A comparison of some recent Task-based Parallel Programming Models

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Introduction

- Today
- Moore's law
- Future
- Task-based parallelism
- About this presentation

Task-based Programming Model

- OpenMP
  - Gcc
  - Icc
  - Mcc
  - Sun CC
- Cilk++
- Wool
- Others (Intel TBB, Microsoft Task Parallel Library , X10 activities)

Task-generation(OpenMP)

```
int fib(int n) {
  int x, y;
  if (n < 2)
    return n;
  else {
    #pragma omp task shared(x)
      x = fib(n-1);
    #pragma omp task shared(y)
      y = fib(n-2);
    #pragma omp taskwait
      return x + y;
  }
}
```

Task-Generation(Cilk++)

```
int fib(int n) {
  int x, y;
  if (n < 2)
    return n;
  else {
    x = cilk_spawn fib(n-1);
    y = cilk_spawn fib(n-2);
    cilk_sync;
    return x + y;
  }
}
```

Task-Generation(Wool)

```
TASK_1 (int, fib, int, n) {
  if (n < 2)
      return n;
  else {
      int x, y;
      SPAWN( fib, n-1 );
      y = CALL( fib, n-2 );
      x = SYNC( fib );
      return x + y;
  }
}
```

Methodology

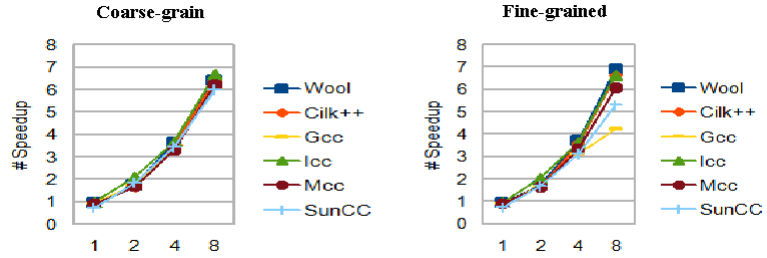
- Two quad-core AMD64 system
- Program executed ten times.
- Measurement as compared to serial(gcc)
- Median value used
- Compilation

Benchmarks

- Five benchmarks
- FFT, nQueens,Multisort, SparseLU , Strassen
- Barcelona OpenMP task suite

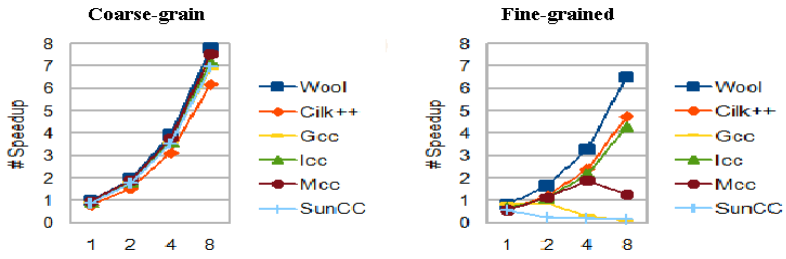
FFT

- Fast Fourier Transform
- Task-grainsize differs on vector before going serial(64k – 16)



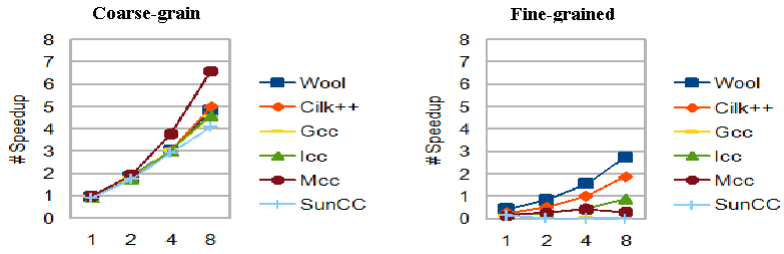
nQueens

- Nqueen problem
- Task-grainsize differ on allowed task-depth(4 – 12)



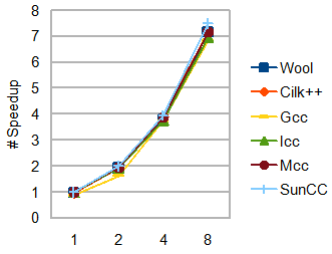
Multisort

- Multisort benchmark
- Task-grainsize differ on list-size before going serial(512k – 16)



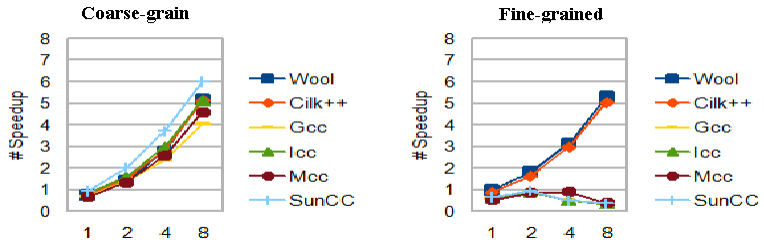
SparseLU

- SparseLU benchmark



Strassen

- Strassen benchmark
- Task-grainsize differ with sub-matrix before serial(256 – 16)



Conclusion

- Performance comparison
- Wool shows good promise
- OpenMP not yet complete for finegrained tasks.

Future work

- Identify and explain
- Possible further improvments

Questions