1 Introduction

Visualizing performance data [1] in intuitive domains [2] helps analysts optimize massively parallel applications. Thus, we propose a tool featuring linked views that

• guides analysts towards important parts of performance data,
• visualizes performance data in its spatial context:

Performance data is visualized in its spatial context:

![Performance Data Visualization](image)

The data is related to the properties of the simulated geometry:

<table>
<thead>
<tr>
<th>MPI Rank</th>
<th>Severity</th>
<th>Severity/Element</th>
<th>Severity/Area</th>
<th># Elements</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPI Rank 0</td>
<td>0.58042e+07</td>
<td>5458.21</td>
<td>337.167</td>
<td>12056</td>
<td>195168</td>
</tr>
<tr>
<td>MPI Rank 1</td>
<td>1.25155e+08</td>
<td>4447.44</td>
<td>628.775</td>
<td>28141</td>
<td>199682</td>
</tr>
<tr>
<td>MPI Rank 2</td>
<td>7.06628e+07</td>
<td>6166.42</td>
<td>362.169</td>
<td>11488</td>
<td>195663</td>
</tr>
<tr>
<td>MPI Rank 3</td>
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<td>4487.38</td>
<td>520.682</td>
<td>22981</td>
<td>198056</td>
</tr>
</tbody>
</table>

A parallel-coordinates plot summarizes the above data:

![Parallel-Coordinates Plot](image)

2 Performance Profiles

Profiles summarize performance data according to

• performance metrics \( m \in M \)
• for the call paths \( c \in C \)
• per system resource \( s \in S \).

Let \( v_{m,c}(s) \) denote a severity view, then

\[ v_{m,c}(s') \neq v_{m,c}(s) \] yields the severity of, e.g., execution time spent in function \( c \), for an MPI rank \( s' \in S_{MPI} \subseteq S \).

With a mapping to the simulated geometry

\[ v_{m,c}(s') \neq v_{m,c}(s) \] yields the severity for the individual geometry parts.

3 Detecting Variation

For severity views

• with little variation a single number represents performance,  
• with large variation a detailed analysis is required.

Large-variation views are detected via the variation coefficient

\[ q_{m,c} = \sigma_{m,c} \cdot \frac{\mu_{m,c} - 1}{\mu_{m,c}} \]

\( \mu_{m,c} \): mean severity \( \sigma_{m,c} \): standard dev. in \( v_{m,c} \)

4 Visualization

A severity view gets selected in two tree-view widgets:

![Visualization Tree-View](image)

5 Results

Preliminary evaluation (4 thin nodes of SuperMUC, Phase 1):

• search-space reduction by 29 %;
• data forms two almost separate classes;
• MPI ranks 1 and 3 required most CPU-time;
• MPI ranks 1 and 3 are computing high-detail geometry.

6 Conclusion

• Our tool greatly reduces the search space,
• quickly guides analysts towards important severity views,
• relates performance phenomena to the simulation domain,
• thus helps simulation experts understand performance data.

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References