Sista: Saving Optimized Code in Snapshots for Fast Start-Up

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Abstract

Modern virtual machines for object-oriented languages such as Java HotSpot, Javascript V8 or Python PyPy reach high performance through just-in-time compilation techniques, involving on-the-fly optimization and deoptimization of the executed code. These techniques require a warm-up time for the virtual machine to collect information about the code it executes to be able to generate highly optimized code. This warm-up time required before reaching peak performance can be considerable and problematic. In this paper, we propose an approach, Sista (Speculative Inlining SmallTalk Architecture) to persist optimized code in a platform-independent representation as part of a snapshot. After explaining the overall approach, we show on a large set of benchmarks that the Sista virtual machine can reach peak performance almost immediately after start-up when using a snapshot where optimized code was persisted.

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Table 1 Benchmark results with standard errors in avg ms per iteration with 90 % confidence interval

Benchmark	Cog	Cog+Counters	Sista (Cold)	Sista (Warm)
A*	68.39 +- 0.485	72.833 +- 0.129	36.13 +- 1.12	35.252 +- 0.0479
Binary tree	9.301 +- 0.0811	9.694 +- 0.0865	4.505 +- 0.13	4.278 +- 0.0031
Delta Blue	44.33 +- 1.08	47.892 +- 0.638	36.86 +- 6.42	31.315 +- 0.601
JSON parsing	10.545 +- 0.0174	10.826 +- 0.0089	2.185 +- 0.140	2.121 +- 0.00826
Richards	5.7419 +- 0.0119	6.388 +- 0.0045	4.375 +- 0.115	4.3217 +- 0.0174
K-Nucleotide	3563.1 +- 28.6	3634.4 +- 21.8	3298.6 +- 71.8	3306.8 +- 20.0
Thread Ring	1237.70 +- 5.73	1244.93 +- 3.89	756 +- 106	686.27 +- 1.56
NBody	358.42 +- 2.74	439.25 +- 0.484	329.5 +- 22.9	281.883 +- 0.836
Meteor	282.858 +- 0.658	301.60 +- 0.132	229.5 +- 24.8	202.07 +- 1.480

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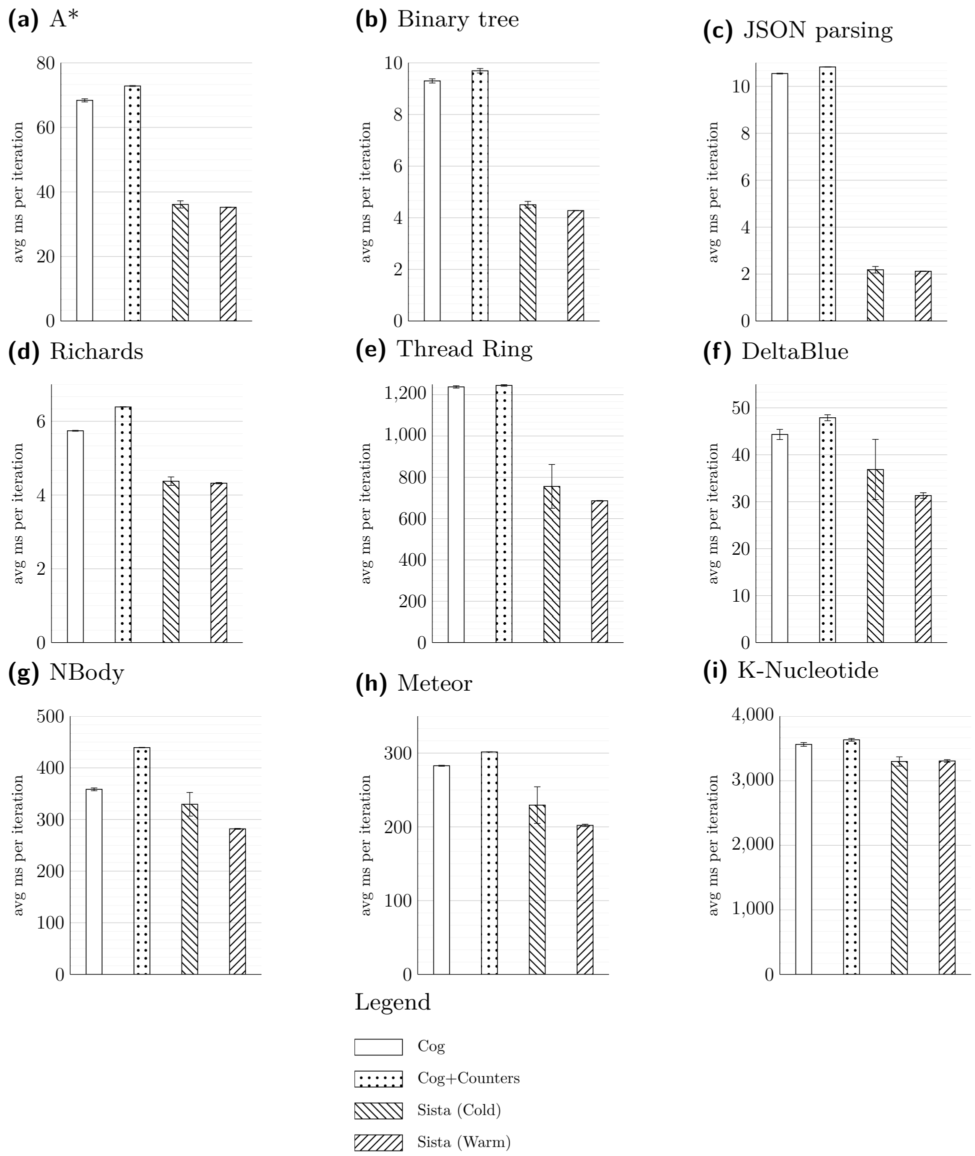
(a) A*
(b) Binary tree
(c) JSON parsing
(d) Richards
(e) Thread Ring
(f) DeltaBlue
(g) NBody
(h) Meteor
(i) K-Nucleotide
avg ms per iteration
Legend
Cog
Cog+Counters
Sista (Cold)
Sista (Warm)