Making Price Index of Detached Houses
in Tokyo Metropolitan Area

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Abstract: The information about transactions of real estate has tended to be not open. Therefore, it has been difficult for individuals to judge the proper price of each real estate. In the course of time several studies have been conducted on proposing criterions for judging the proper price of real estates. As to office buildings and apartments, it is proved techniques required for making criterions have been achieved to a certain extent. Therefore, this research aims to make methods that propose to consumers reliable criteria for judging the proper price of detached houses. The methods are based on hedonic price method and micro-level spatial elements peculiar to detached houses are considered.

Keywords: real estate, hedonic price method, address matching.

1. Introduction

In Japan, after the war the price of real estate continued to rise rapidly and thought that never came down for the long time. However, it plunged suddenly in the first half of the 1990s. It is so-called bubble collapse. The price of the real estate wasn't decided by a clear basis and to estimate risk at the real estate was made neglected. At present, the real estate company and the real estate appraiser have the information about dealings and the price of the real estate. This kind of information is generally rarely made public and rather indistinct. Therefore, as for individual's evaluating a value at each real estate objectively, appraising, the difficult status continues. Received such flow, the technology that appraise the value of the real estate logically which in the past real estate appraisers judge by their scent and the experiences has been required.

It appraises a value logically in the real estate and generally, as the shown one, so-called the real estate index exists. The real estate index is the one to have shown the basic value which becomes the standard of the price at the real estate at the index when judging a value at each real estate. With this index, it becomes possible to judge which degree the price which each real estate is proper.

Some techniques exist in the way of calculating the real estate index. The index for office buildings is mainly used in the profits return method. The profits return method is the technique to evaluate a value at the real estate by the profit by the fare fee.

Also, as for the index for apartments, hedonic price method is mainly used [1][2]. The dependent variable of hedonic price method is the price of land and a house price. It estimates an influence over the price of the environment in defining the price function the explanation variable of which was environment and a thing itself element and analyzing a multiple regression and it shows the one to have made the quality of the house a standard. The element which is used for the explanation variable has a distance to the nearest station, approach-ability to the downtown, monopolization area, building year, balcony area, total number of houses, the number of the rooms and so on.

However, the service of the real estate price index for detached houses is moving ahead hardly. It is said that, as for the price of detached houses, compared with the one of office buildings and apartments, the peculiar factor has an influence on the price and that combination of the conventional spatial data and the conventional technique have not solved this problem.

Base on above background, this research aims at making real estate price index of detached houses by searching and analyzing the factors which decide the price of detached houses. This index makes it possible for consumers to know the reliable criteria for judging the proper price e of detached houses. In this research Tokyo metropolitan area is targeted because of the possibility of collecting data. The methods are based on hedonic price method used in the studies about apartments mostly, and by considering additionally micro-level spatial elements peculiar to detached houses, this research aims to create the high resolute index.

2. Method for Making Price Index

2.1 Decision Factors of Detached House Price

It may well be said that decision factors of detached house price are divided into two. One is the living environment around the place where the house is located, and the other is the micro-level element peculiar to detached houses. As the factor of living environment the

houses. As the factor of living environment the following items are considered.

- Distance from the nearest station, downtown
- Super markets, stores, Elementary schools, parks and so on.

As the micro-level element peculiar to detached houses, which seems to have an influence on the price, the following items are considered.

- land shape
- land inclination
- accurate path distance

As for these items, in detached houses, the dispersion is a seen element as the element which is peculiar to the thing. The thing with the heavy specific gravity which has an influence on the price as the factor which is peculiar to detached houses is sufficiently thought of.

Also, by using road network data, the distance from each houses to the station and so on can be more correctly calculated.

2.2. Land Shape

As for the land shape, it is expected that the shape where the balance is better than the distorted form is liked. Here, using the building shape polygon of the ZENRIN map, the land shape is estimated.

First, it extracts block and building shape polygon from the ZENRIN map. Next, by the division algorithm to have considered road condition, a floor-area ratio and so on, in the land shape, it does Voronoi division or buffering and it estimates a land shape. Division example is shown in Fig. 1.

2.3. Land Inclination

Whether or not the sunshine is good with the land inclination and also how ups and downs of the land has an influence on the price are considered. It uses 3-Dimension data, Mitsubishi DiaMap with the high-precision land altitude which was created by the satellite digital image and laser measure. Fig. 2 is TIN map around Shibuya.

2.4. Accurate Path

Using Sumitomo road networks that a car navigation system is used, it seeks a distance among the place ones correctly. With this, it is possible to improve in the precision with distance. As the result, it is expected that the precision of the index improves.

2.5. Spatial Data

Here, spatial data used in this research are listed.

Price data of real estate
- Recruit real estate data: detached houses for sale (sold price), from April 1990 to October 2002, 23 wards in Tokyo, "Go"-level, 29,650 samples
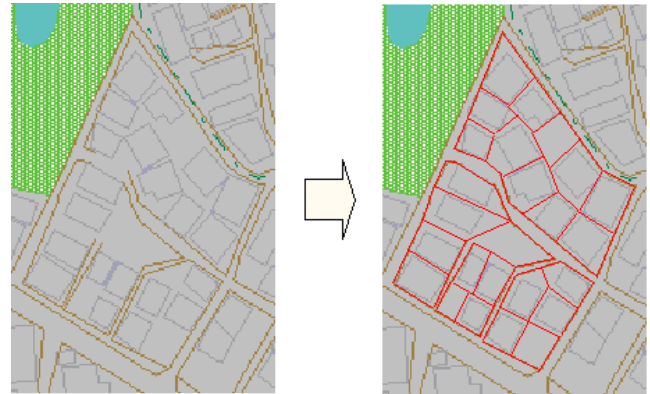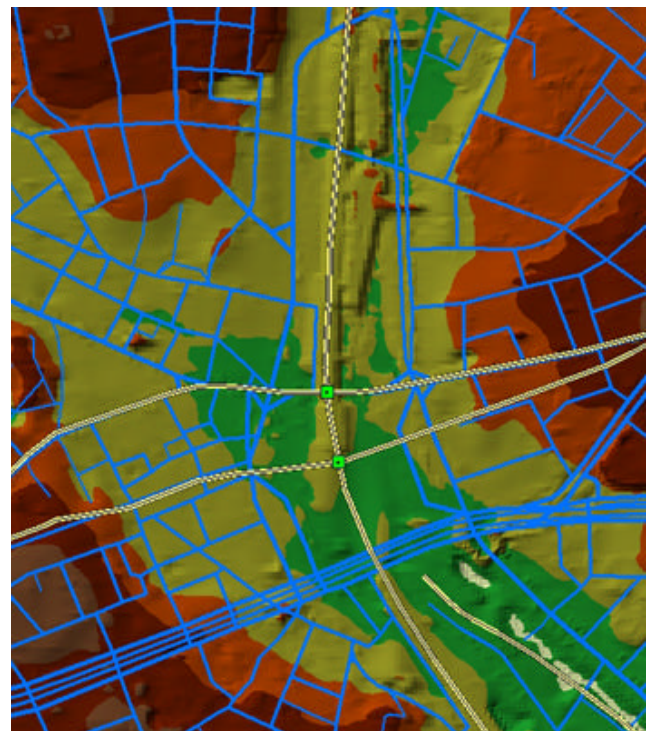

Fig. 1. Division of Land Shape.

Fig. 2. Land Altitude near Shibuya.

- ISIZE Housing Information: detached houses for rent (offering price), from January 2002 to August 2003, 23 wards in Tokyo, "Cho"-level, 2500-3500 samples per month

Environments
- Super markets, elementary schools, convenience stores, banks: NTT Townpage, RITZ Co. Ltd data

Detailed spatial data
- Land shape, land inclination, building shape: ZEN-RIN Map, Mitsubishi DiaMap (3-dimension map)
- Accurate path: Sumitomo road networks

Some of these data can not be read in GIS as the direct

map data. Their spatial data becomes a map using the address matching which is described to the following paragraph.

2.6. Address Matching

Address Matching is a method to extract address and convert it to coordinate. To display spatial data which an address is given to over digital maps, the coordinates value like the latitude and the longitude must be calculated from the address which is contained in the spatial data as the attribute. In this research CSV Geocoding Service [3] is used for address matching. This is the service which does the automatic addition of the latitude and the longitude in the data file which contains the address notation of the CSV format on the internet using the map of ZENRIN. By this the text data which an address is given to like Fig. 3 gets to read it with the electronic map and to be able to be displayed.
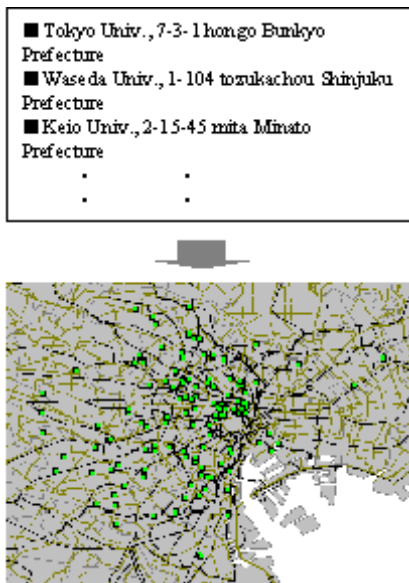

Fig. 3. Address Matching.

3. Price Map of Detached Houses

Here, the price map of detached houses centered on the neighborhood of Shibuya is shown in Fig. 4. The distribution of the value which divided the sold price of detached houses for each by the building area is shown with the about 30 meter meshes. The unit of the number in the legend expresses a price per square meter by 10,000 yen.

4. Conclusions

In this paper the price map of detached houses is made. It is necessary to develop the individual technique to have proposed in detail in the future. Also, the development of the technique to more efficiently process the micro-level element to take into consideration, the removal of the noise of each data and the detailed evaluation of the quality, the error of the data, too, can not be missed by the index precision improvement.

References

[1] Ono, H., H. Takatsuji, and C. Shimizu, 2002. Development of House Price Index which has adjusted quality for Secondhand Housing Market in Tokyo Metropolitan Area, *Reitaku Institute of Political Economics and Social Studies*, working paper No. 3, pp. 1-36.

[2] Ono, H., H. Takatsuji, and C. Shimizu, 2002. Estimation of Hedonic Price Model for Secondhand Housing Market, *Reitaku International Journal of Economic Studies*, vol. 10, No. 2, pp. 81-102.

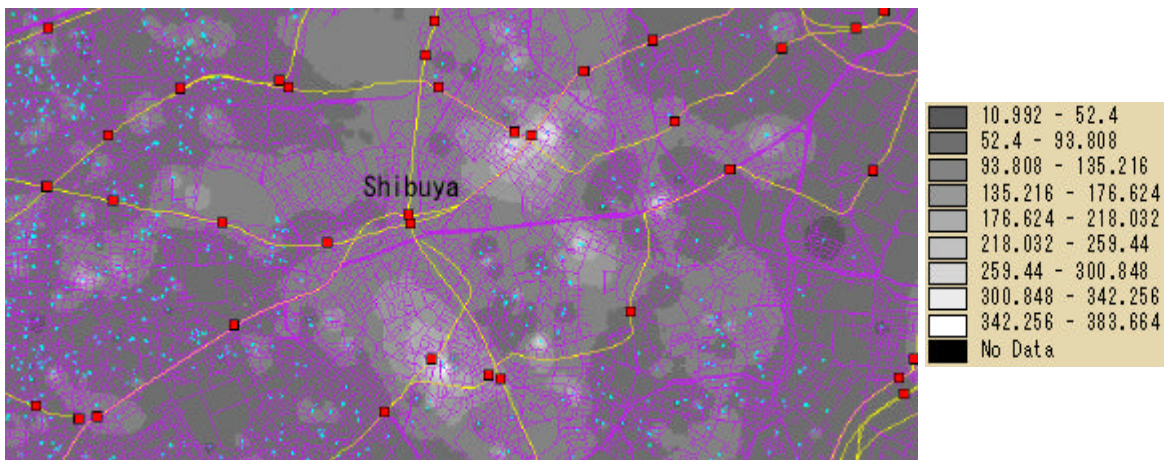[3] **URL:** CSV Geocoding Service. Available at: http://fujieda.csis.u-tokyo.ac.jp/cgi-bin/geocode.cgi.

Fig. 4. Price Map of Detached Houses.