

THE SUMMARY OF Ph. D. DISSERTATION

Major Science for Open and Environmental Systems		SHIRAISHI, Yoh
Title  <p style="text-align: center;">A Retrieval Method for Incremental Visualization of Spatial Information and its Application to Sensor Databases</p>		
Abstract <p>Spatial information is information related with geographic location and includes not only spatial data such as map data, but also sensor data such as weather and traffic information. Providing spatial information from distributed databases on a network is useful for many location-oriented applications.</p> <p>However, when retrieving and visualizing spatial information over a network, the response time will increase because of the increase in cost for data search and integration. To deal with this problem, this study takes an approach to provide incrementally results of the retrieval. By providing the user with the intermediate results in a meaningful way, the user can interactively browse the spatial information even if it takes a while for the final complete result to be available.</p> <p>The purpose of this dissertation is to develop a retrieval method for incrementally visualizing spatial information over a network. Also, this study applies the incremental method to retrieve sensor data from multiple sensor databases and to integrate the collected sensor data.</p> <p>First, this dissertation proposes a retrieval method to incrementally provide spatial data based on region partition. This method partitions a query region, searches a spatial index at each partitioned region, and incrementally transmits these searched results to a client. This method is implemented within a spatial data server. Experimental results show that, by specifying some parameters for region partition, a user can prioritize the ordering of acquiring information in a given region.</p> <p>Next, the method based on region partition is applied to a retrieval mechanism for sensor databases on a network. The proposed mechanism consists of a mediator agent and sensor data servers. A sensor data server is a wrapper for a sensor database that manages sensor data as time-series. The mediator agent partitions a query region and temporal interval, and controls the sub-queries to these data servers and the transmission of retrieval results from these servers. This retrieval method can provide sensor data incrementally in consideration with spatial and temporal constraints.</p> <p>Furthermore, a spatial aggregation method based on region partition is proposed to integrate different kinds of sensor data collected from multiple databases. Spatial aggregation is a technique for spatial information processing based on geographic location and relations. The proposed method aggregates sensor data at each partitioned region and incrementally shows the aggregated results. A sensor data visualization system implements this spatial aggregation method. Experimental results show that the proposed retrieval and integration method can be useful for realizing an interactive system for sensor data visualization.</p>		

