ALPS: Software Framework for Scheduling Parallel Computations
with Application to Parallel Space-Time Adaptive Processing

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ALPS Software Framework

User’s idea on Parallel Computations (e.g. STAP)

Various STAP heuristics constructed from ALPS building blocks

Task Graph

ALPS Library

ALPS CodeGen

Find optimal configuration that minimizes overall makespan or maximizes throughput

ALPS Scheduler

ALPS Benchmark & Modeler

Modeling execution times of basic building blocks under various configurations
Building execution time models using incremental weighted least-squares

Measurements are not quite reliable
Number of variables in the model is large

Relative errors from ordinary least-square

26.6% error from ordinary least-square

7.5% error from INV-weighted least-square

10% better
20% better
30% better
40% better
Scheduling tree-shaped task graphs on parallel computers exploiting mixed-parallelism

**Difficulties**
- Communication cost not negligible
- Arbitrary computation costs
- Trade-off between task-parallelism and data-parallelism

Our scheduling algorithm

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<tr>
<th>Makespan (sec)</th>
<th>Data-parallelism only</th>
<th>Task-parallelism preferred</th>
<th>Our scheduling algorithm</th>
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<tbody>
<tr>
<td></td>
<td><strong>estimated</strong></td>
<td><strong>achieved</strong></td>
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<tr>
<td>Throughput (1/sec)</td>
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