

Architecture Project 1

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1 ALPHA

a) Benchmark Results

Benchmark	Instructions	Instruction Distribution					
		Load	Store	Uncond Branch	Cond Branch	Integer Comp	FP Comp
<code>anagram.alpha</code>	4940	18.24%	19.64%	6.30%	11.76%	43.59%	0.18%
<code>go.alpha</code>	545823087	30.62%	8.17%	2.58%	10.96%	47.64%	0.03%
<code>compress95.alpha</code>	88981	1.80%	78.53%	0.28%	5.76%	13.62%	0.00%
<code>cc1.alpha</code>	337353488	24.67%	11.47%	4.12%	13.33%	46.30%	0.11%

b) Is the benchmark memory- or computationally-intensive?

a) `anagram.alpha`

~38% of the instructions are memory operations, and the rest are computational. This benchmark is mostly computationally-intensive.

b) `go.alpha`

This benchmark has the same approximate memory/computation ration as `anagram.alpha`, so it is mostly computationally-intensive.

c) `compress95.alpha`

This benchmark has ~80% memory operations; it is mostly memory-intensive.

d) cc1.alpha

This benchmark has only ~36% memory operations, with the rest computational. This is computationally-intensive.

c) **Is the benchmark mainly using integer or floating point computations?**

a) anagram.alpha

43.59% Integer vs 0.18% FP, so FP.

b) go.alpha

47.64% Integer vs 0.03% FP, so FP.

c) compress95.alpha

13.62% Integer vs 0.00% FP, so FP.

d) cc1.alpha

46.30% Integer vs 0.11% FP, so FP.

d) **What % of the instructions executed are conditional branches?
How many instructions are computed between each pair
of conditional branches?**

a) anagram.alpha

11.76%. $\Sigma(18.24\%, 19.64\%, 6.30\%, 43.59\%, 0.18\%)/11.76\% = 7.48$

b) go.alpha

10.96%. $\Sigma(30.62\%, 8.17\%, 2.58\%, 47.64\%, 0.03\%)/10.96\% = 8.12$

c) compress95.alpha

5.76%. $\Sigma(1.80\%, 78.53\%, 0.28\%, 13.62\%, 0.00\%)/5.76\% = 16.36$

d) cc1.alpha

4.12%. $\Sigma(24.67\%, 11.47\%, 13.33\%, 46.30\%, 0.11\%)/4.12\% = 23.25$

2 Alpha vs PISA

a) ALPHA Benchmark Results

Benchmark	Instructions	Instruction Distribution					
		Load	Store	Uncond Branch	Cond Branch	Integer Comp	FP Comp
<code>test-math</code>	49310	17.14%	10.44%	3.95%	11.03%	55.40%	1.88%
<code>test-fmath</code>	19399	17.64%	12.58%	4.72%	11.17%	53.29%	0.43%
<code>test-llong</code>	10527	17.66%	14.73%	5.47%	12.21%	49.63%	0.10%
<code>test-printf</code>	983373	17.99%	10.74%	4.82%	11.39%	54.85%	0.09%

b) PISA

Benchmark	Instructions	Instruction Distribution					
		Load	Store	Uncond Branch	Cond Branch	Integer Comp	FP Comp
<code>test-math</code>	213553	15.96%	10.67%	4.22%	13.84%	54.42%	0.88%
<code>test-fmath</code>	53312	16.17%	14.47%	4.24%	15.08%	49.90%	0.11%
<code>test-llong</code>	29495	16.38%	18.11%	4.37%	15.40%	45.70%	0.00%
<code>test-printf</code>	1813745	19.22%	9.28%	5.13%	17.01%	49.33%	0.01%

c) Comparison

The PISA ISA requires many more (1.8x - 4.3x) instructions than the ALPHA ISA for the same programs.