CPE 315 Computer Architecture
Lab 4
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Data Machine 1 (Daniel):

	O0	O1	O2	O3	Unroll 2	Unroll 4	Unroll 8
Average CPI	1.27900149	1.25987025	1.25925082	1.27623751	1.30356324	1.32706709	1.33875932
Cycles	141673920	139578285	139511030	141392620	137585837	136586178	136012166
Instructions	110769158	110787825	110788912	110788641	105545962	102923340	101595688
Branch Misses	6762498	6779064	6787290	6722839	6750874	6793277	6805512
Runtime (measured)	1.826077	1.8083	1.7967	1.845	1.76115	1.76682	1.72133130
Runtime (equation)	1.28677493	1.26774101	1.26713015	1.28421998	1.24964430	1.24056474	1.23535119

Fraction of time executing matadd with O1: 88.24%
Fraction of time executing matadd with loop unrolling 2: 77.78%
Fraction of time executing matadd with loop unrolling 4: 79.49%
Fraction of time executing matadd with loop unrolling 8: 81.85%

Data Machine 2 (Jasmine):

	O0	O1	O2	O3	Unroll 2	Unroll 4	Unroll 8
Average CPI	1.2994282	1.31210687	1.29727756	1.29784957	1.33212353	1.34258876	1.36253099
Cycles	138506455	139857141	138277393	138337966	137821245	136781293	137731246
Instructions	106590310	106589748	106590445	106590139	103459807	101878771	101084854
Branch Misses	6736831	6748504	6754686	6729875	6,795,396	6796894	6722488
Runtime (measured)	1.74571113	1.79762691	1.81875224	1.78969501	1.77698610	1.81098491	1.78932576
Runtime (equation)	1.25800595	1.27027376	1.25592546	1.25647562	1.25178242	1.24233690	1.25096500

Fraction of time executing matadd with O1: 76.32%

Observations

Compiling the same assembly code with different optimization levels didn't appear to significantly impact the number of cycles, instruction count, or runtime of the resulting program. All optimization levels (O0 through O3) showed practically identical performance numbers. However, manually loop unrolling did have an impact on the number of instructions executed by the computer. The greater the loop unrolling factor, the fewer instructions were executed. Despite this, there was little impact on the runtime of the program.