

## Hierarchical Data Structures for Geographic Information

- Abstract -

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Project, geographic information system, graphic representation, data handling, linear quadtrees

The status of an ongoing research effort to develop a geographic information system based on a variant of linear quadtrees is described. This system uses quadtree encodings for storing area, point, and line features. Recent enhancements to the system are presented in greater detail. This includes a new hierarchical data structure for storing linear features that enables representing straight lines exactly as well as permitting updates to be performed in a consistent manner. The memory management system was modified to enable the representation of an image as large as 16,384 by 16,384 pixels. Improvements were also made to some basic area map algorithms which yield significant efficiency speedups by reducing node accesses. This includes windowing, set operations with unregistered images, a within function, and an optimal quadtree building algorithm which has an execution time that is proportional to the number of blocks in the image instead of the number of pixels.

### [Hierarchische Datenstrukturen für Geographische Informationen]

Der Stand eines Forschungsprojektes zur Entwicklung eines Geographischen Informationssystems, das auf einer Variante von Linearen Quadtrees aufbaut, wird beschrieben. Das System verwendet Quadtrees zur Speicherung von Flächen-, Punkt- und Linien-Elementen. Erweiterungen des Systems werden detailliert beschrieben. Dazu gehört eine neue hierarchische Datenstruktur zur Speicherung linearer Elemente, die es ermöglicht, gerade Linien exakt abzubilden und Änderungen folgerichtig durchzuführen. Das Speicherverwaltungssystem wurde so modifiziert, daß es Bilder in einer Größe bis zu 16 384 x 16 384 Pixeln abbilden kann. Einige Algorithmen zur Verwaltung von Flächen wurden durch Reduzierung von Knotenzugriffen verändert, was zu einem spürbar besseren Laufzeitverhalten führt. Window-Techniken, eine „innerhalb“-Funktion und ein Algorithmus zum optimalen Aufbau der Quadtree-Struktur ermöglicht nun Laufzeiten, die proportional zur Anzahl der Bildblöcke statt der Pixel sind.

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