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Study on Construction of Database for Confirmation of Rural Homestead Right

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Abstract Confirmation of homestead right is helpful for planning of rural construction land and comprehensive development of new socialist countryside construction. At present, China is carrying out confirmation of rural homestead right on a large scale. Theoretical analysis on construction of database for confirmation of rural homestead right is of great significance for promoting confirmation of rural homestead right. Using the Mapgis urban cadastral management system database, this paper studied the process of creating database for conformation of rural homestead right, and came up with recommendations for update and maintenance of the database.

Key words Land resources, Homestead, Database construction, Land right confirmation

In the *Communiqué of the Third Plenary Session of the* 18*th Central Committee of the CPC*, it proposed deepening rural reform in an all-round way. A highlight is to empower farmers to more property rights and establish urban and rural integrated construction land market. In other words, it is to allow rural collectively owned profit-oriented construction land to be sold, leased and appraised as shares, on the premise that it conforms to planning and its use is under control, and ensure that it can enter the market with the same rights and at the same prices as state-owned land. Due to historical reason, China's rural collective construction land is uncertain in property right and unclear in definition. Therefore, the primary task of empowering farmers to more property rights is to promote conformation and registration and certificate issue of rural homestead. The ultimate goal of this work is to realize clear property right, definite powers and functions, and complete information of rural homestead. Therefore, it is urgent to create database for confirmation of rural homestead right.

1 Task of creating database

The task of creating urban land survey database is to create database and management system containing land use, land ownership, and basic geography and integrating graphics, attributes, and scanned data in urban build-up area and organic town build-up area[1].

It is required to take full advantage of Mapgis urban cadastral management system database, combine the second urban land survey area 80 coordinate system, Autocad format, accepted cadastral surveying and mapping, and ownership survey results, relevant technical standards, regulations, and methods such as *Regulations for Urban Cadastral Survey*, *Standard for Urban Cadastral Database*, and *Technical Regulations for Construction of Second Land Survey Database*, and consolidate and store urban cadastral survey and ownership survey results, and documents of land ownership registration and certificate issue, graphical data, and attribute data[2-4]. It is recommended to create cadastral database interrelated with graphical data and attribute data, correct topological relation, convenient inquiry statistic, and convenient land registration and certificate issue.

2 Items of database construction

(i) Basic geographical information data: including measuring control points, administrative division, contour, and houses, *etc*;

(ii) Land ownership data: including land parcel, estate boundary location lines, and estate boundary location point, *etc*;

(iii) Land use data: including map signs of land type, boundary line of land type, and linear feature, *etc*;

(iv) Tables, report texts, scanning documents, and other data.

According to TD/T1015-2007 *Standard for Urban Cadastral Database*, we listed some required property fields of following objects:

Land parcel: identification code, element code, four boundaries of land parcel, correspondence address, land location, ownership nature, type of land use right, purpose of use, and measured area;

Houses: identification code, element code, affiliated land parcel, number of house, house structure, storey number of house, building area, and floor area;

Estate boundary location lines: identification code, element code, length of estate boundary location lines, nature of boundary, type of estate boundary location lines, location of estate boundary location lines, ownership certificate number or agree-

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ment of estate boundary location lines, number or document of ownership dispute cause;

Other data, such as estate boundary location point, map signs of land type, linear feature, right owner, ownership source certificate, application registration, ownership survey, ownership examination and approval, registration, and other rights, should be input in the database according to *Standard for Urban Cadastral Database*, to ensure attribute of all objects is complete after completion of database construction, and ensure validity of data, for convenience of search, statistics, and output.

3 Process of database construction

3.1 Analysis of original data

3.1.1 Analysis of attribute data. Firstly, it is required to check the original data, namely, whether number of land parcel is complete and whether the corresponding relationship is correct. Also, it is necessary to check designation was made in accordance with rules of "code of administrative division - number of street - district number - number of basic land parcel - branch number of land parcel". If the number of land parcel in cadastral file is not consistent with the number of cadastral survey results, it is required to find out causes and make correction.

Secondly, it is required to check newly surveyed data against previous registration and certificate issue data. If the present owner of land parcel is not the same person registered in the land ownership certificate, it is required to make comments of their relationship in the column of remarks. If the data of newly surveyed table are not consistent with data registered in ownership certificate, it is required to feed back to the bureau of land and resources, and ask it to make field survey and find out causes.

Finally, it is required to check whether newly surveyed attribute data and graphics remain in the same period. If the data are inconsistent with each other, it is required to find out reason for inconsistency and make correction, for example, filling wrong information in the table, or the measured graphic is not in the same period with the attribute table provided.

3.1.2 Analysis of graphical data. We analyzed graphical data using existing Mapgis system data and combining data provided by southern CASS7.0, including street digit, district digit, decimal place, height of land number character, method for numbering of estate boundary location point, graphic and cadastral map note within the land parcel.

3.2 Acquisition of attribute data

3.2.1 Collection of text data. Text data include cadastral survey table, examination and approval data, registration card, and land certificate. During acquisition of text data, attention should be paid to following points:

(i) Rules for input of cadastral number:

According to provisions of TD/T1015-2007 *Standard for Urban Cadastral Database*, the cadastral number of urban cadastral database consists of 19 digits of sequence code, including 6 digits of county level (and above) administrative division code, 3 streets of district/town (township) administrative division, 3 digits of district/village sequence code, and 7 digits of land parcel number, taking Lu'an City of Anhui Province as an example (Table 1).

(ii) Rules for input of ownership attribute.

Table 1 Cadastral number of Lu'an City

Code of administrative division	Street code	District code	Basic land parcel number	Land parcel branch number
6 digits of Arabic numeral characters for county and above level (001 – 999)	3 digits of Arabic numeral characters (001 – 999)	3 digits of Arabic numeral characters (001 – 999)	4 digits of Arabic numeral characters (0001 – 9999)	3 digits of Arabic numeral characters (001 – 999) < alteration of cadastral number >
Taking districts of Lu'an City as an example				
Lu'an City	First street	Second district	First land parcel	After subdivision of first land parcel
341501	001	002	0001	001

As per existing land ownership nature, land ownership can be divided into state-owned land ownership, state-owned land use right, collective land ownership, villager group, village collective economic organization, township collective economic organization, other villager collective economic organization, the results are listed in Table 2.

(iii) Rules for input of types of land use right.

According to existing types of land use right, the land use right in China can be classified into allocation, transfer, buying shares, leasing, authorized operation, auction of wasteland, allocated homestead, allocated enterprise land, rural land contracting, collective land buying shares, and other types. The land use types are determined and input according to cadastral survey data, as listed in Table 3.

3.2.2 Acquisition of image data. Acquisition of image data is relatively simple. Use the scanner to directly scan various documents into jpg format images. The scan should be chromoscan, image should be clear, not oblique, and free of missing. During acquisition of image data, attention should be paid to following points:

(i) Scanning and storage of image files:

Firstly, divide catalogues as per streets, each district under the street is stored in a catalogue, and each land parcel under the district is stored in a catalogue.

For each land parcel catalogue, image data are stored as per image type.

For common land parcel, storage type is similar to independent land parcel with the difference of adding the letter "G" in the catalogue name as prefix, the subordinate catalogue name is common land parcel number. The ownership survey data are stored

under the common land parcel catalogue.

Table 2 Nature and code of ownership already confirmed

Code	Nature of ownership
10	State-owned land ownership
20	State-owned land use right
30	Collective-owned land ownership
31	Villager group
32	Village collective economic organization
33	Township collective economic organization
34	Other farmer collective economic organization
40	Collective-owned land use right

Table 3 Type and code of land use right involved in confirmation of right

Code	Type of land use right
11	Allocation
12	Transfer
13	Share buying
14	Leasing
15	Authorized operation
21	Auction of wasteland
22	Allocated homestead
23	Allocated enterprise land
24	Rural land contracting
25	Collective land buying shares
99	Others

(ii) Items of acquisition of image documents:

The cadastral survey table, mainly including four boundaries of land parcel, mark of estate boundary location, comments of surveyor, and sk*etc*h map of land parcel;

ID card or other identification documents of the owner, scanned power of attorney for estate boundary location, scanned ID card or identification documents of entrusting party;

Examination and approval table, mainly including opinions of examination and approval, and details of land parcel;

Application form, mainly including land user and four boundaries;

Source data of ownership, including of copy of land certificate, transfer contract, and sales contract (all pages should be scanned); Land registration sheet, registration of sheet by household, and *etc*.

3.3 Acquisition of graphical data Graphical processing is mainly to convert cass7.0 generated from cadastral measurement and previous Mapgis data into necessary data format (SHAPE format), plot to strict topological relationship, assign necessary attribute to graphic, and input the graphic into database, to complete processing of entire image.

3.4 Data linking to database Using Jiangsu Jintu urban cadastral management system software, link the graphical data and attribute data meeting requirements of database construction through quality inspection (for example, land parcel map and attribute of input are linked through unique land parcel number), attributes of other graphics can be linked in diverse methods through spatial position of different graphical documents.

Input spatial data and attribute data after completion of linking complete attribute into the urban cadastral database management system, and the data input process is as follows:

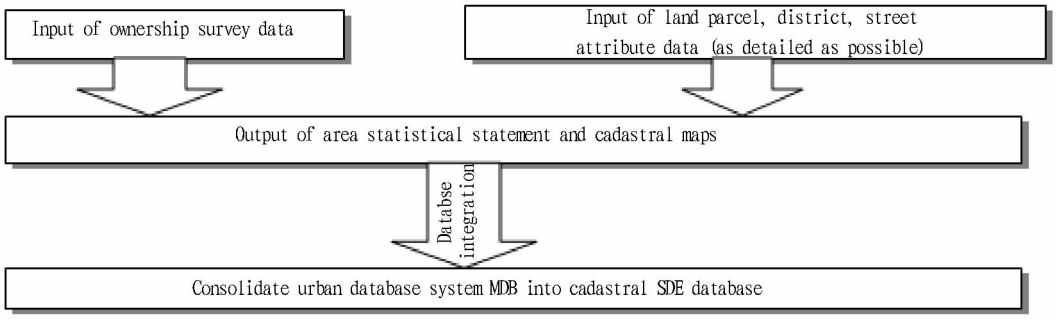

Fig.1 Technical map for process of data input

With the aid of database management system, input graphical and attribute data into urban cadastral database management system in accordance with following steps:

(i) Establish data glossary and map index in accordance with *Standard for Urban Cadastral Database*;

(ii) Create meta database as per acceptable content and format;

(iii) Input acceptable attribute and graphical data into application database;

(iv) Run the test according to software functions, the technical responsible person signs after it passes inspection and acceptance.

4 Recommendations for update and maintenance of database

Before carrying out second land survey database construction and urban cadastral management information system, we have completed several land survey and database. In view of current situations and experience, we came up with following recommendations:

4.1 Establishing second land survey office to increase training and experience exchange Urban cadastral survey and database construction involve mapping, land, and GIS technologies and it is very difficult to complete. In order to proficiently apply software and satisfy business demand, it is recommended to strengthen training of relevant leaders and grass-roots personnel, to promote experience exchange.

4.2 Strengthening management and database quality control and establishing security and confidentiality system in the process of database application In the process of database putting into operation, it is recommended to establish a set of

management system for operators and system administrators. Every operator should do every step of work in strict accordance with requirements, to avoid problem of certain link leading to failure of subsequent work and consequently influencing work progress. Besides, it is recommended to ask system administrators to make regular maintenance and data backup, to avoid computer virus damaging system and leading to data loss or corruption.

4.3 Carrying out integrated management of temporary database, current database and historical database in case of change of database At present, changes in majority land survey database are stored in current database and historical database. Such operation is handled by input operator after inspection of data quality of changed data package. Current database is changed directly for cadastral data and the data before change would be input into historical database. Such mode empowers all powers of database entry to the operator. The power is excessively centralized and free from supervision. Once there is any error or inconsistency in data change, it will be difficult to locate and will inevitably bring hidden trouble for future work. Therefore, it is recommended to carry out integrated management of current database, temporary database, and historical database. Database entry operator should store changed data in temporary database for the time being and does not make change of current database until the person handling checks, examines, and approves. In the event of any problem found, it can return promptly and the database entry operator can correct the error. This improves management mode of land survey database.

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(iii) According to difference of working conditions, the working information interface consists of plowing, harrowing, sowing, pesticide spraying (irrigation), fertilizer application, and harvesting, helping drivers to grasp working conditions of tractor and increase working efficiency.

(iv) The camera monitoring interfaces monitors ground working conditions beyond field of vision of drivers, helping drivers to grasp more working information.

(v) The fault diagnosis interface provides signal alarming, fault alarming, fault diagnosis and maintenance information, removes faults and provides maintenance advice for drivers once there is fault, and assists drivers to make routine maintenance and extend service life of tractor during normal drive of tractor.

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