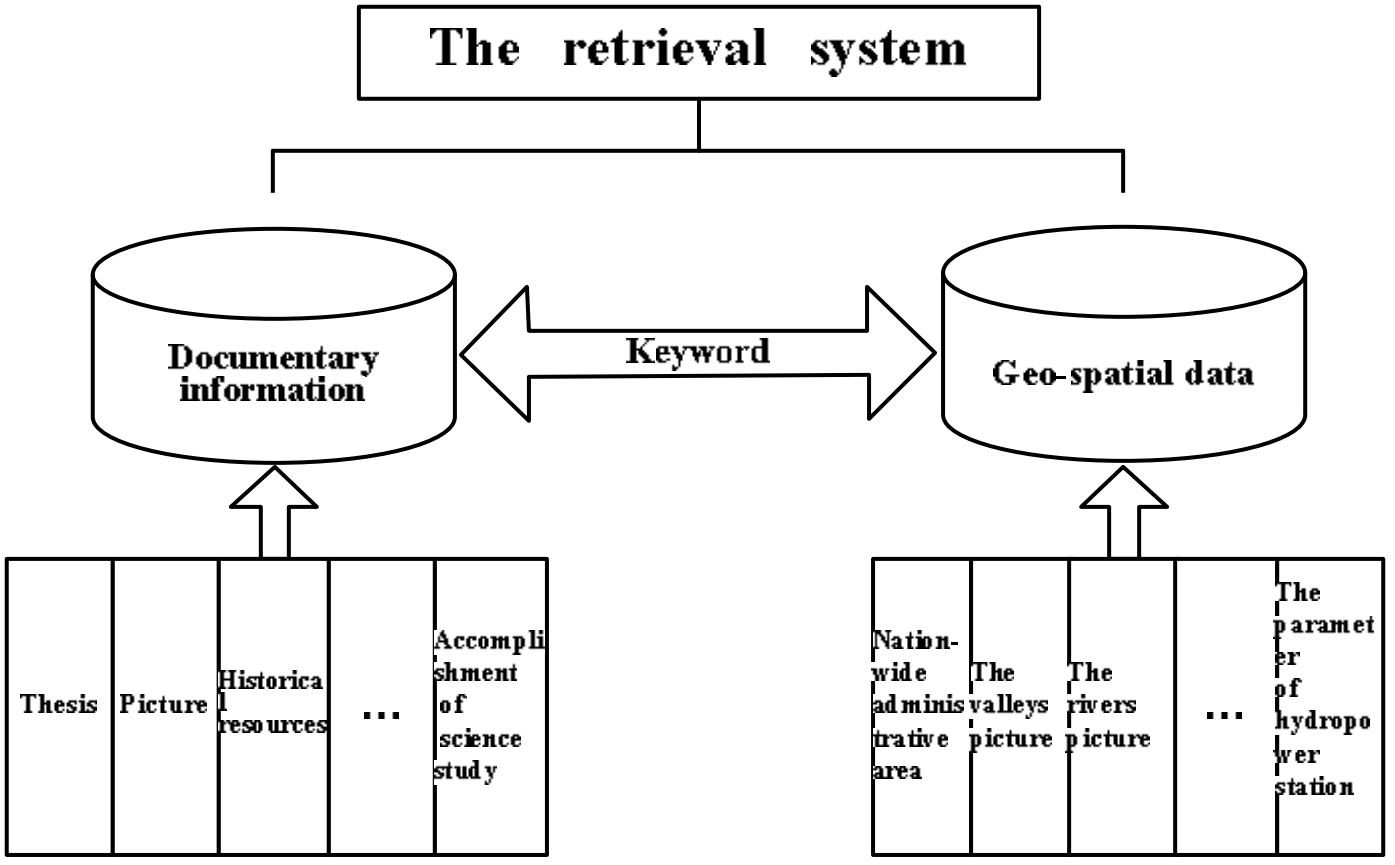
a article that study in the draft tube which using in Three Gorge Hydropower Station.

Area	Element	Content
Spatial data	Place,river,valley, name	SanDouPing, Yangtez River Yangtez river valley
Attribute data	Technical parameter	Draft tube,
Research resources	Thesis	Three Gorge Hydropower Station, Draft tube

Studying the data model can find out the relationship between different kind of data and help us to construct the retrieval system

4. setting retrieval system (1/3)

The retrieval system module



4. setting retrieval system (2/3)
Setting up the rule of names

In fact, each hydropower station has several different names.

Types of Name	Example	Function in the System
Standard name	? ? ? ? ?	indexing and shown name in the information system
English name	Three Georges Hydropower Station	for English version
Nickname	? ? ? ? ,? ? ? ? ? , ? ? ? ?	non-standard name, synonymous, To find information
Marking name	? ?	abbreviation in digital map

4. setting retrieval system (3/3)
Searching route of digital map system

Enter digital map system → find a hydropower station

→ Interesting in research resources

→ system switch names as keywords

→ tune to the information system

→ searching the information

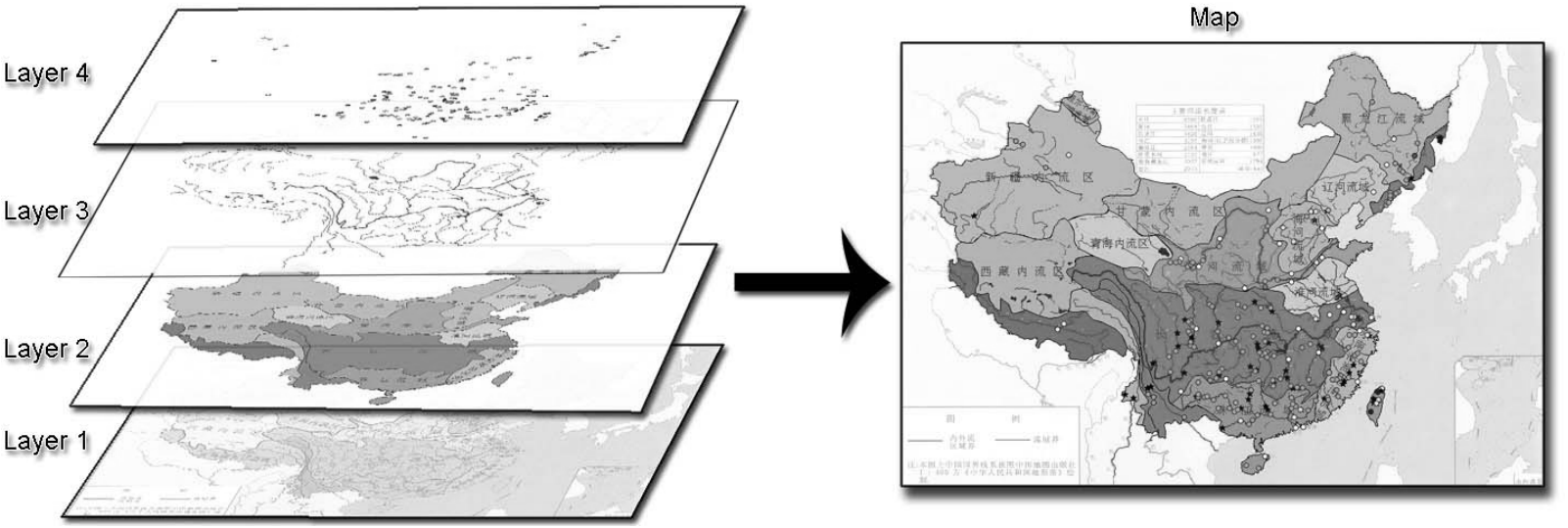
→ send the result to the user

6. Forming the digital map (1/2)

- **In a map, geo-spatial data have been modeled into entities of which there are three kinds: points, lines and areas that as talked above.**
- **The structuring of information in a GIS is most commonly organized in layers of maps. Each layer may contain information of a different nature.**

5. Forming the digital map (2/2)

The layer model of digital map

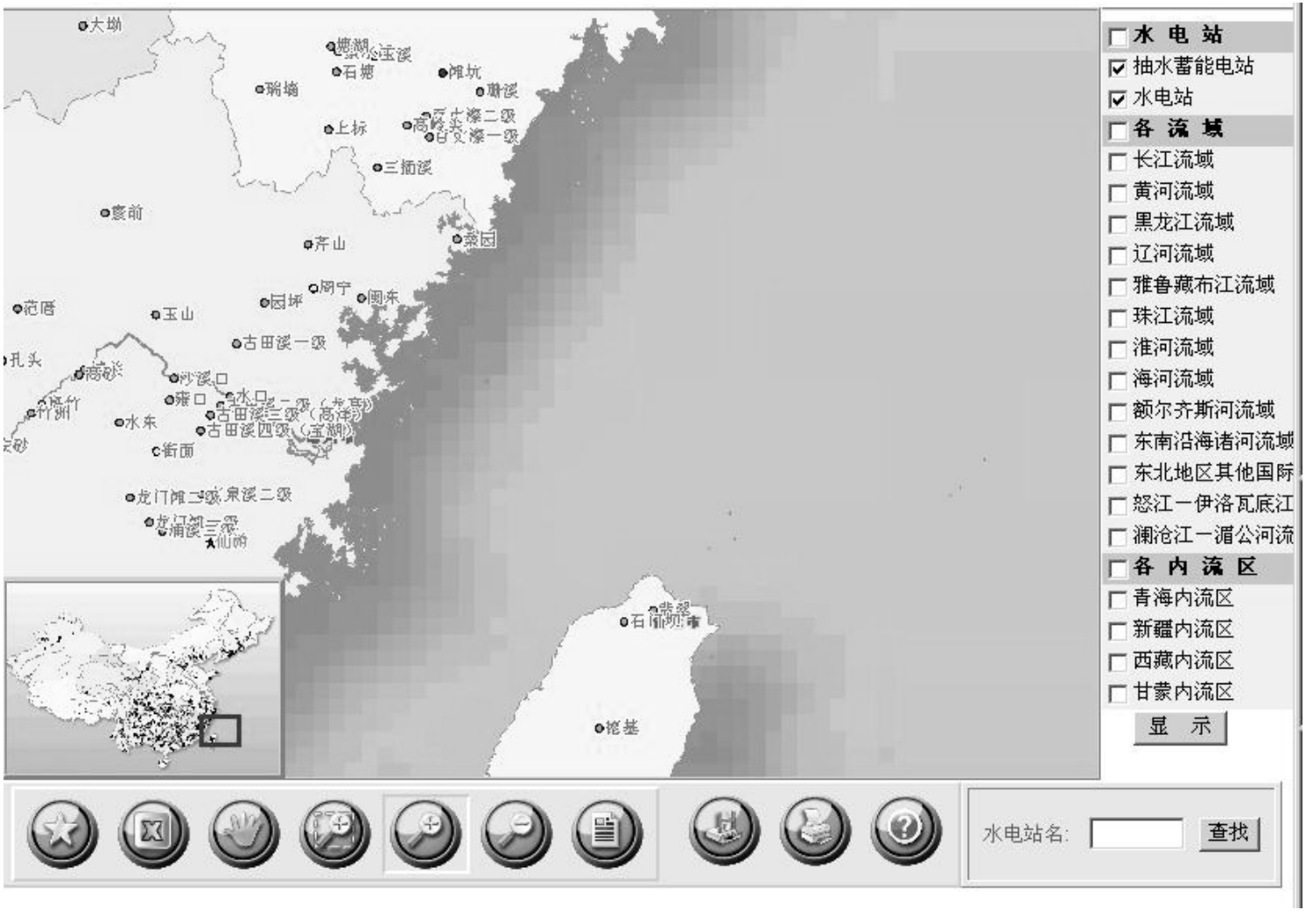


We can think the layers are transparency, if stacked them on top of one by one we can make this digital map.

7. Showing the Function of the digital map system (1/7)

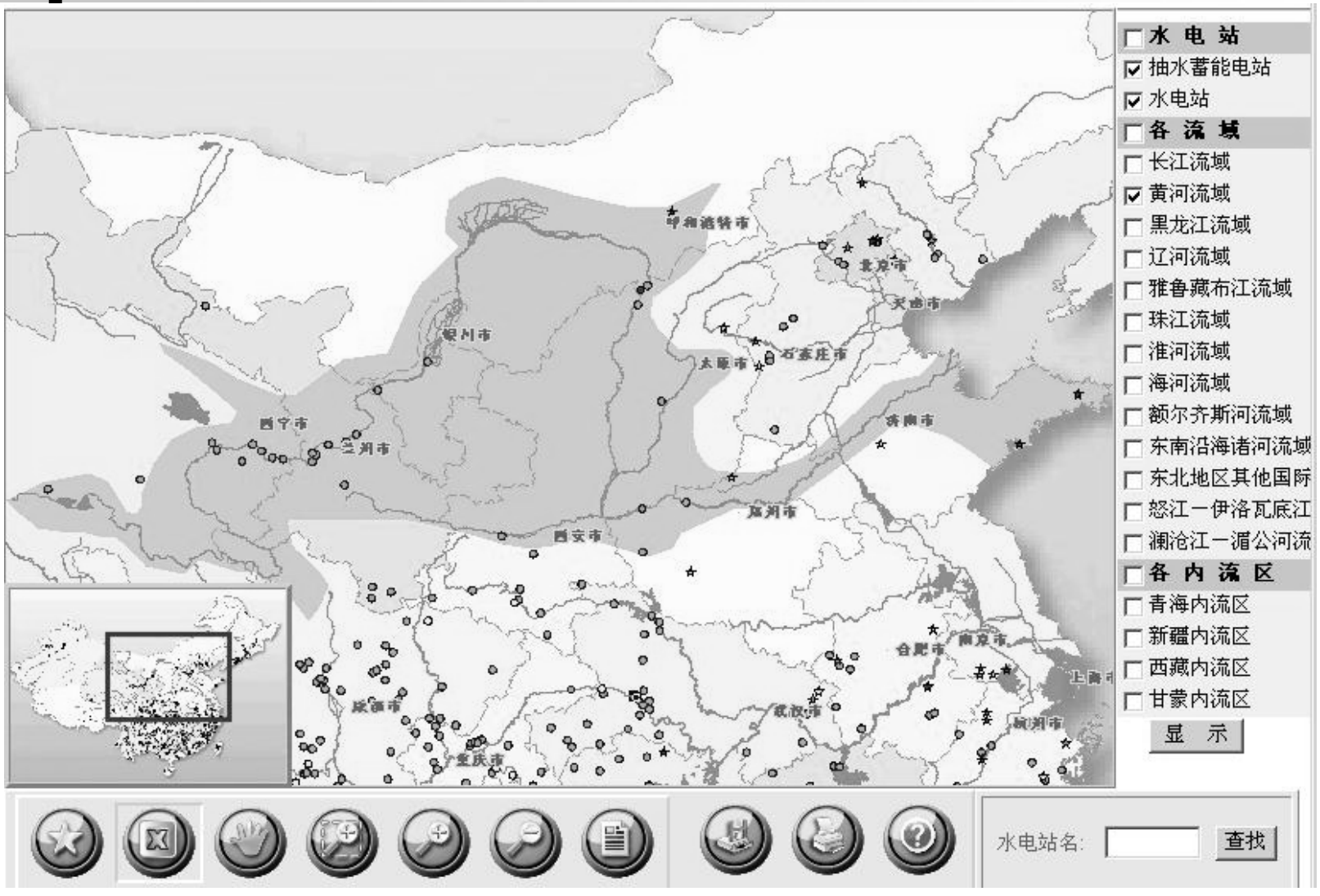
7. Showing the Function of the digital map system (2/7

Zoon in and zoon out ； “Hawk eye”



7. Showing the Function of the digital map system (3/7

The valley choosing function

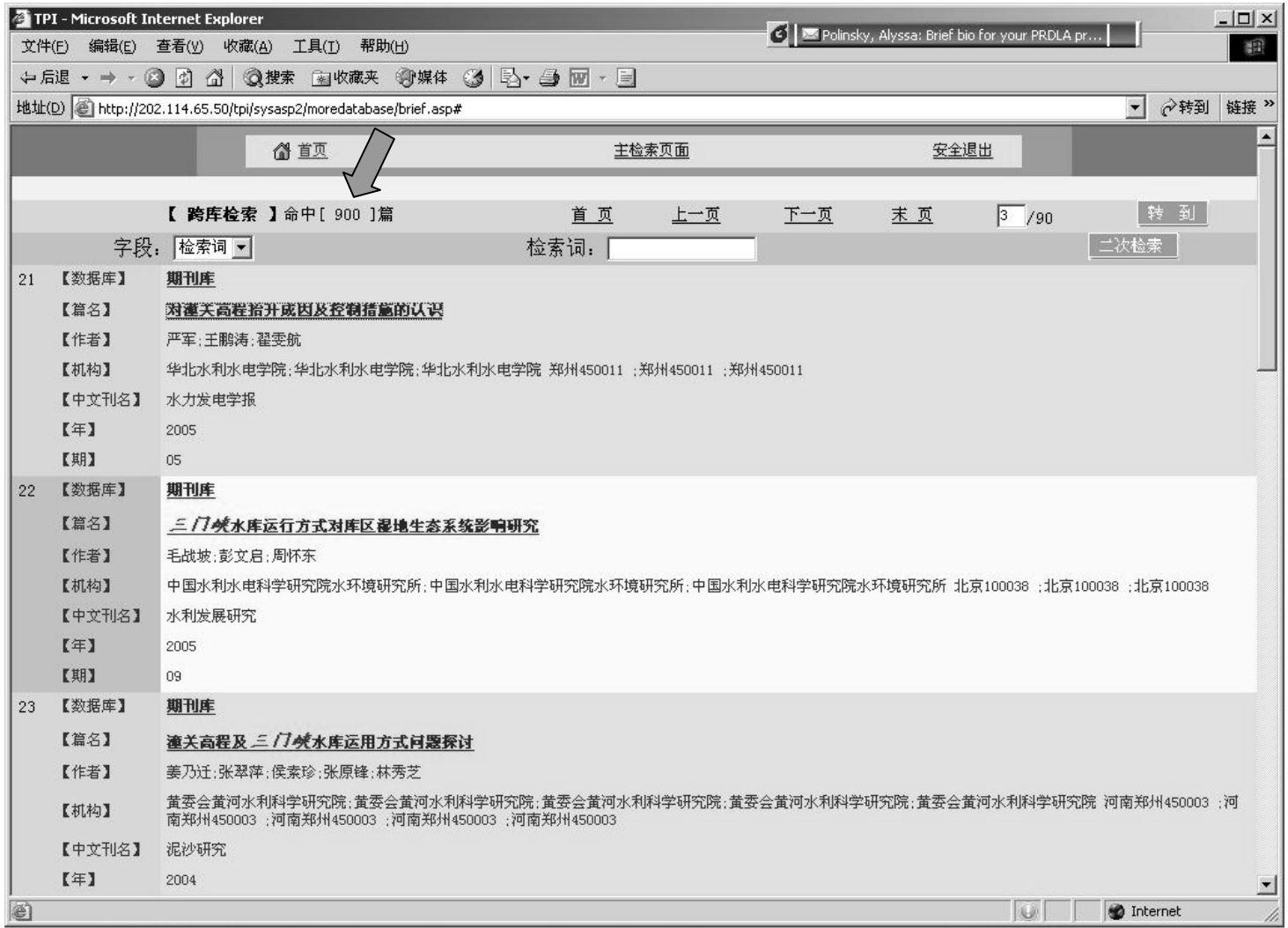


7. Showing the Function of the digital map system (4/7

Choosing a hydropower station (Sanmenxia)

7. Showing the Function of the digital map system (5/7

The result of retrieval in the TPI system, which related to Sanmenxia

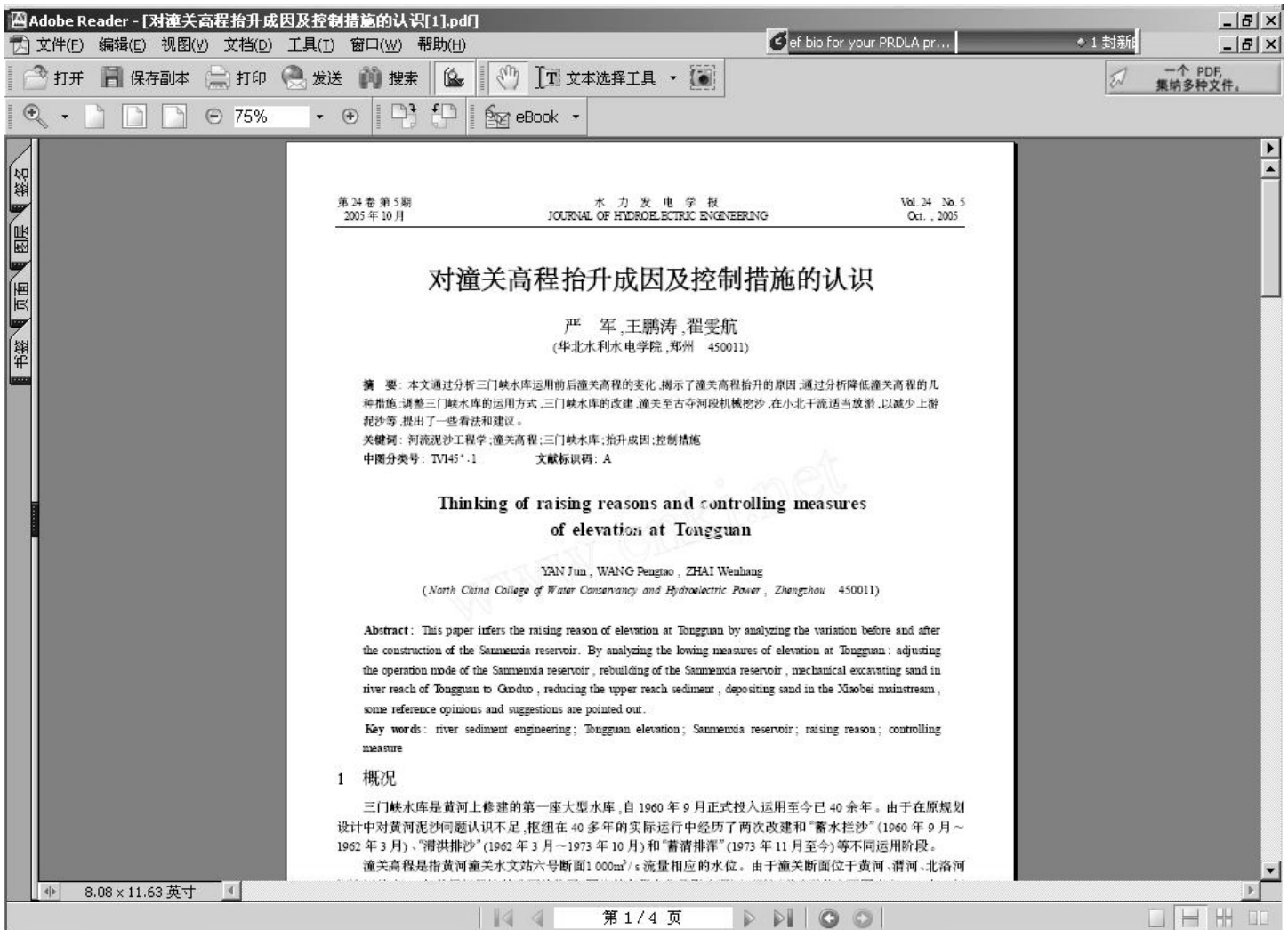


7. Showing the Function of the digital map system (6/

The metadata of a article

7. Showing the Function of the digital map system (7/7

The function of linking full paper

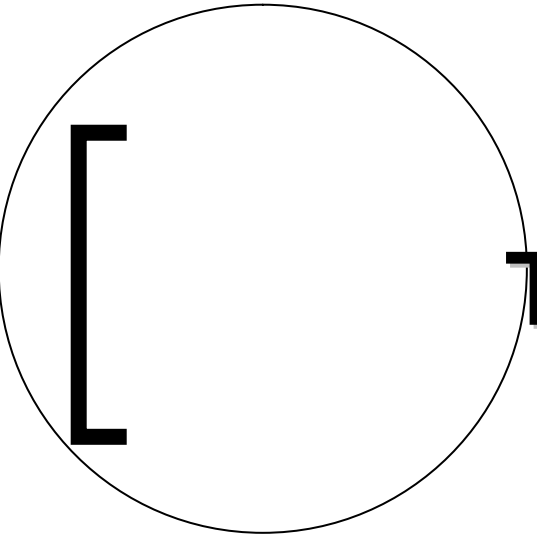


7. Conclusion

- **Information is no longer simply text and pictures. It has different forms and attributes. So, trying to use and combine different retrieval system in a project architecture will have more benefit for users.**

7. The future work

- Continue to collect the resources
- Began to design English home page
- Trying to using the ontology tool to realize the retrieval system on knowledge database



Thank You!