Benchmarking: SUN High Performance Computing MPI versus MPICH on two applications

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ABSTRACT

1 Introduction

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2 The Timetabling Problem

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3 Mean-Field Annealing

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4 The Rule-Based System

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5 Simulated Annealing

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5.1 Timetabling Using the Annealing Algorithm

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5.2 The Annealing Schedules

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5.3 The Choice of Moves

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6 Experimental Results

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7 Conclusions

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Acknowledgments

	First Semester	Second Semester	Third Semester
Rooms	509	509	120
Classes	3839	3590	687
Professors	1190	1200	334
Students	13653	13653	2600
Buildings	43	43	11
Schools/Colleges	20	21	17
Departments/ Course Prefix	143	141	108
Areas of Study (majors)	200	200	200

Table 1: Size of the data set for each of the three semesters.

Academic Time Period	sparseness ratio
First Semester	0.50
Second Semester	0.53
Third Semester	0.62

Table 2: The sparseness ratios of the problem for the data sets for each of the three semesters. Lower values indicate a harder problem.

Academic Time Period	Algorithm	Scheduled (average) %	highest Scheduled %	lowest Scheduled %
First Semester	SA (geometric)	65.00	67.50	56.80
	SA (adaptive)	67.80	70.15	61.20
	SA (cost-based)	70.20	72.28	68.80
	ES	76.65	76.65	76.65
	MFA	65.60	71.00	61.00
Second Semester	SA (geometric)	65.65	68.00	57.10
	SA (adaptive)	68.50	70.10	60.77
	SA (cost-based)	75.14	77.68	70.82
	ES	79.00	79.00	79.00
	MFA	67.20	75.00	65.00
Third Semester	SA (geometric)	83.10	86.44	68.50
	SA (adaptive)	85.80	89.00	70.75
	SA (cost-based)	91.20	95.18	85.00
	ES	96.80	96.80	96.80
	MFA	88.00	95.00	82.00

Table 3: Percentage of classes scheduled using the different methods. The averages and highest and lowest values were obtained using 10 independent runs for simulated annealing (SA) and mean-field annealing (MFA). The expert system (ES) is deterministic so the results are from a single run. *No preprocessor was used with the three methods.*

Academic Time Period	Algorithm	Scheduled (average) %	highest Scheduled %	lowest Scheduled %
First Semester	SA (geometric)	93.90	95.12	85.20
	SA (adaptive)	98.80	99.20	95.00
	SA (cost-based)	100.0	100.0	100.0
Second Semester	SA (geometric)	95.00	98.95	89.40
	SA (adaptive)	99.00	99.50	98.50
	SA (cost-based)	100.0	100.0	100.0
Third Semester	SA (geometric)	97.60	98.88	90.90
	SA (adaptive)	100.0	100.0	100.0
	SA (cost-based)	100.0	100.0	100.0

Table 4: Percentage of scheduled classes, averaged over 10 runs of the same initial temperature and other parameters, for three terms using simulated annealing *with an expert system as preprocessor.*

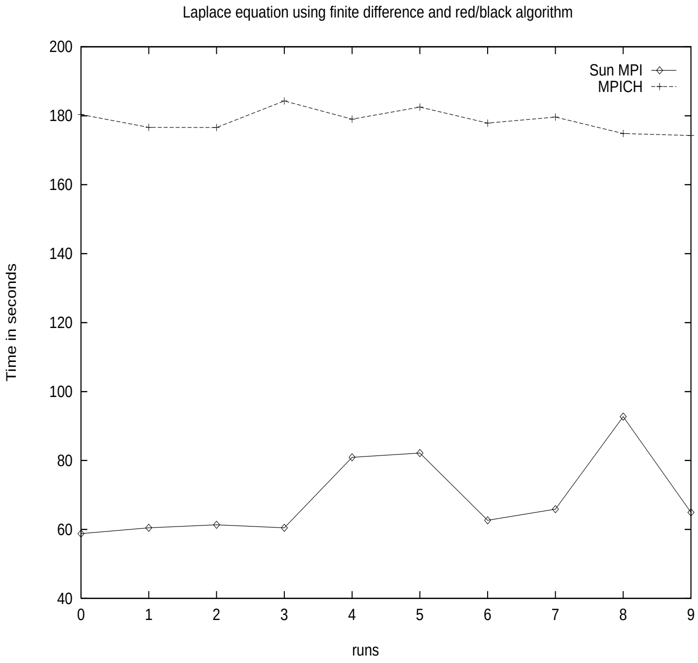

Figure 1: Runs vs. their runtimes.

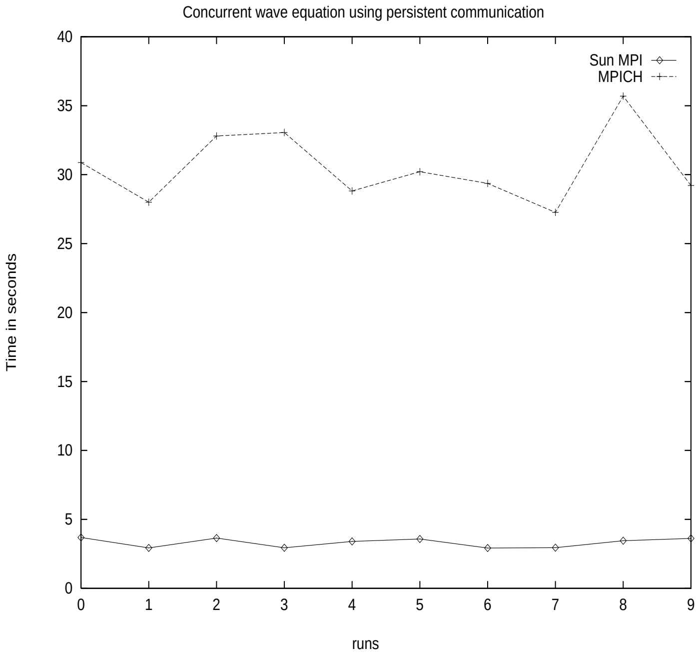

Figure 2: Runs vs. their runtimes.

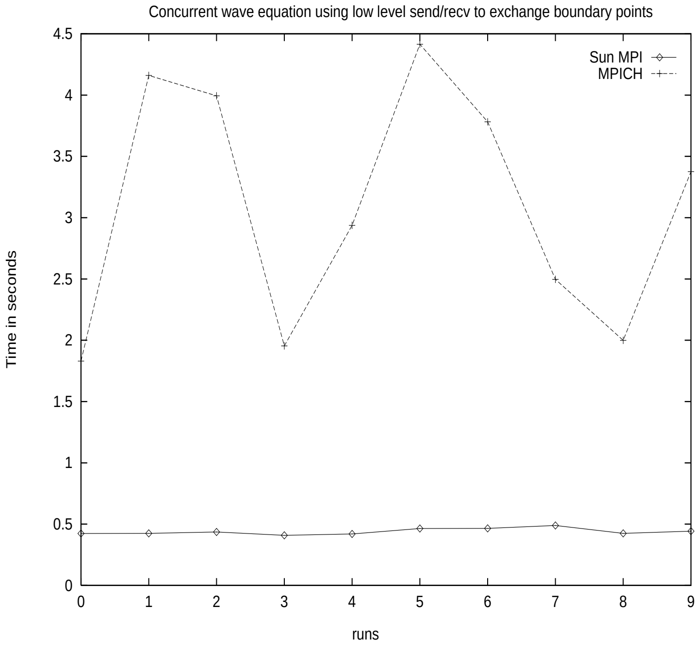

Figure 3: Runs vs. their runtimes.

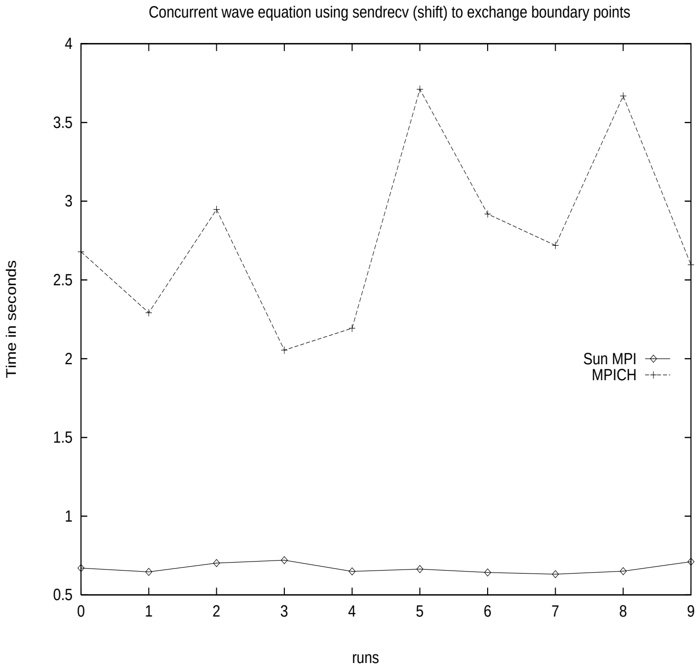

Figure 4: Runs vs. their runtimes.