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Research on Key Technology of Grid Cell Division Method in Rural Community

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Abstract: Village and town are the basic unit of our society, there vigorously development in social management and innovative plays an important role in promoting economic growth, maintaining social stability, improving people's living environment and other aspects, but the traditional government management mode can not meet the claim of the social development of the villages. Based on the idea of grid management model, this paper presents the the principles and method of grid cell division in the process of the grid management in the village community, and to analyze the division method so as to provide evidence for the scientific, rational division of community grid unit.

Keywords: management, grid cell division, village community

1 Introduction

As the market economy continues to develop, village society presents a diversified development trend, along with the development of the towns, village members appeared stratified society, dispatch phenomenon, which leads to differences complicate the values and interests of the main interests of the village community sources of. The village society of pluralism, diversity is bound to induce complex social needs, social conflicts and problems, the improper disposal may cause discontent among the members of the village community, and even leads to mass incidents [1]. For China, a vast country with a large agricultural population, the role of towns and villages in the county of socio-economic development can not be ignored. Facing the new situation and the new problems of rural society, rural grass-roots government's public service still follow the tradition of fragmentation, the fragmented nature of resource allocation and administrative work, this kind of government management model is clearly not meet the requirements of the village social development. Particularly in industrialized, urban reform orientation of the development process, long-term adherence to the "urban bias" in public policy-oriented, leading to a serious shortage of village public services.

How in the new rural governance system effectively extend the management and service functions of government to farmers, covering the entire villages is a new topic in the new situation of grass-roots social management innovation. Thus, according to

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the new characteristics of rural community development, the research on the method of new village community governance has important theoretical significance and practical significance [2].

Grid management is a new management model, which was worked out in the construction of China's urban grass-roots social management in recent years, it mainly refers to in accordance with certain criteria the community are divided into a plurality of mesh, as the basis of the IT and grid coordination mechanisms, the sharing of resources between the grid and efficient exchange of information, and ultimately achieve the optimal allocation of resources, improve the efficiency of the new management thinking for the community management [3], to solve community information due to the work and information integration across sectors shared problems brought [4]. Grid management centralized dynamic management, fine management and flat management, the use of digital management technology, from the perspective of social management, to integration of social wealth and resources, eliminate information silos, to achieve information sharing and coordination office, can greatly improve the efficiency of community management, saving management costs, laid the basis for innovative community management model [5-6]. Therefore, exploring for grid management model for village communities has great significance in urban and rural dual economic structure and build a new socialist countryside construction.

2 Grid Cell Division

Grid Cell division is the basis of geographical network applications. It has a relatively large workload. The first step in constructing the grid management system is to divide each grid cell, there must be some criteria for the classification constructed so that for standard each grid cell's construction and management, in order to facilitate the implementation of grid management.

Village space meshing has rules division and irregular division. Village spatial data is complexity and variety, space meshing will directly affect the entire village grid system and the management based on this. Geography meshing should give full consideration to the workload of each mesh grid administrators, and should be divided according to the village space form, and should consider the integrated grid area, the number of households within the grid, the number of towns and villages within the grid and other parts of factors. In this paper, three division methods are proposed according to the administrative divisions, road blocks and regular grid.

2.1 Principle of Grid Cell Division and Geographical Elements

The division of the grid cell should follow the principle of a statutory basis, territorial management, geographical distribution, the convenience of management, space and relative stability. Space grid with rectangular shape is appropriate, and the ratio of length to width should not be too large, meanwhile, it should avoid the appearance of "7" shape or "concave" shape of the space grid.

The division of the grid cell should be in accordance with the layout of the village lanes, courtyards and open spaces, rivers, mountains, lakes and other natural

geography. References to the standard of the relevant grid division recommended by the construction department can give the following method for the division of geographical elements. Geographical elements mentioned here may not be comprehensive, in the implementation should be flexible to grasp.

(1) Boundary. Spatial grid can not cross the township, village, administrative boundaries.

(2) Settlement places. In general, considering the ownership relations, put the buildings which have a wall or have unified label on the topographic map in a spatial grid. A building which is inconsistent with the ownership should be based on the adjacent relationship, as far as possible subdivided into a grid with rules shape.

(3) Hilly area. According to its boundary (the slope bottom or the bottom of the slope), in principle, hilly area is divided into an independent space grid. If there is a high degree of highway in the middle of the mountain, it can be divided into several mountainous areas in accordance with the road. In the boundary of the mountain division, first consider the river and road at the bottom of the slope, if existing rivers and roads divide the mountain and other according to the roads and the rivers. Otherwise, to divide the sideline according to the steep ridge or the fence, etc. In addition, lakes, reservoirs and rivers in the mountains and small area residents and other features are generally no longer to be divided, and as a part of the mountain space grid [7].

(4) Waters. It mainly includes linear rivers and lakes, reservoirs, etc. To make the central line of the river as the boundary of the space grid (If the river is the boundary of the administrative division, treatment by administrative divisions), and according to the grid object distribution, the river can be divided into the appropriate space grid. For relatively large reservoirs and lakes generally divided separately, if the area is lesser, which can consider a merger with the surrounding terrain for the same space grid.

2.2 Grid Cell Division Method

2.2.1 According to the Administrative Divisions

Administrative divisions are in the area of the state to facilitate the administration and hierarchically divided region, also known as administrative region. In the villages and towns, the village is primary mass self-government organizations of the villagers elected by the villagers, it is the township (town) the next level of administrative division, setting up a villagers' committee, and accepting the guidance of the administrative authority at the next higher level. Space grid division, which is according to the township (town) - the village of the administrative rank level division. The first step is to meet the needs of villages and towns management departments, do the division of "rough" class level. Township and village boundaries are certain legal boundaries, and once determined it is difficult to be amended, unless the authorities to modify the boundary line. The second step is to meet the needs of rural management and other functional departments, do the division of "fine" class level. Comprehensive analysis is needed to determine the size of the smallest unit grid, which is division of

rural space grid by the comprehensive analysis of the survey report, multiple data source graphics overlay, contrast, and field survey. In the area of the villages and towns, the geographical elements are diverse. The division of the region is actually a partition of the geographical elements..

The basic idea of the geographic grid according to the administrative division is that village as the unit. According to the territorial management, geographical distribution, the status quo management, convenient management, integrity management objects, etc. The town is divided into a number of geographic grid units. The geographic grid divided according to the administration should follow the following principles.

(1)The division of the grid cell should be carried out according to the statutory topographic survey data, the scale should generally be with 1 / 500 advisable, but should not be less than 1 / 2000. When dividing grid cell, the larger the scale, the grid line to be more accurate, and management object is more accurate positioning.

(2)The maximum boundary of the unit grid is the villages boundary, and one village has a grid at least.

(3) The division of the grid should be adapted to the current situation, and not split more than ten thousand square meters of independent courtyard,division of the units of the independent courtyard. In the actual process of separating, the area of the unit grid may be reached tens of thousands of square meters.

(4) The division of the grid must enable service behavior to be easily realized, in the process of information service, whether considering the traffic tools, or consideration to the problem of rural politics of rapid processing, etc., all requirements can be easily arrived at the scene.

(5)Building can't be split.Otherwise the description of the location of the management object will be ambiguous.Villages and towns management object can't be split.Otherwise you will produce the phenomenon such as cross or management absence. Unit within the grid management object number is roughly balanced, for the implementation of the management behavior, evaluation and so on, are very necessary.

(6) The splicing between the elements of the grid must be seamless splicing, and can not overlap, otherwise it will inevitably produce the phenomenon such as cross or management absence.

2.2.2 According to the Road Blocks

In the villages and towns, block plays a very vital role in traffic.It also divides the village into different areas. Block itself is a kind of irregular geographic grid, therefore, it can be divided into geographical grid based on block elements. The basic idea of dividing geographic grid according to the road block division is that in the block formed between the main road as the basic unit in the towns and villages, in each block unit which is divided into irregular geographic grid according to the actual geographical distribution and non-trunk, the roads should be divided as an independent unit grid. The geographic grid separated according to the road blocks should follow the following principles.

(1)The division of the unit grid should be carried out according to the statutory topographic survey data, the scale should generally with 1 / 500 advisable, but should

not be less than 1 / 2000. 1 / 500 1 / 1000 and 1 / 2000 are three kinds of scale topographic survey data can be used to divide the unit grid.

(2)The maximum boundary of the unit grid is the boundary of the road block, and one block has at least one unit grid.

(3) The division of the grid unit to be carried out in accordance with the layout of the village lanes, courtyards and public green space, square, bridge, open space, rivers, mountains, lakes and other natural geography.

(4) The division of the grid should maintain the integrity of the independent courtyard, and do not split the larger detached courtyard. In the actual process of dividing, the area of the unit grid may be reached tens of thousands of square meters.

(5) The division of the grid must enable service behavior to be easily realize, in the process of information service, whether considering the traffic tools, or consideration to the problem of rural politics of rapid processing, etc., all requirements can be easily arrived at the scene.

(6)Building can't be split, otherwise the description of the location of the management objective will be ambiguous; Villages and towns management object can't be split, otherwise you will produce the phenomenon such as cross or management absence. Unit within the grid management object number is approximately balanced, for the implementation of the management behavior, evaluation and so on, are very necessary.

(7)The splicing between the elements of the grid must be seamless splicing, and can not overlap, otherwise it will inevitably produce the phenomenon such as cross or management absence.

(8)The road as an independent unit grid to be divided.

2.2.3 According to the Regular grid

Regular grid square is a kind of geographic data model, namely, can express geographic information as a series of grid cells, which are of the same size and align by rows and cols. The first step of dividing geographic grid is to divide the large scale map into regular grid square by with a certain distance. These grid squares are composed of a regular geographic grid.Each geographic grid determines its location by the coordinates of its center point. If necessary, geographic grid can be subdivided according to the actual surface intensity, such as sparse objects without the need of mesh subdivision, but intensive surface features can be subdivided into geographic grid according to the needs, from high level to low level of different thickness.

Geographic grid , divided by regular grid square , whose properties should be determined, because of their different properties contribute several algorithms in the following:

(1)Central Point Method, Central point method is the most simple method of properties discrimination. The core idea of Central point method is taking the attribute values of the central point in source regions as the attribute value of the entire grid area for each grid. Central point method is applicable to the geographical elements with continuous distribution characteristics. In the practical application, there may be the center point of the grid area falls on the boundary of many source regions and can't determine the position ownership of the center point. Then require combined

with other methods, or directly by analysts, according to the experience and the need to clarify the properties.

(2) Preponderant Area Method, Preponderant area method takes the attribute value of the source region, which is the largest component of the grid region, determines the value of the entire grid area. It can be applied to the case of a finer classification and smaller grid [8].

(3) Weightiness Method, Weightiness method according to the importance of the non-homologous region in the area of the grid, the most significant source region is chosen to decide the attribute value of the grid area. It is suitable for the region with special meaning and less area.

3 Analysis and Comparison

According to the division of administrative division the geographic grid, makes the information of towns and villages in the space forming three levels, and clearly determine the responsibility of village management at each level. The first level is townships (towns). The responsible person in the village management is the township (town) government. The second level is the village, the responsible person is the village committee; The third level is the geographical grid unit, the responsible person is a special geographic grid unit management personnel. Geographical grid encoding is the same with administrative divisions encoding. There is no phenomenon road and road intersection because of the management cross or management defects. The disadvantage is that the data is not easy to manage, and the flexibility is not high.

According to road blocks divide geographical grid, blocks network on the map has an obvious boundary, thereby dividing the grid cells relatively easy, and take the road as a separate grid may avoid road cross management or management vacancy phenomenon. The disadvantage is that according to the district road network divide geographical grid may be conflict with the administrative divisions. For example, two different villages or groups (teams) in the region are likely to be divided into a geographic grid unit, resulting in conflict with administrative divisions. Correspondingly, the geographical grid encoding and the grid components encoding conflict with the administrative divisions encoding. The intersection of the road can cause the phenomenon of the management across or management absence. The road unit grid and the grid of the adjacent units need to be equipped with the management personnel, which will cause the waste of human resources.

Geographic grid divided in accordance with the square grid is a regular grid, is contributing to store the geographic space information, management and spatial analysis, but it can't guarantee the surface features' integrity. Many surface features are split in different geographic grids, even the relatively larger independent courtyard will be split in several unit grids. That will easily cause the management across or management absence. And the properties in a single grid are not sole. There may be a number of different properties in the grid.

4 Conclusions

The new model of rural grid management is still at the stage of theoretical exploring and researching. This paper discusses the grid partition technology in the village and

town grid management, and gives out the specific principles and method of grid division. In the implementation of the actual grid partition should according to the characteristics of local topography and the village or town planning layout, combined with the advantages and disadvantages of various divide method, considering each management subject of convergence after grid partition to avoid the fracture of management services rights, finally archive success of covering the whole management and full service in village management grid construction and operation process.

References

1. Fuying Lu. Cooperative service: Innovation Mode of Rural Social Management [J].Study&Exploration, 2012, (1).64-65.
2. An-xin Huang.Governance of New Rural Communitese in the Context of Urbanization[J].Journal of GuangZhou open university,GuangZhou.2011(4).
3. Mengxiang Gao. The Study of China's Urban Community Grid Management [D].HeNan: Henan University,2013:1-3.
4. JaneE.Fountain. Building the Virtual State Information Technology and Institutional Change[M]. Washington: Brookings Institution Press,2001.
5. Ming Chen. The Research on Lucheng Town Community Grid Management[D].AnHui: Anhui University,2013:2-4.3-10.
6. Richard C. Box. Citizen Governance: Leading American Communities into the 21st Century[M]. New York: SAGE Publications Inc,1998.
7. Linyan Li. Plotting of City Spatial Grid Based on Field Mode [J].GEOSPATIAL INFORMATION.2008(4):96-99.
8. Liangfeng Zhu.GIS Study on the Gridding of Vector Polygon in GIS [J]. Geography and Geo-Information Science.2004(1):12-15.