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*	65.63 ± 1.04	71.83 ± 1.13	59.80 ± 15.30	45.00 ± 0.35
Binary tree	9.31 ± 0.09	8.72 ± 0.08	6.30 ± 0.26	5.96 ± 0.04
Blowfish	255.23 ± 0.34	257.20 ± 0.46	336.30 ± 35.90	256.89 ± 0.38
DeltaBlue	57.43 ± 0.17	49.44 ± 1.07	184.60 ± 50.20	52.40 ± 6.36
JSON	10.39 ± 0.02	10.41 ± 0.02	9.19 ± 0.05	7.93 ± 0.03
Richards	5.64 ± 0.01	6.50 ± 0.02	4.96 ± 0.03	4.99 ± 0.01
k-Nucleotide	3667.00 ± 26.40	3672.00 ± 22.20	3439.00 ± 56.00	3329.00 ± 14.80
Threadring	1157.00 ± 2.56	1167.00 ± 3.09	730.20 ± 52.80	676.20 ± 1.66

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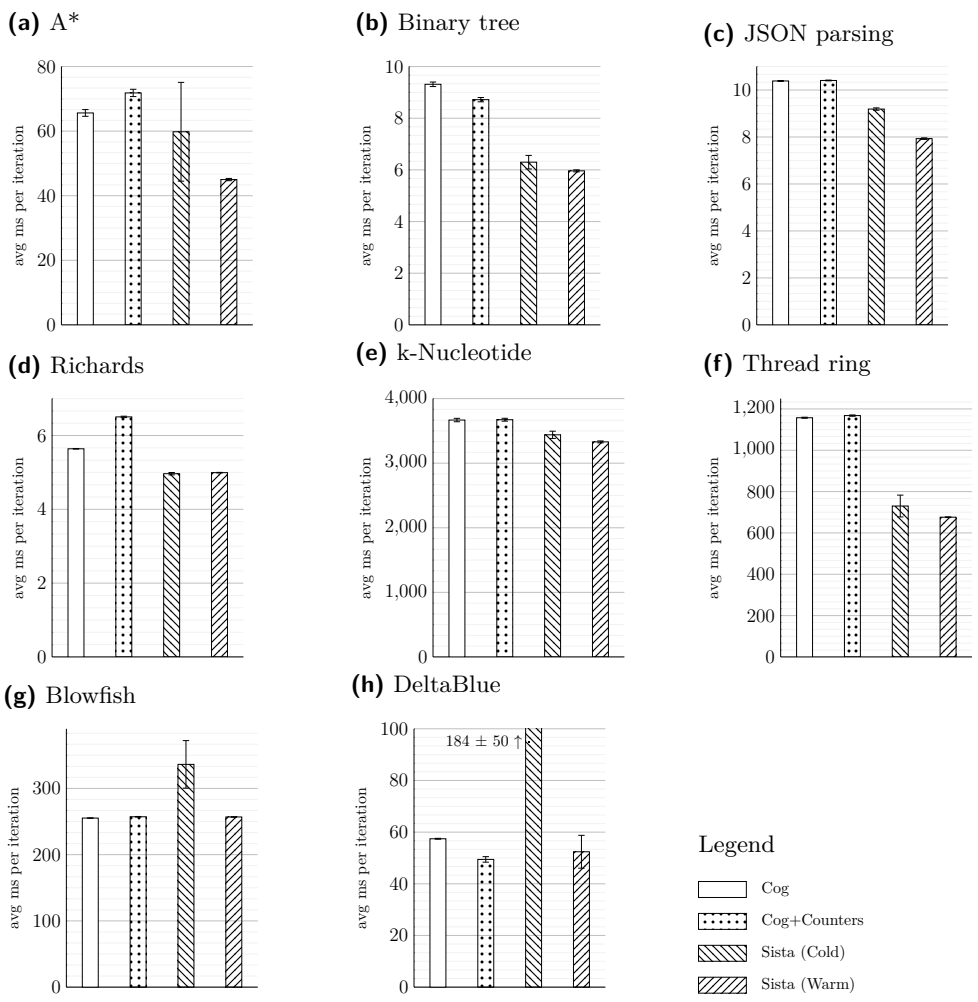
(a) A*
(b) Binary tree
(c) JSON parsing
(d) Richards
(e) k-Nucleotide
(f) Thread ring
(g) Blowfish
(h) DeltaBlue
avg ms per iteration
184 ± 50 ↑
Legend
Cog
Cog+Counters
Sista (Cold)
Sista (Warm)