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

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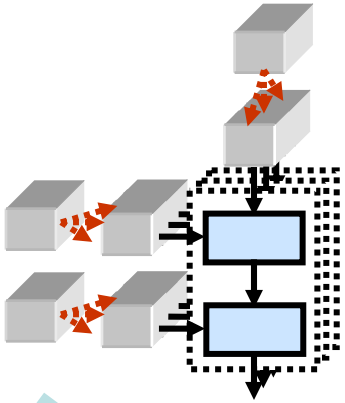
ALPS Software Framework



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

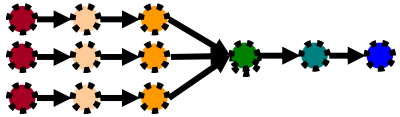
```
/*
This is a .cpp file of the partially
adaptive STAP methods that the
user had in mind.

This is optimized for minimum
latency or maximum throughput
on a given parallel machine.
*/

#include <alps.h>
...
```

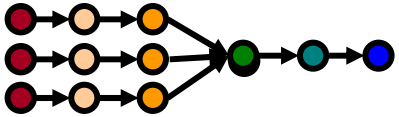
ALPS CodeGen

ALPS Library



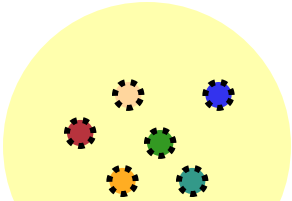
Various STAP heuristics
constructed from ALPS building blocks

Task Graph



ALPS Scheduler

Find optimal configuration that minimizes
overall makespan or maximizes throughput



ALPS Benchmarker & Modeler

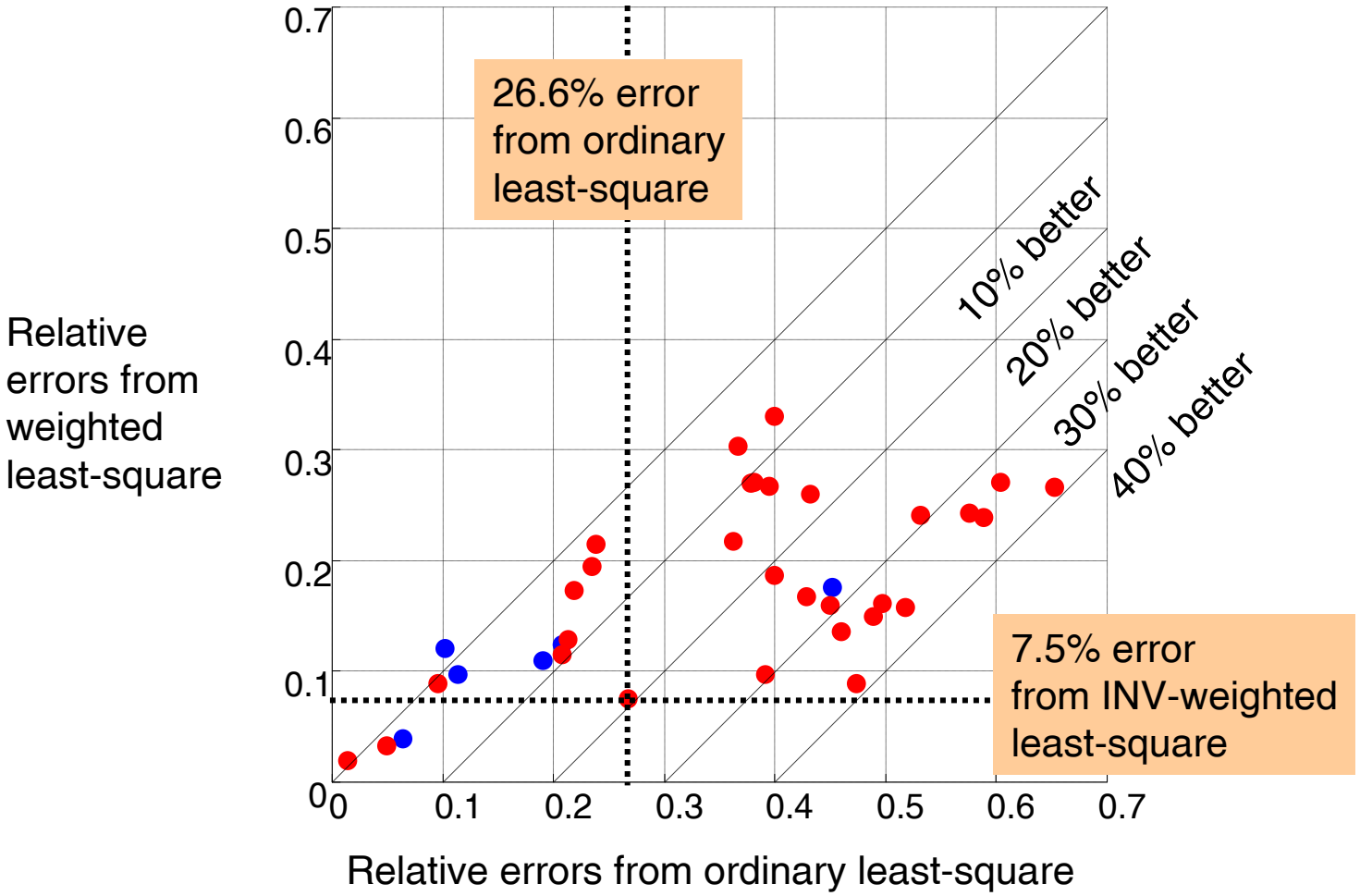
Modeling execution times of
basic building blocks under various configurations

Building execution time models using incremental weighted least-squares

Difficulties

Measurements are not quite reliable

Number of variables in the model is large



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