Detail Urban Geographical Information System

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Abstract   Since Geographical Information System (GIS) technology was introduced into China, the theory and technology of GIS had made many great progresses. However, most of the applications emphasize on macro analysis, few of detail GIS was introduced in journal papers and technical reports. In this paper, some ideas about detail GIS were discussed, and one system was also introduced, in it each house is considered as a unit to link population information to spatial information.

1. Background

Since Geographical Information System (GIS) technology was introduced into China, the theory and technology of GIS had made many great progresses. At present, its development of theory attends to several orientations, one is integration of GIS (geographical information system), RS (remote sensing) and GPS (global positioning system), the second is intelligent GIS with the help of AI (artificial intelligent) and ES (expert system), the third is spatial information science. In the view of software, the popular foreign GIS software is the rage in China including ARC/INFO, MAPINFO, MGE, MICROSTATION, SYSTEM9 etc., the domestic GIS software including MAPGIS, GEOSTAR etc. In practice it has been used almost every fields, such urban layout, land management, agriculture, forestry. However, the effect of GIS in their fields didn't exert so large as estimated at the beginning, as leads to that many end-users lost the trust. This partially affects the healthy development of GIS in China.

2. Existing problems in present GIS

We also develop many professional GISs for our clients. A great deal experiences states that it may

be caused by several reasons as follows:

(1) The developers of GIS have rich knowledge of GIS, but they are short of the knowledge of special application fields, so they emphasize the functions of GIS itself, not the complete function of special application fields, which are more convenient to end-users.

(2) For GIS systems, in my viewpoint, data is core. But many GIS professionals think few of geographical data, so data is the bottle-neck to lag the development of GIS.

Because the above existing misunderstanding, only do most GISs have query and simple statistic functionality, and these functionality are not enough for daily operation.

3. New generation GIS --Detail GIS

In order to avoid the above shortages and make GIS develop deeply, the new framework of urban GIS was proposed in this paper, including three core ideas:

(1) Detail information, the data in GIS are very particular, and they are even useful in daily operation for professional department;

(2) Because the information has much detail, the spatial basis is gigantic, and the update is very difficult for vector format. So, in the new frame the orthoimage is used for the spatial basis of GIS, sometimes we also called it orthoimage GIS.

(3) All the functions are not designed by experts in GIS fields, they are enduser-oriented, the functions demanded by users is very complete.

4. An example --Urban population Geographical Information System

1) Background

China is a country with the biggest population number, according to the estimation of "world population", in the year 2040 it will exceed 1,500,000,000. With the development of economy, the flow of population is faster then ever, furthermore it includes 56 nationality, the rural areas and the urban areas are difficult to distinguish and the makeup of population is quite complex. Although the population problem is one of the most important problems in China to cumber the economic development, the level of population management lagged behind the developed countries such as America, UK etc.

From 1996 our academy began to pay attention to this field, on the basis of foreign country's experience, the research on urban GIS was being carried out.

2) Actuality of abroad research in this field

The United States had developed TIGER system, which was used in America census. It has four virtues: firstly, it is a wonderful map published system; secondly, it has wonderful statistical and tabulate functions; thirdly, it has common geographical units, and the last is that they economize 20% census outlay. In UK, population GIS is considered as a basic tool for census, during the process, some softwares were used, for example, SASPAC(Small Area Statistics Package) , ACORN、PiN、MOSAIC、Super Profiles etc. At the same time, most of countries in Europe, under the consideration of UK's experience the population GIS were developed for their special applications.

3) Population GIS in China

Before 1996, although China is a country with the biggest population number, the GIS technology wasn't used in census. There are two methods to get population information in China, one is registered permanent residence, the other census, but the two data sets have differences, we don't know which is more precisely. We can't compare each other without a common spatial basis. The ecumenicity was plotted out using sketch map, the census geographical unit often changes. Only census database exists, while population GIS doesn't exist. It leads many problems. For example, one is that each time of the census can't be compared, because the changes of geographical unit. The second is that the geographical analysis of population can't be carried out, and the last is that the registered permanent residence (RPR) population data and census can't check each other. After 1996, our academy started to establish population GIS in urban areas, it was called Urban GIS.

4) Basic Idea of Urban Population Geographical Information System

China is a large country, some cities have new maps, however some cities only have old maps, even 10 years ago. So, Urban Population Geographical Information System in China has own characters. Some experiences of foreign country only can be as used for reference, it must suit for the situation of China.

(1) Logical Model of Urban Population Geographical Information System

The doorplate number is a key factor to connect the registered permanent residence population data and census.
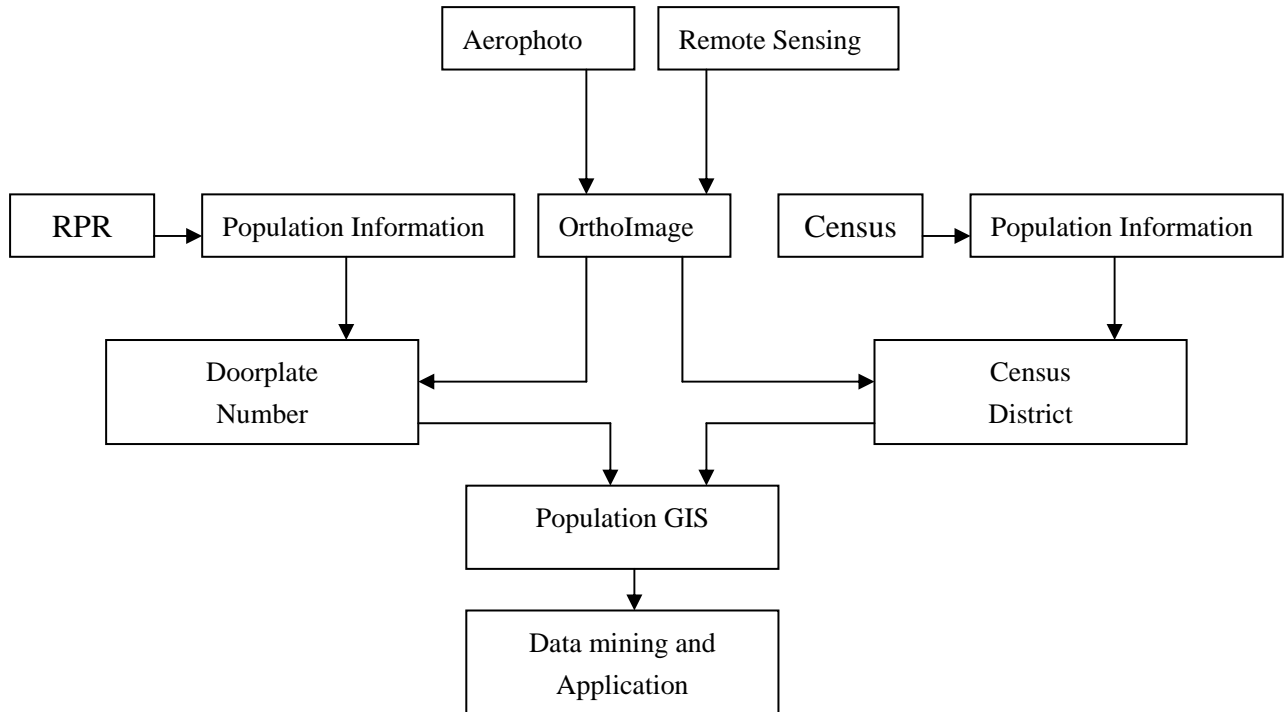

Fig.1 Logical framework of Urban Population GIS in China

(2) In this system, the orthoimage was used for establishing spatial basis.

(3) Doorplate number that was used as the tache to contact geographical information and population information is not available in 2D GIS, while it is obligatory in 3D GIS.

(4) Population equation was also improved with spatial distribution.

(5) In this paper, the data mining was used for getting new data from detail database, the data mining was divided into three levels, they are from data to data, from data to model and from data to knowledge.

5. Conclusions

After finishing several GIS software, the detail GIS is very popular, which not only is feasible in theory, but also takes wonderful economical return. Especially it really exerts the large influence in the special application fields besides simple query and statistic.