NC State University

Department of Electrical and Computer Engineering

ECE 463/563: Fall 2017

Project #3: Dynamic Instruction Scheduling

by

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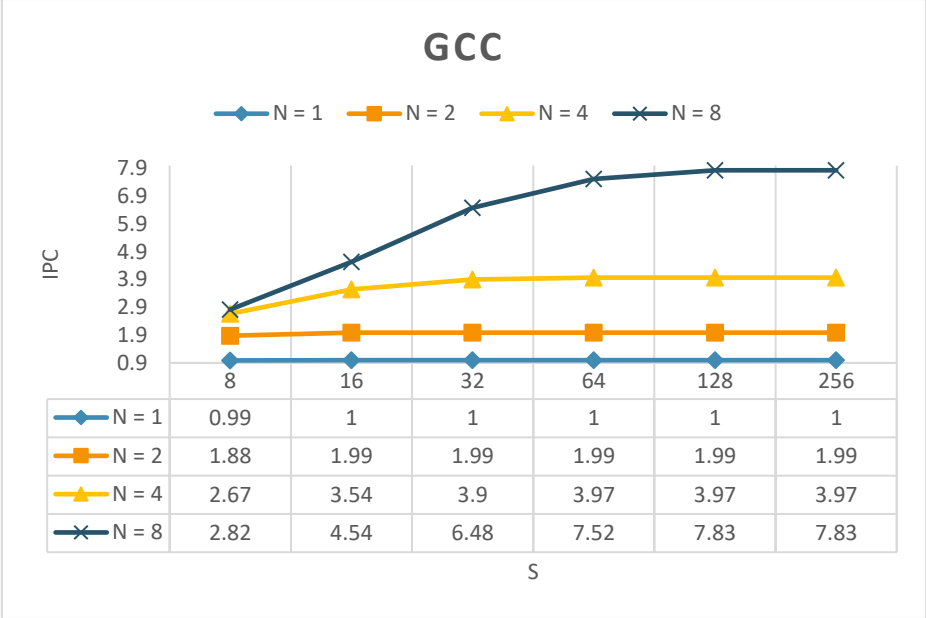
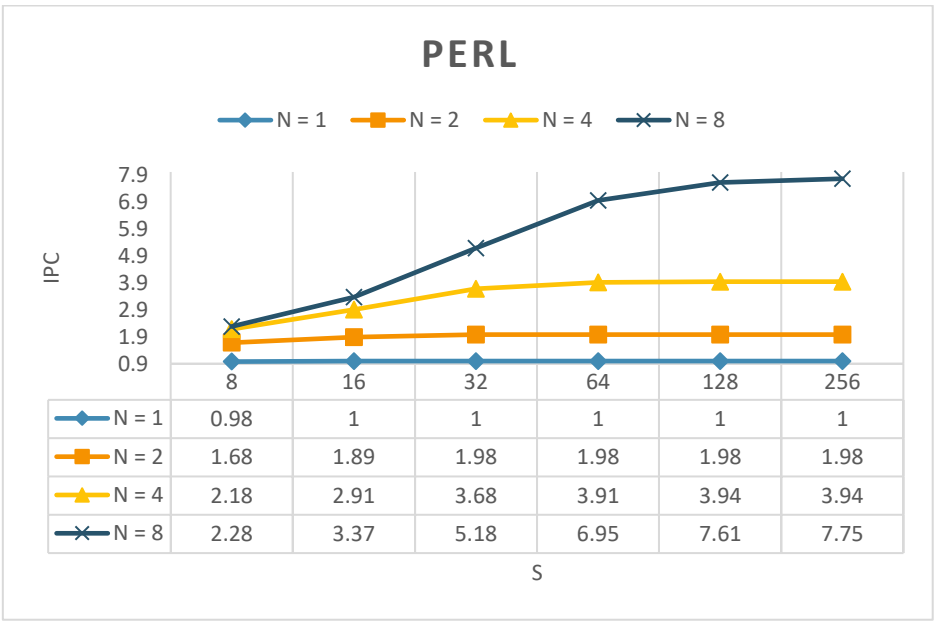
Course number: 563

(463 or 563 ?)



	8	16	32	64	128	256
N = 1	0.99	1	1	1	1	1
N = 2	1.88	1.99	1.99	1.99	1.99	1.99
N = 4	2.67	3.54	3.9	3.97	3.97	3.97
N = 8	2.82	4.54	6.48	7.52	7.83	7.83



	8	16	32	64	128	256
N = 1	0.98	1	1	1	1	1
N = 2	1.68	1.89	1.98	1.98	1.98	1.98
N = 4	2.18	2.91	3.68	3.91	3.94	3.94
N = 8	2.28	3.37	5.18	6.95	7.61	7.75

Apart from the fact that GCC benchmark provides a higher value of IPC as compared to PERL, we can see that the trends for both the benchmarks are quite similar.

ANALYSIS:

(i) EFFECT OF SCHEDULING QUEUE SIZE (S) ON IPC:

For both the benchmarks, we can see that for N=1 and N=2 there is almost no significant change in IPC with increase in the Scheduling Queue size(S) but for N=4 we see that the IPC initially increases with S but then remains constant for further increase in S and for N=8 we can see almost uniform increase in IPC with increase in S, but the curve starts flatlining for higher values of S.

On comparing the trends for both the benchmarks we can see that the GCC gives higher values of IPC as compared to PERL for the same values of S.

(ii) EFFECT OF PEAK ISSUE RATE (N) ON IPC:

As seen from the graphs, we observe that for any given value of S for both the benchmarks we get a higher value of IPC for a higher value of N but the amount of increase in IPC increases with increasing values of S. The reason for the increase in IPC with increase in N is that N decides the number of instructions that can be processed in one cycle. As N increases the number of instructions that can be processed per cycle increases and therefore we see an increase in IPC for increase in N.

(iii) RELATION BETWEEN “N” AND “S”:

A change in the value of either S or N will affect the value of IPC. Both S and N directly affect the value of IPC. For a lower value of N, increasing S will not provide significant improvement in IPC since N decides number of instructions that can be processed in one cycle. Thus, both the parameters have a combined effect on the value of IPC.

(iv) DIFFERENCE IN TRENDS OF GCC AND PERL:

For N=1 both benchmarks have the same value of IPC for corresponding values of S. But as N increases we see that GCC gives higher value of IPC as compared to PERL for same values of S. If we consider for example the configuration S=16 and N=4, we see that for GCC the number of cycles taken is 2824 and for PERL the number of cycles taken is 3433. From this we can infer that since PERL benchmark is taking more number of cycles than the GCC benchmark, the number of long latency instructions may be high for PERL and the number of dependencies among instructions in PERL may be more as compared to GCC. This causes the IPC to reduce for PERL as compared to GCC for the same configurations.