Investigation on Application of GIS in Population Management

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Abstract

Complexity of population problems and the biggest population radix make population management much difficult. Traditional manual record card and population information system lagged the development of economy and society. Geographical information system (GIS) is an effective tool to manage spatial data and attribute data, it has been used widely in many fields such as land, environment, urban planning. However, a few of papers consider the applications of GIS in population management.

In this paper, the doorplate number is used to integrate the population data and spatial data, on the basis of the integrated data, the population geographical information system (PGIS) was constructed. It includes the design of scheme, integration of population data and spatial data, functions of system.

Keywords: Population problem, Population Geographical Information System, Population Data, Design of Scheme, Doorplate number

1. Introduction

China is a large country; it has the biggest population radix. At present, to assure the social stable is the key factor to keep the economy to develop much quickly. So, the work of public safety is very important, in order to do this, population management plays an important role. If traditional mode of population management is still in use, this is not appropriate compared with 20 years ago, the flow of population is so large that present simple system of population information isn't enough. That is to say, in China with improvement of social and scientific technology, with the increasing much quickly of population flow, to integrate the population information and spatial information is much necessary.

Geographical information system is a powerful tool to manage spatial data and database. Although it is widely used in many fields, but due to the shortage of population information, it leads the limitation of GIS applications. Both geographical information and population information are basic information, although they can be used lonely, the integration of them will exert the more important effects.

In this paper, following the introduction part two will discuss the construction of spatial basis. Part three proposed the method link the spatial data and population database. Part four listed the functions of PGIS. At last, the concluded remarks were given.

2. Spatial Basis

Spatial basis is a basis to integrate the population and other social information. In this paper, according to the spatial data, several methods to generate the spatial basis were considered. One is with digital topographical maps and no air-photo, second is with air-photos and topographical maps, the third is with no air-photos and no topographical maps.

For the first case, it was divided into the following steps:

Step 1: scanning the negative airborne photos, and then the digital image were gotten;

Step 2: Via the known control points, finishing the relative direction;

Step 3: collecting the digital elevation model;

Step 4: digital correction and digital mosaic;

Step 5: fusion of remote sensing image and black-white airborne image;

Step 6: According the demands of population management, generating the basic geographical units.

For the third case, it was divided into the following steps:

Step 1: scanning the negative airborne photos, and then the digital image were gotten;

Step 2: Via the known control points and reference data of photo, finishing the backside direction;

Step 3: Using the known digital elevation model, correcting the image and digital mosaic;

Step 4: fusion of remote sensing image and black-white airborne image;

Step 5: According the demands of population management, generating the basic geographical units.

For the second case, it was divided into the following steps:

Step 1: scanning the paper topographical map, and then the digital image were gotten;

Step 2: Via the known control points, finishing the correction of DRG (Digital Raster Map);

Step 3: Digital image processing, and finishing the geometrical correction;

Step 4: fusion of remote sensing image and black-white DRG;

Step 5: According the demands of population management, generating the basic geographical units.

3. Integration of Population and Spatial information

Every family has only one doorplate number. The doorplate number is a keyword to link the house in the spatial basis to the existed population database. Because on the spatial basis the image of can be distinguished, at the same time in the population database the doorplate number is one item. The relation between the image of buildings and the doorplate number is 1:n. Via the relation, the population information and spatial information can be integrated (See Figure 1).

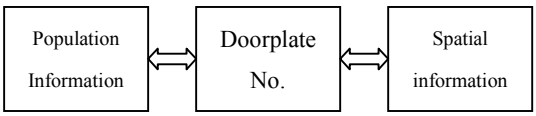

Fig.1 Contact between of Spatial information and Population information

The process of integration of population and spatial information can be divided into several steps as followings:

Step1: to get the population information from the census data;

Step 2: to get the information from resident of police department;

Step 3: to make the unified geographical unit via the spatial information (see figure 2)

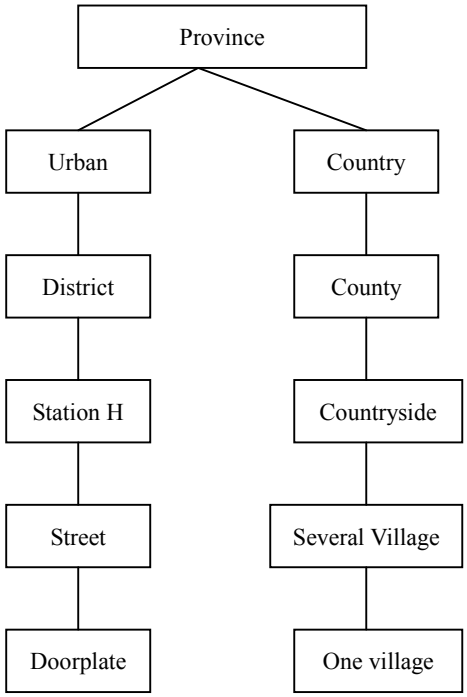

Figure 2. Geographical units of population information

Step 4: to integrate the census data and residence registration data by using the unified geographical units;

Step 5: to link the spatial information database and integrated population information database by the doorplate number in urban area and by the name of village in rural area.

3. PGIS-An Example

In the Hebei province, the city Langfang, which is very near to Beijing, was selected as test area. The 1-meter RS image is used as the spatial basis. A PGIS system was designed and finished. It includes three kinds of functions in the system, first one is to find the place according the population information, second is to find the population information according the

spatial information, and the last is population information spatial analysis (See figure 3,4,5).

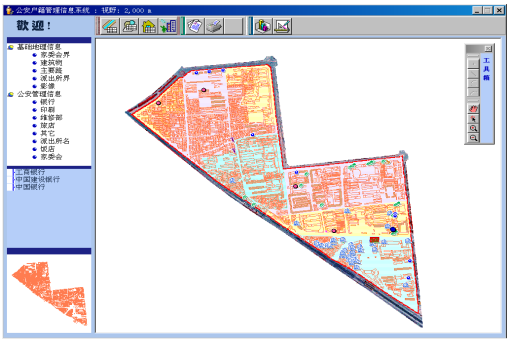

Figure 3 Integration of population and spatial information

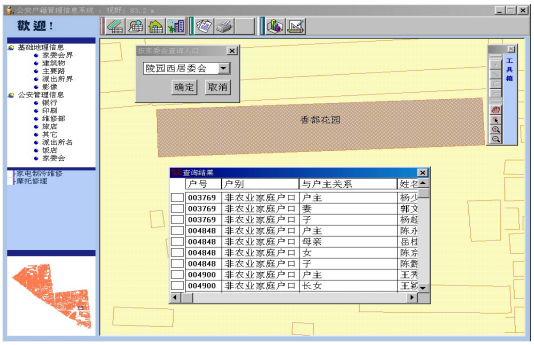

Figure 4. Find the place using population information

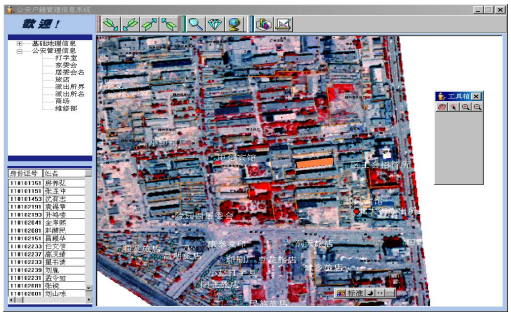

Figure 5. Find the population using place information

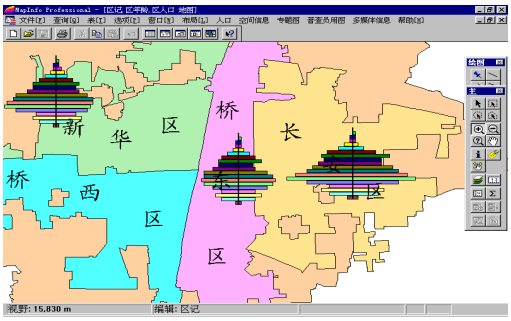

Figure 6. Population spatial analysis.

4. Concluded Remarks

From this paper, several remarks can be drawn: firstly, PGIS is very necessary in china. Secondly, analysis and experiments state that the design and construct method of PGIS proposed in this paper is operative. Thirdly, it is very helpful to population management.

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