CS6868: Concurrent Programming
Spring 2014
Assignment 1: Due 22 February 2014, 11:59 pm

Problem 2:Game Of Life

Approach

In game of life,we have a matrix whose each cell modifies (Live or Die) itself according to it's neighbors. Approach used in this concurrent program is as follows. Each cell can operate independently with respect to others in each generation. So we can parallelize modification operation for each cell (parallel for : cilk_for). We just have to swap matrix (pointer) in each generation.

Cilkview Scalability Analyzer Output

Input #1:

Cilkview Scalability Analyzer V2.0.0, Build 3566

Whole Program Statistics
1) Parallelism Profile

Work :		*879,537,093,065 instructions*
Span :		*144,428,526,365 instructions*
Burdened span :		*144,435,226,365 instructions*
Parallelism :	*6.09*	
Burdened parallelism :		*6.09*
Number of spawns/syncs:		*1,000,000,000*
Average instructions / strand :		*293*
Strands along span :		*561*
Average instructions / strand on span :		*257,448,353*
Total number of atomic instructions :		*1,000,000,030*
Frame count :		*2,000,000,000*

2) Speedup Estimate

2 processors:	*1.56 - 2.00*
4 processors:	*2.18 - 4.00*
8 processors:	*2.71 - 6.09*
16 processors:	*3.08 - 6.09*
32 processors:	*3.31 - 6.09*
64 processors:	*3.44 - 6.09*
128 processors:	*3.51 - 6.09*
256 processors:	*3.55 - 6.09*

Cilk Parallel Region(s) Statistics - Elapsed time: 110.512 seconds

1) Parallelism Profile

Work :	*735,108,650,420 instructions*
Span :	*83,720 instructions*
Burdened span :	*6,783,720 instructions*
Parallelism :	*8780562.00*
Burdened parallelism :	*108363.65*
Number of spawns/syncs:	*1,000,000,000*
Average instructions / strand :	*245*
Strands along span :	*280*
Average instructions / strand on span :	*299*
Total number of atomic instructions :	*1,000,000,030*
Frame count :	*2,000,000,000*
Entries to parallel region :	*10*

2) Speedup Estimate

2 processors:	*1.90 - 2.00*
4 processors:	*3.80 - 4.00*
8 processors:	*7.60 - 8.00*
16 processors:	*15.20 - 16.00*
32 processors:	*30.40 - 32.00*
64 processors:	*60.80 - 64.00*
128 processors:	*121.60 - 128.00*
256 processors:	*243.20 - 256.00*

Input #2

Cilkview Scalability Analyzer V2.0.0, Build 3566

Whole Program Statistics
1) Parallelism Profile

Work :	*879,536,995,541 instructions*
Span :	*144,428,520,641 instructions*
Burdened span :	*144,435,220,641 instructions*
Parallelism :	*6.09*
Burdened parallelism :	*6.09*
Number of spawns/syncs:	*1,000,000,000*
Average instructions / strand :	*293*
Strands along span :	*561*
Average instructions / strand on span :	*257,448,343*
Total number of atomic instructions :	*1,000,000,030*
Frame count :	*2,000,000,000*

2) Speedup Estimate

2 processors:	*1.56 - 2.00*
4 processors:	*2.18 - 4.00*
8 processors:	*2.71 - 6.09*
16 processors:	*3.08 - 6.09*
32 processors:	*3.31 - 6.09*
64 processors:	*3.44 - 6.09*
128 processors:	*3.51 - 6.09*
256 processors:	*3.55 - 6.09*

Cilk Parallel Region(s) Statistics - Elapsed time: 110.334 seconds
1) Parallelism Profile

Work :	*735,108,558,620 instructions*
Span :	*83,720 instructions*
Burdened span :	*6,783,720 instructions*
Parallelism :	*8780560.90*
Burdened parallelism :	*108363.64*
Number of spawns/syncs:	*1,000,000,000*
Average instructions / strand :	*245*
Strands along span :	*280*
Average instructions / strand on span :	*299*
Total number of atomic instructions :	*1,000,000,030*
Frame count :	*2,000,000,000*
Entries to parallel region :	*10*

2) Speedup Estimate

2 processors:	*1.90 - 2.00*
4 processors:	*3.80 - 4.00*
8 processors:	*7.60 - 8.00*
16 processors:	*15.20 - 16.00*
32 processors:	*30.40 - 32.00*
64 processors:	*60.80 - 64.00*
128 processors:	*121.60 - 128.00*
256 processors:	*243.20 - 256.00*

Input #3

Cilkview Scalability Analyzer V2.0.0, Build 3566

Whole Program Statistics

1) Parallelism Profile

Work :	*3,084,862,315,135 instructions*
Span :	*144,428,774,695 instructions*
Burdened span :	*144,455,574,695 instructions*
Parallelism :	*21.36*
Burdened parallelism :	*21.36*
Number of spawns/syncs:	*4,000,000,000*
Average instructions / strand :	*257*
Strands along span :	*2,241*
Average instructions / strand on span :	*64,448,359*
Total number of atomic instructions :	*4,000,000,120*
Frame count :	*8,000,000,000*

2) Speedup Estimate

2 processors:	*1.85 - 2.00*
4 processors:	*3.23 - 4.00*
8 processors:	*5.14 - 8.00*
16 processors:	*7.29 - 16.00*
32 processors:	*9.23 - 21.36*
64 processors:	*10.64 - 21.36*
128 processors:	*11.52 - 21.36*
256 processors:	*12.02 - 21.36*

Cilk Parallel Region(s) Statistics - Elapsed time: 115.139 seconds

1) Parallelism Profile

Work :	*2,940,433,875,320 instructions*

Span :	*334,880 instructions*
Burdened span :	*27,134,880 instructions*
Parallelism :	*8780559.83*
Burdened parallelism :	*108363.62*
Number of spawns/syncs:	*4,000,000,000*
Average instructions / strand :	*245*
Strands along span :	*1,120*
Average instructions / strand on span :	*299*
Total number of atomic instructions :	*4,000,000,120*
Frame count :	*8,000,000,000*
Entries to parallel region :	*40*

2) Speedup Estimate

2 processors:	*1.90 - 2.00*
4 processors:	*3.80 - 4.00*
8 processors:	*7.60 - 8.00*
16 processors:	*15.20 - 16.00*
32 processors:	*30.40 - 32.00*
64 processors:	*60.80 - 64.00*
128 processors:	*121.60 - 128.00*
256 processors:	*243.20 - 256.00*