An estimation of land price by kriging using geographic information system

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Abstract

The Japanese government publishes official land prices each year via the Land Market Value Publication. However, the officially published prices cover only a small number of properties. In pricing a property, real estate companies thus refer to both the official land prices of comparable properties and the transaction history of the property in question, as buyers face the problem of not knowing the standard price of the land. Therefore, if we buy a piece of land, we need to estimate its price based on the published official land prices. In this study, we estimate land price by kriging using road network distance and verify the precision of the estimation.

Kriging is a linear regression method applied to space. The method models the temporal and spatial relevance of natural phenomena. Kriging is a major technique in Geo-statistics that employs the covariance function, and is mainly used to estimate ore reserves. Generally, spatial properties depend on direct distance. Therefore, estimation by kriging depends on distance. In this paper we compare the estimation accuracy of Euclidean distance and road network distance.

In conclusion, the numerical experiment using road network distance clearly achieved a better estimated result than using Euclidean distance in urban space.

Keywords
Geographic information system, Dual Kriging, network distance, Euclidean distance, official land price

Biography
Yutaro Kitamura is currently a student of the advanced course in Production Systems Engineering, Salesian Polytechnic, Japan. His research interests include discrete mathematics, Geographic information system and operations research.

Yoichi Shimakawa is a Professor and Director of the Department of Computer Science and Technology, Salesian Polytechnic Japan. He received his B.S. and M.Sc. degrees from Chuo University in 1990 and 1996. In 1998, he joined the staff as a research assistant on the research project “Integrated Geographic Information Systems” at ChuoUniversity. He received his D.E. degree from Chuo University. He received paper awards from the Operations Research Society of Japan (ORSJ) in 2002. He is a member of ORSJ and the Geographic Information Systems Association of Japan.