

A framework study on applying a prospective monitoring procedure to exploit regularly updated spatial databases of land transactions

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Abstract

Since mid 1990s, the government of South Korea has made tremendous efforts to build spatial databases. Demands for practical exploitation of these spatial databases have drawn increasing attention from various domains. Recently, as the database updates of land transactions in land market domain which were collected on a regular basis, a prospective monitoring surveillance system has revealed that the spatial concentration of abnormally high priced as well as too frequent transaction counts likely to lead to some critical problems such as land speculation. In this domain, it is of major interest to timely capture any indication of abnormality in the early stages so that appropriate policy measures can be quickly taken to tackle the worsening of the system. In this respect, the spatial databases that contain the regularly updated information of land transactions provide certain fundamental data sets based on which time series analysis can be prospectively performed for monitoring purposes. The main purpose of this study is to build an experimental modeling scheme that targets land domain, in which some advanced spatiotemporal analysis tools can produce prospective monitoring information using dataset from regularly updated spatial database of land transactions. This paper also discusses the methods and techniques to prevent the further damages. Then, it is discussed how to use the information fruitfully for preventing the furthering of the problem in a policy drafting context. In this study, at first it is shown as how to apply a prospective framework in monitoring land market trend by measuring a global tendency of spatial clustering using a spatial statistic. Then, at each time only the statistically significant portion of the statistic was accumulated to the *cusum* statistic to quickly pinpoint the temporal points when the system of concern has fundamentally changed. The change points are determined by ensuring if the *cusum* statistic exceeded the threshold at when appropriate actions are demanded immediately.

As a key research contribution, this study provided in-depth analysis on how to exploit the spatiotemporal statistical methodologies to prospectively monitor the land market. In land market domain, especially in Korea, it is critical to sensitively detect some gradual but accumulatively significant signs of speculative investments

on lands those are located in non-urban areas where public announcements of land developments are required and some agile occupants of information are shrewdly responded. Therefore, timely actions need to be taken to prevent the spreading of abnormal transaction activities in land market by quickly announcing some relevant countermeasures prior to public announcements, intending to control the land market likely to be malfunctioning otherwise.

Finally, this study intends to understand the key property of abnormal condition of land markets in perspective of spatiotemporal structure. Land transactions, in nature, occur in space and time, and therefore it is logically worth to examine the spatial and temporal process that triggered the emergence of anomalies in land markets. The process of concern in this regard corresponds to some potential attractions such as the geographic closeness of transaction occurrences within a short period of time, etc.

To perform the overall procedures in the monitoring framework, an analysis program was made using Visual C++. The program is coupled with Google API interfaces so that realistic background images of interested local areas are used. It is also expected that, associated with further researches, this program has potentials to be enhanced toward a practical monitoring system in an enterprise level by connecting to a spatial database system such as Real estate Trade Management System (RTMS) where near real-time updates are regularly made.