Towards Automatic Generation of Energy-aware Efficient Geometric Multigrid Solvers
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RESULTS AND GOALS

Overall charter
A tool-assisted fully automated domain-specific design approach for energy-aware stencil codes

Results Achieved:
- Domain-specific language ExaSlang and transformation framework
- Scalability up to full breadth of the JUQUEEN supercomputer
- Low-level optimizations for BlueGene/Q and Intel CPUs
- Performance forecast via product-line sampling and machine learning

Further Goals:
- Exascale technology for a broader range of PDEs
- Energy efficiency at all layers of abstraction
- Performance/power trade-offs on exascale machines
- Exploitation of heterogeneous and hybrid architectures

DESIGN FLOW

GEOMETRIC MULTIGRID

1. Pre-smoothing
2. Calculation of residual
3. Restriction
4. Recursive call(s) or solve (at coarsest level)
5. Prolongation
6. Correction
7. Post-smoothing

Smother applied
Residual on fine grid
Residual on coarse grid

REFERENCES & ACKNOWLEDGEMENTS


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