Abstract

The massive increase of multi-dimensional (spatial) data collected, either in size or veracity, has demanded better spatial index techniques able to handle efficient storing and fast retrieval of spatial objects. No matter how big the data are, eventually it will reside on physical storage media arranged as a series of logical blocks with prefixed sizes resembling nodes in tree-structured spatial indices. Good node splitting strategy is essential since it affects; the final shape of the index, the overlap area between nodes, and the overall index performance. Better node splitting process results will be obtained if multiple splitting strategies (quality factors) were combined to govern the split decision, and it will eliminate the need for dynamic or static tree packing.

Three widely used quality factors; minimizing total overlap area, even distribution of objects, and squared nodes’ margins, along with a fourth factor named the “preferred-axis” were merged in one combined value to govern the split decision. Provided results, for the index creation tests and different sized window queries performance, indicate the superiority of the combined quality
factors strategy in comparison of other unilateral usage of quality factors. Provided results showed that combined quality-factors strategy had outperformed different two strategies found in the literature in both index creation tests and index performance tests. The obtained results were achieved without the need for any dynamic or static tree packing.

References


Index Terms

Computer Science  Algorithms
Keywords

Splitting strategies, combined node splitting quality factors, Objects classification, Spatial big data.