1 Background

In (OLAP (On-line Analytical Processing)), huge data volumes are analyzed as numeric facts, distributed along descriptive dimensions.

A sample 3-dimensional cube (fragment) with student enrollment numbers (left) and a pivot table view of the data (right).

2 Research Questions

The multidimensional data model and its summarizability constraint are too restrictive for handling complex and non-conventional usage scenarios. Besides, state-of-the-art frontend analysis tools have limited support for comprehensive analysis tasks.

Thesis contributions:
- An extended conceptual data model
- A conceptual-to-relational mapping of the extended model
- Comprehensive graphical modeling notation x-DFM
- Multidimensional analysis for Business Process Intelligence
- Visual OLAP framework
- Hierarchical visualization techniques for OLAP

3 The Roadmap of Dimensional Modeling

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Sample Fact-dimensional scheme modeled in x-DFM:

4 OLAP for Surgical Workflow Analysis

Sample Query: For each surgery of type discectomy and each bone ablating instrument, return the average duration of a work step, in which that instrument was used by a surgeon.

Generated SQL statement and its results as a pivot table:

<table>
<thead>
<tr>
<th>Occurrence</th>
<th>Average duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>bone ablating</td>
<td>0.75</td>
</tr>
<tr>
<td>total</td>
<td>0.5</td>
</tr>
</tbody>
</table>

5 Enhanced Decomposition Trees

References


