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United States Patent [19]

Keighan et al.

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[54] **METHOD AND APPARATUS FOR MULTIDIMENSIONAL DATABASE USING BINARY HYPERSPATIAL CODE**

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[*] Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

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(Under 37 CFR 1.47)

Related U.S. Application Data

[63] Continuation of application No. 08/342,922, Nov. 21, 1994, abandoned.

[51] **Int. Cl.**[7] **G06F 17/30**

[52] **U.S. Cl.** **707/100**; 707/102; 707/104

[58] **Field of Search** 707/102, 104, 707/100

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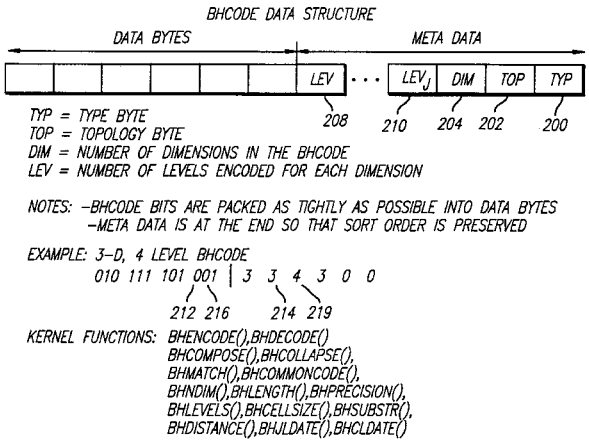
[57] **ABSTRACT**

An improved database data structure and datatype is disclosed for storing, manipulating and accessing multidimensional spatial data in a database. Binary helical hyperspatial code (HH CODE) is used to represent data of N dimensions. The binary HH CODE data structure maintains the dimensional organization of multidimensional data within the data itself. Spatial data is stored using BH code which is modeled as a N-tree structure derived using recursive decomposition. A high water mark is set as the upper limit for data volume which may be stored in any one partition. As data stored in a partition exceeds the high water mark, the data is decomposed into child partitions such that no partition data stores exceed the high water mark. If the high water mark is exceeded, additional child partitions are automatically created and the parent table is not retained. A data structure is defined which represents the partitioned tables and BH code values. Appropriate attributes are associated with each of the BH code values which may represent non-spatial data such as temperature, salinity, or cosmic ray flux. Methods and apparatus are also provided to apply teachings of binary HH CODE to line segments and topology.

69 Claims, 20 Drawing Sheets