

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.

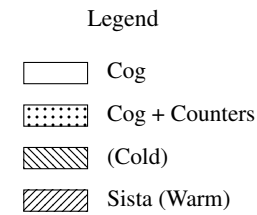
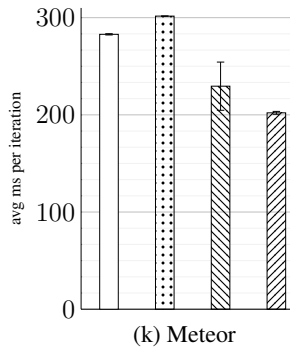
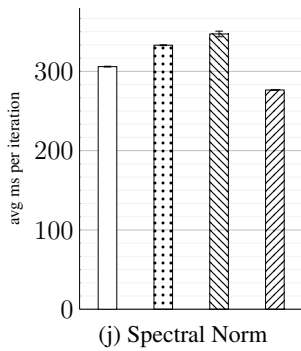
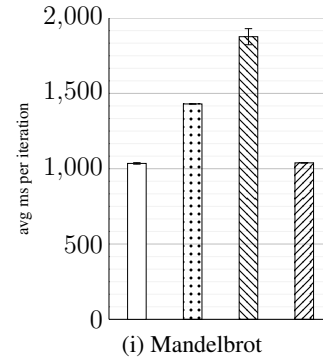
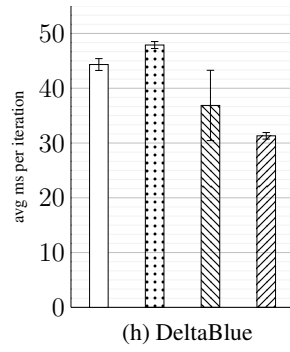
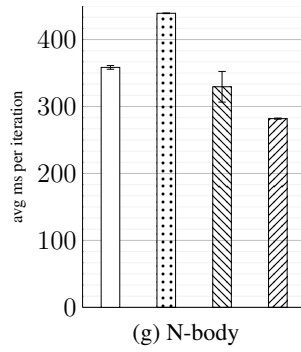
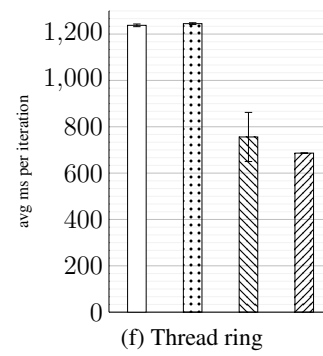
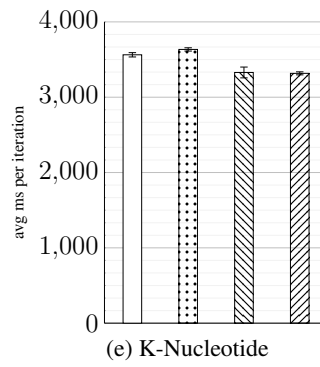
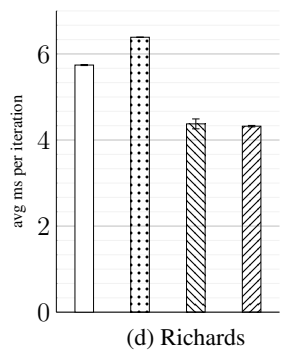
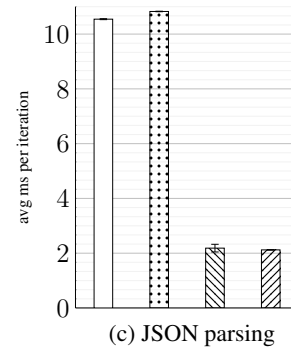
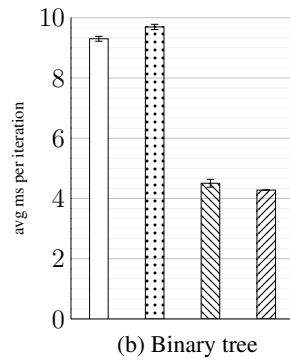
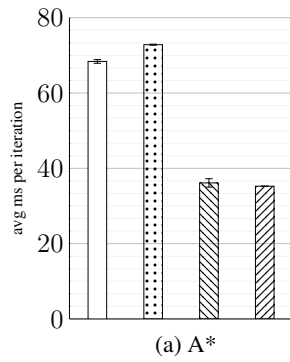


Table 1: Benchmark results with standard errors in avg ms per iteration with 90 % confidence interval

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	2.125 +- 0.140	2.121 +- 0.00826
Mandelbrot	1035.17 +- 4.99	1429.93 +- 1.2	1876.4 +- 53.4	1038.867 +- 0.604
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	3328.6 +- 71.8	3326.8 +- 20.0
Spectral Norm	305.983 +- 0.494	332.983 +- 0.485	347.15 +- 3.54	276.517 +- 0.347
Thread ring	1237.70 +- 5.73	1244.93 +- 3.89	756 +- 106	686.27 +- 1.56
N-body	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