Research on the computer evaluation of land price in Urban-rural Fringe Based on RS and GIS

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Abstract. Urban-rural fringe land prices is the weak spot in the study of land prices, rapid and healthy development of land market demands on the land price evaluation. Under the guidance of the concept of sustainable development, this paper discusses the composition of land value in the rural-urban fringe, which is divided into three parts: the value of quality, the value of the environment and the value of existence. The value of quality is evaluated by revenue reduction method, but at present, when using this method to evaluate the land price, the actual pure income is used to replace the expected pure income, resulting in the unreasonable land price. This study systematically demonstrated the feasibility of using grey system modeling to predict the expected net income of land, and analyzed the whole modeling process. Finally, the model was applied to the land valuation of urban and rural areas in our city.

Keywords: Urban-rural integration, Remote sensing, Geographic information system, Land price, Digital land price model

1. Introduction
Urban-rural fringe is the transition between cities and villages, the border area, refers to the distribution of the city as the center[1]. With the evaluation of urban land and agricultural land becoming an important part of the new round of land resources survey of the ministry of land and resources, a series of research results have been obtained[2]. However, how to set the price in the borderland of the two is a common concern of all levels of government[3]. Therefore, to carry out the urban-rural fringe land grading and evaluation research, in theory for further consummates, our country land price and land price policy system is of great significance, in practice, to promote the city's economic development, to set up the integration of urban and rural land price system, increase the productivity of urban-rural fringe land and land use has practical guiding significance to the comprehensive benefit, etc.
2. Evaluation concept of land price in urban and rural fringe areas

2.1. The concept of urban-rural fringe

Integration of urban and rural areas, it is to point to a combination of city and country special economic and geographical unit, the economic and geographical unit is different from pure urban areas, and different from pure rural areas, is both the urban style and features, and have the characteristics of the rural economic geography space, is a component part of urban geography, extending outward from the city proper, the final transition to the agricultural land.

2.2. Formation of urban-rural fringe

According to the famous French economist porous, economic growth does not appear in all regions at the same time, but first appears in the big cities or central regions according to different intensity, and then by the big cities or central regions to the surrounding areas continuously spread. According to person’s view, economic growth can be divided into two distinct stages: aggregation and diffusion. The former is a variety of factors of production to the big cities or regions concentrated at the center of the stage, it is because of all sorts of factors of production concentration and optimize configuration, promote the trans’ normal development of big cities or a center area, make it become a country's economic growth pole of the latter is a variety of factors of production by the center of big cities or spreading to the surrounding areas, the reason is that big cities or central area due to large amounts of various production factors together to make it appear too cramped, narrow space has seriously restricts the further development of big cities and the center area, so the factors of production in the central regions of the big cities or to move its surrounding, in search of a broader Development space. Since large cities or central areas are generally not isolated in the oasis of the desert, but often adjacent to rural areas, the factors of production in large cities or central areas spread outward, that is, to vast rural areas.

The current situation of land use comprehensively reflects the characteristics of urban and rural landscape, so it is taken as the main basis for defining the urban-rural boundary[4]. In the computer processing using RS and GIS, we use some expressions:

\[ W = - \sum_{i=1}^{n} X_i \ln X_i \]  \hspace{1cm} (1)

In expression (1), W represents the percentage of the area occupied by a certain land use type in Xi sample, and I represent the number of land use types in the sample.

At the same time, in the United States, Japan, Russia and other countries, income reduction method is one of the most commonly used methods in land assessment, it is also the basic method for the assessment of houses, real estate or other assets with income nature[5]. When this method is applied to land appraisal, the purchase of land is regarded as an investment, and the land price is regarded as the capital invested in the purchase of land income in future years[6]. Therefore, the income reduction method is a method to reduce the expected annual net income of the land to be estimated in the future with a certain income reduction rate as the total daily income in the evaluation period. When the method of revenue reduction is used to calculate the land price, the total revenue should be obtained...
first, then the total expense should be deducted, and the revenue reduction rate should be used to reduce the total cost, and then the revenue price of the land can be obtained after proper correction. The basic formula is:

\[ P = \frac{a}{r} \]  

(P for land price, a for net benefits for land, r for land reduction rate.)

3. Land price evaluation based on RS and GIS

3.1. construct reasonable land price classification index

In order to reflect the characteristics of land in the urban-rural fringe as much as possible, based on the current unified "national land classification" of urban and rural areas in China, a two-level land classification interpretation index composed of agricultural land, construction land, and unused land is adopted, whose composition is shown in table 1:

| First class                     | Second class                                |
|---------------------------------|---------------------------------------------|
| Agricultural land               | Cultivated land                             |
| land used for building          | Garden land                                 |
|                                 | Urban construction land                     |
| Unused land                     | Rural construction land                     |
|                                 | Land for traffic construction               |
|                                 | Waters                                      |
|                                 | Unused land                                 |

At the same time, through the analysis of TM image color, texture, shadow, size, shape, structure and other signs, combined with the field investigation comparative analysis, established the type of land - optical interpretation identification system.

The rural-urban fringe is an area where agricultural land and construction land coexist. Most scholars think that the grading and evaluation of agricultural land should follow the general idea of "grading first, evaluating later"[7]. This line of thinking mainly considering the factors of regional agricultural land indicators, thus argues that according to the different regions of the natural and social economic characteristics, a division control area, try to be the same control areas, the natural conditions of agricultural production, agricultural land use, crop structure, production layout, social economic condition and the consistency of the technical level of agricultural production practice has proved that this way of thinking is entirely correct and necessary. On the other hand, due to the lack of land transaction data in the urban and rural areas, it is difficult to evaluate the land directly. Therefore, before land evaluation, the land should be graded to divide the areas with relatively consistent land quality. It can be seen that it is particularly important to grade the land before appraising it.

3.2. Establish the land resource use value system with different demand

The characteristics of land resources can be summarized as natural characteristics, economic characteristics and human characteristics, according to which many functions and USES of land
resources can be derived and evolved. Specifically, in addition to the land resources has been widely accepted in the production and load features, also includes some other functions, such as wildlife habitats, biodiversity conservation, protect the ecological environment, an ethical and moral education base, the value of the natural landscape. The value of these functions is hardly reflected in the current market price system. Its value composition is shown in figure 1:

![Figure 1. Land resource utilization value system](image)

These functions and purposes can be integrated into two final function or purpose: the first is as Spaces with human production and life, which provides a kind of bearing. Secondly, directly or indirectly to provide the production and life of the human needs of the product or resources, such as all kinds of mineral resources, food, that is, land resources have a productive function. Under the strategy of sustainable development of resources and environment economic theory, resources include land resources in addition to be able to bring to mankind the direct material comforts direct function, there are many cannot bring contemporary material directly enjoy the non-use value of function, and as the land resources gradually reduce, this produces the use value of the function will be more and more apparent.

4. Conclusion
This study combined with remote sensing and geographic information system technology, the current research hotspots in land of the urban-rural fringe land price is studied. Firstly, the boundary range of urban and rural areas in our city is analyzed and determined, and the land in this region is graded and evaluated by using spatial analysis and mathematical statistics model. On the basis of DSR model, the land grading factor system of urban and rural fringe area was established, and the types of each factor were analyzed. According to the specific situation of urban and rural fringe area in our city, the analysis method of GIS and traditional analysis method were combined to quantify each factor. Finally, the land grade of urban and rural fringe area in our city was divided, and the benefits were verified.

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