URN etd-0407109-183721-1703
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Statistics This thesis had been viewed 41 times. Download 14 times.
Department
Year 2003
Semester 2
Degree Master
Type of Document Master's Thesis
Language zh-TW.Big5 Chinese
Title An efficient association rules mining algorithm and its application in mining weighted quantitative association rules with multiple support threshold
Date of Defense 0000-00-00
Page Count 78
Keyword
Data Mining
Association Rule
Frequent Itemset
QSD Algorithm

Abstract
The generation of frequent itemsets is an essential and time-consuming step in mining association rules. Most of the studies adopt the Apriori-based approach, which has great effort in generating candidate itemsets and needs multiple database accesses. Recent studies indicate like FP-Tree approach has been utilized to avoid the generation of candidate itemsets and scan transaction database only twice, but they work with more complicated data structure. Therefore, algorithms for efficient mining of frequent patterns are in urgent demand.

This thesis aims to improve both time and space efficiency in mining frequent itemsets. We propose a novel QSD(Quick Simple Decomposition) algorithm using simple decompose principle which derived from minimal heap tree, we can discover the frequent itemsets quickly under once database scan. Meanwhile, QSD algorithm is not necessary to rescan database and reconstruct data structure when database is updated or minimum support is varied.

Moreover, we apply the features of the QSD algorithm to explore profit weight-based quantitative association rules with multiple support threshold in accordance with item’s characteristics. The derived rule can solve the problem that itemset with high profit but few trading times was difficult to find out.

Comprehensive experiments have been conducted to assess the performance of the proposed algorithm. Experimental results show that the QSD algorithm outperform previously ones, like ICI, FP-Tree algorithms etc.
Advisory Committee Jen-peng Huang - advisor

Files etd-0407109-183721-1703-001.pdf

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Date of Submission 2004-07-22