



# Research on the efficiency of querying historical data with the spatio-time data integration method

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## ABSTRACT

One of the main purposes of spatio-temporal modeling is to replay and reproduce states at different historical moments. The spatio-temporal data integration is the key to building the model because it exerts a direct influence on the mode and efficiency of querying data in the database. In fact, in the previous study, the author has proposed a time-based spatio-temporal data integration method and proved that the efficiency of querying historical data with the integration method is higher than that with the widely used integration method regarding time as an attribute from the theoretical level. In the study, from the application level, the author, using real cadastral parcel alternation data and the numerical fitting method, makes a contrast analysis of these two methods in the query efficiency based on two situations of historical data query respectively and real query time data, and also further verifies the conclusion from the theoretical study.

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## 1. Introduction

Spatio-temporal data model is a geographic data model including more complete attribute, space, and time semantics, which can effectively organize and manage temporal geographic data. The main purpose for the spatio-temporal modeling study is to replay and reproduce the states at different historical times through dynamically updating data and predict the future change tendency in view of variation regularities. Thus, the integration of space and time or how to pull time into the spatial database is the key issue for the study because the integration of space and time will exert a direct impact on the mode and efficiency of querying data in the database [1].

In recent years, in order to query massive spatio-temporal data quickly and efficiently, scholars have made unremitting efforts to put forward various spatio-temporal data integration methods, including organization structures of those data and their corresponding historical data query method. As for the former, the method which is based on a relational database and regards time as an attribute is still the most widely used organization form nowadays [2]. However, in the previous study, the author pointed out that historical data query efficiency with the method can be improved and proposed an improved one—a time-based integration method of spatio-temporal data [3]. As for the historical data query, currently there are two solutions. One is to query data with recursive iteration and gradual backtracking [4–8], and the other is to query data with spatial superposition operation [2]. The essential difference between them lies on whether spatio-temporal topology is recorded.

In the previous study, the author analyzed historical data query efficiency of the above two spatio-temporal data integration methods from the theoretical level. In the study, from the application level, the author, using real cadastral parcel alternation data and the numerical fitting method, makes a comparative analysis of the above two methods in the query efficiency based on real query time data. The thesis consists of three parts. Part one mainly introduces organization

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