

## **GRAPH COLORING**

### Approach

Implementation of heuristic which considers largest degree first for coloring.

### Parallelisation in approach

- Degree is calculated parallelly.
- A thread is running for each vertex checking its neighbours and comparing their degrees.
- A count is maintained for the uncolored neighbours of higher degrees.
- Vertex is assigned with the smallest available color and number of vertices covered is incremented.
- For colored neighbouring vertices the degree of the vertex is decremented in parallel.

### Parallelism Statistics

#### Cilk view report for **small test case-**

##### Whole Program Statistics

##### 1) Parallelism Profile

Work :	5,163,136 instructions
Span :	4,047,806 instructions
Burdened span :	6,703,444 instructions
Parallelism :	1.28
Burdened parallelism :	0.77
Number of spawns/syncs:	2,990
Average instructions / strand :	575
Strands along span :	217
Average instructions / strand on span :	18,653
Total number of atomic instructions :	3,043

Frame count : 6,096

## 2) Speedup Estimate

2 processors:	0.62 - 1.28
4 processors:	0.52 - 1.28
8 processors:	0.49 - 1.28
16 processors:	0.47 - 1.28
32 processors:	0.46 - 1.28
64 processors:	0.46 - 1.28
128 processors:	0.46 - 1.28
256 processors:	0.45 - 1.28

Cilk Parallel Region(s) Statistics - Elapsed time: 0.022 seconds

### 1) Parallelism Profile

Work :	1,161,482 instructions
Span :	46,152 instructions
Burdened span :	2,701,790 instructions
Parallelism :	25.17
Burdened parallelism :	0.43
Number of spawns/syncs:	2,990
Average instructions / strand :	129
Strands along span :	108
Average instructions / strand on span :	427
Total number of atomic instructions :	3,043
Frame count :	6,096
Entries to parallel region :	14

## 2) Speedup Estimate

2 processors:	0.40 - 2.00
4 processors:	0.31 - 4.00
8 processors:	0.28 - 8.00
16 processors:	0.27 - 16.00
32 processors:	0.26 - 25.17
64 processors:	0.26 - 25.17
128 processors:	0.25 - 25.17
256 processors:	0.25 - 25.17

## Cilk view report for **medium test case-**

### Whole Program Statistics

#### 1) Parallelism Profile

Work :	49,101,378 instructions
Span :	6,077,047 instructions
Burdened span :	13,641,731 instructions
Parallelism :	8.08
Burdened parallelism :	3.60
Number of spawns/syncs:	113,792
Average instructions / strand :	143
Strands along span :	625
Average instructions / strand on span :	9,723
Total number of atomic instructions :	113,921
Frame count :	228,447

#### 2) Speedup Estimate

2 processors:	1.36 - 2.00
4 processors:	1.65 - 4.00
8 processors:	1.86 - 8.00
16 processors:	1.98 - 8.08
32 processors:	2.05 - 8.08
64 processors:	2.08 - 8.08
128 processors:	2.10 - 8.08
256 processors:	2.11 - 8.08

### Cilk Parallel Region(s) Statistics - Elapsed time: 0.026 seconds

#### 1) Parallelism Profile

Work :	43,146,364 instructions
Span :	122,033 instructions
Burdened span :	7,686,717 instructions
Parallelism :	353.56
Burdened parallelism :	5.61
Number of spawns/syncs:	113,792
Average instructions / strand :	126
Strands along span :	312
Average instructions / strand on span :	391
Total number of atomic instructions :	113,921
Frame count :	228,447

Entries to parallel region :

26

## 2) Speedup Estimate

2 processors:	1.54 - 2.00
4 processors:	2.10 - 4.00
8 processors:	2.56 - 8.00
16 processors:	2.89 - 16.00
32 processors:	3.08 - 32.00
64 processors:	3.19 - 64.00
128 processors:	3.24 - 128.00
256 processors:	3.27 - 256.00

## Cilk view report for **large test case-**

### Whole Program Statistics

#### 1) Parallelism Profile

Work :	97,807,157,255 instructions
Span :	894,116,429 instructions
Burdened span :	1,369,439,304 instructions
Parallelism :	109.39
Burdened parallelism :	71.42
Number of spawns/syncs:	250,720,200
Average instructions / strand :	130
Strands along span :	39,571
Average instructions / strand on span :	22,595
Total number of atomic instructions :	250,729,933
Frame count :	501,717,764

#### 2) Speedup Estimate

2 processors:	1.90 - 2.00
4 processors:	3.73 - 4.00
8 processors:	6.86 - 8.00
16 processors:	11.79 - 16.00
32 processors:	18.41 - 32.00
64 processors:	25.60 - 64.00
128 processors:	31.82 - 109.39
256 processors:	36.21 - 109.39

Cilk Parallel Region(s) Statistics - Elapsed time: 0.026 seconds

#### 1) Parallelism Profile

Work :	96,930,136,965 instructions
Span :	17,096,139 instructions
Burdened span :	492,419,014 instructions
Parallelism :	5669.71
Burdened parallelism :	196.84
Number of spawns/syncs:	250,720,200
Average instructions / strand :	128
Strands along span :	19,785
Average instructions / strand on span :	864
Total number of atomic instructions :	250,729,933
Frame count :	501,717,764
Entries to parallel region :	1,214

#### 2) Speedup Estimate

2 processors:	1.90 - 2.00
4 processors:	3.80 - 4.00
8 processors:	7.54 - 8.00
16 processors:	14.17 - 16.00
32 processors:	25.24 - 32.00
64 processors:	41.45 - 64.00
128 processors:	61.05 - 128.00
256 processors:	79.94 - 256.00