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Qualitative Evaluation Criteria for Parallel Programming Models

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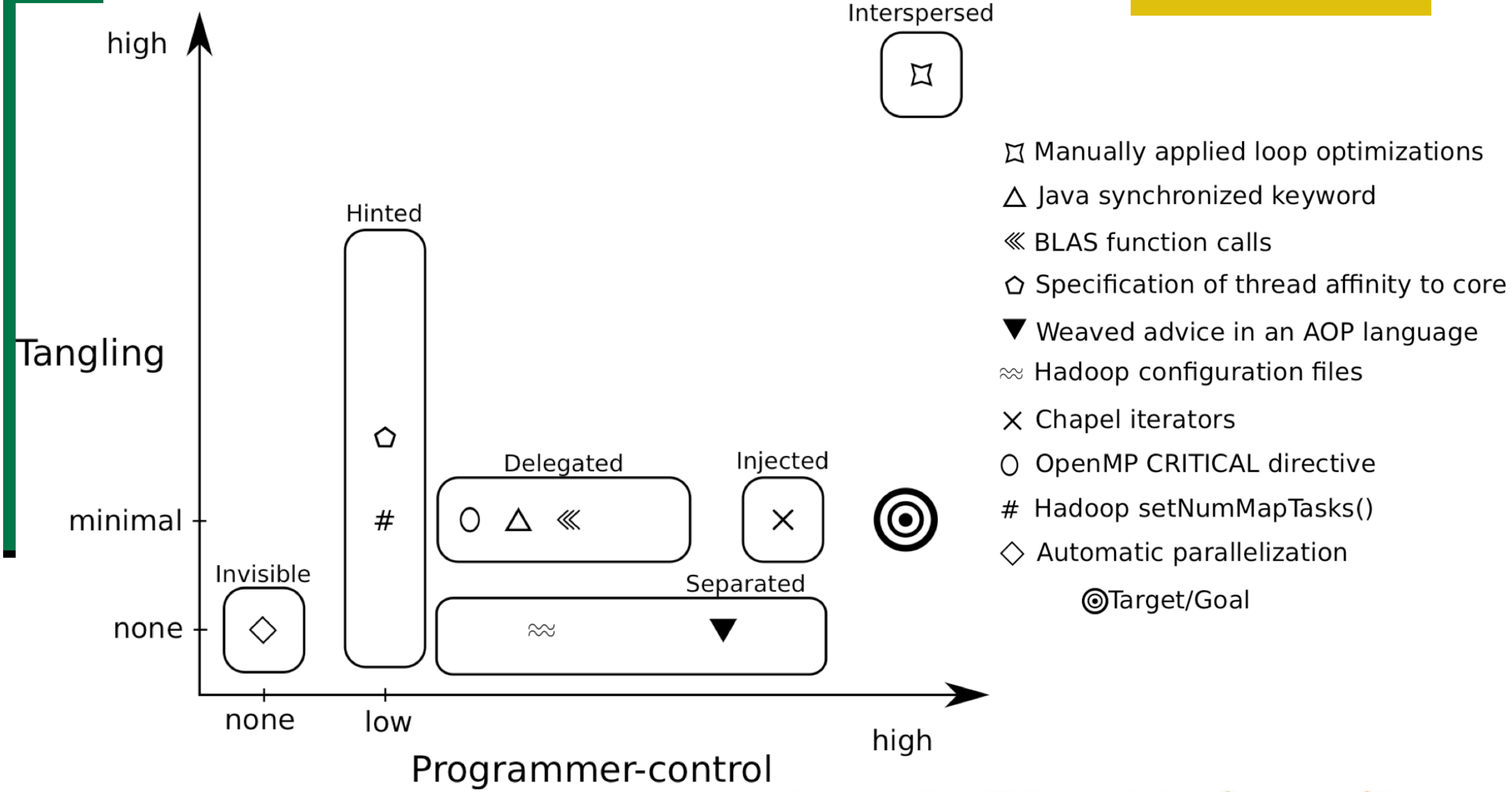
Evaluating Performance and Programmability

- Implementation details tangle with algorithm specification to cause obfuscation
  - Data distribution and layout
  - Computation distribution and scheduling
- Programmer control enables performance
- Tangling hurts programmability
- We propose evaluating programming models by realizing implementation strategy patterns from the OPL (Mattson et al.)
  - SPMD, Loop Par, Fork/Join, BSP, Task Queue, …, Dist Array

Evaluation Criteria for Programming Models
Tangling and *Programmer Control*


Tangling
high
minimal
none
Programmer-control
none
low
high
Interspersed
Hinted
Delegated
Injected
Invisible
Separated
⌑ Manually applied loop optimizations
△ Java synchronized keyword
« BLAS function calls
⬠ Specification of thread affinity to core
▼ Weaved advice in an AOP language
≈ Hadoop configuration files
× Chapel iterators
○ OpenMP CRITICAL directive
# Hadoop setNumMapTasks()
◇ Automatic parallelization
◎Target/Goal

Moving Forward

- Goal is to encourage the conscious development of program language constructs for the exposed and orthogonal specification of implementation details
- Questions for the community
  - Other important qualitative criteria?
  - Additional parallel patterns for eval framework?
  - What are some other construct examples?
  - Missing categories in programmer control and tangling tradeoff space?