

P.O.Box 8718, Beijing 100080, China	Journal of Software July 2003,14(7):1258-1266
E-mail: jos@iscas.ac.cn	ISSN 1000-9825, CODEN RUXUEW, CN 11-2560/TP
http://www.jos.org.cn	Copyright © 2003 by The Editorial Department of Journal of Software

数据仓库系统中层次式Cube存储结构

高 宏, 李建中, 李金宝

[Full-Text PDF](#) [Submission](#) [Back](#)

高 宏, 李建中, 李金宝 (哈尔滨工业大学 计算机科学与技术学院,黑龙江 哈尔滨 150001)(黑龙江大学 计算机科学与技术学院,黑龙江 哈尔滨 150086)

第一作者: 高宏(1966—),女,黑龙江哈尔滨人,博士,副教授,主要研究领域为数据库,数据仓库.

联系人: 高宏 Telephone: 86-451-6415827, Fax: 86-451-6415827, E-mail: gaohong@mail.banner.com.cn

Received 2002-11-25; Accepted 2003-03-04

Abstract

Range query is a very important operation to support On-Line Analytical Processing (OLAP) in data warehouses. Although several cube storage structures for range sum queries and dynamic updates have been introduced recently. However, the complexities of both space and time are too higher to realistic. To solve this problem, a hierarchical data cube (HDC) and corresponding algorithms are provided in this paper. Both of the range query and update costs of HDC are $O(\log dn)$, and the overall cost is $O((\log n)^2 d)$ (under the CqCu model) or $O(K(\log n)d)$ (under the Cqnq+Cunu model). The analytical and experimental results show that the costs of HDC's range queries, dynamic updates, storage space and the overall performance of HDC are superior to other cubage storage structures.

Gao H, Li JZ, Li JB. Hierarchical cube storage structure for data warehouses. *Journal of Software*, 2003,14(7):1258~1266.

<http://www.jos.org.cn/1000-9825/14/1258.htm>

摘要

区域查询是数据仓库上支持联机分析处理(on-line analytical processing,简称OLAP)的重要操作.近几年,人们提出了一些支持区域查询和数据更新的Cube存储结构.然而这些存储结构的空空间复杂性和时间复杂性都很高,难以在实际中使用.为此,提出了一种层次式Cube存储结构HDC(hierarchical data cube)及其上的相关算法.HDC上区域查询的代价和数据更新代价均为 $O(\log dn)$,综合性能为 $O((\log n)^2 d)$ (使用CqCu模型)或 $O(K(\log n)d)$ (使用Cqnq+Cunu模型).理论分析与实验表明,HDC的区域查询代价、数据更新代价、空间代价以及综合性能都优于目前所有的Cube存储结构.

基金项目: Supported by the National Natural Science Foundation of China under Grant No.60273082 (国家自然科学基金); the National High-Tech Research and Development Plan of China under Grant No.2001AA415410 (国家高技术研究发展计划(863)); the National Grand Fundamental Research 973 Program of China under Grant No.G1999032704 (国家重点基础研究发展规划(973)); the Natural Science Foundation of Heilongjiang Province of China under Grant No.F0208 (黑龙江省自然科学基金)

References:

- [1] Gray J, Bosworth A, Layman A, Pirahesh H. Data cube: A relational aggregation operator generating group-by, cross-tab and sub-total. In: Marek R, ed. Proceedings of the 12th ICDE. IEEE Press, 1996. 152~159.
- [2] Geffner S, Agrawal D, Abbadi A, Smith T. Relative prefix sums: an efficient approach for querying dynamic OLAP data cubes. In: Alberto O, ed. Proceedings of the 15th International Conference on Data Engineering. IEEE Press, 1999. 328~335.
- [3] Liang W, Wang H, Orlowska ME. Range queries in dynamic OLAP data cubes. *Data and Knowledge Engineering*, 2000,34(1): 21~38.

[4] Ho CT, Agrawal R, Megiddo R, Srikant R. Range queries in OLAP data cubes. In: Joan P, ed. Proceedings of the International ACM SIGMOD Conference. ACM Press, 1997. 73~88.

[5] Li HG, Ling TW, Lee SY, Loh ZX. Range sum queries in dynamic OLAP data Cubes. In: Lu HJ, Stefano S, eds. Proceedings of the 3th International Symposium on Cooperative Database Systems for Advanced Applications (CODAS 2001). IEEE Computer Society Press, 2001. 74~81.

[6] Chan CY, Ioannidis YE. Hierarchical cubes for range-sum queries. In: Bassiouni A, ed. Proceedings of the 25th VLDB Conference. IEEE Press, 1999. 675~686.

[7] Geffner S, Agrawal D, Abbadi AE. The dynamic data cube. In: Zaniolo C, Lockemann PC, Scholl MH, Grust T, eds. Proceedings of the EDBT. LNCS 1777, Heidelberg: Springer-Verlag, 2000. 55~77.

[8] Chun S J, Chung C W, Lee J H, Lee S L. Dynamic update Cube for range-sum queries In: Peter MG, ed. Proceedings of the 27th VLDB Conference. IEEE Press, 2001. 521~530.