Project Assignment - 2

Parallel Gaussian Elimination Using P-Threads

Multi-Processor System (DV 2544)

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Aim :- Write a C program that implements the Gaussian Elimination algorithm using P-Threads.

Data Structure : The equations matrix was represented using a 2-dimensional array and two vectors (1-dimensional arrays) b and y are used for the solution vector and the constant vector.

Work Allocation : Each thread will be working in parallel on each column i.e each pivot element will be identified and will be worked on by each program thread. The elimination and division threads are executed by using the mutex variable i.e by locking the row on which an operation is being performed.

Measurements:

Matrix Size	Sequential Version			Parallel Version (1 CPU)			Parallel Version (8 CPUs)			Speedup 8 cpus
	Execution Time (sec)		CPU Utilized	Execution Time (sec)		CPU Utilized	Execution Time (sec)		CPU Utilized	
	System	*Elapsed*		*System*	*Elapsed*		*System*	*Elapsed*		
32	0.00	0.00	0%	0.00	0.00	0%	0.00	0.00	100%	-
64	0.00	0.00	0%	0.00	0.00	0%	0.00	0.00	133%	-
128	0.00	0.00	57%	0.00	0.00	57%	0.01	0.01	155%	-
256	0.00	0.04	93%	0.00	0.06	96%	0.03	0.02	227%	1.2
512	0.00	0.37	99%	0.00	0.40	99%	0.03	0.11	367%	2.64
1024	0.01	3.27	99%	0.01	3.08	99%	0.25	0.50	608%	4.12
2048	0.04	24.37	99%	0.06	24.32	99%	0.37	4.23	728%	5.3

Conclusion: From the above speedup values it is clearly evident that the parallel version executes faster than the sequential version.

References

[1] A. Grama, A. Gupta, G. Karypis, and V. Kumar, *Introduction to parallel computing, 2nd edition,* Addison-Wesley, 2003.