

# Mandatory assignment No. 2 of INF3380

## 1 Parallelization

The second mandatory assignment of INF3380 is a continuation of the first mandatory assignment. More specifically, you are required to use OpenMP to parallelize the sequential 2D wave solver, which can be downloaded from

<http://www.uio.no/studier/emner/matnat/ifi/INF3380/v10/undervisningsmateriale/wave2D-sequential.c>

Hint: The OpenMP directive

```
#pragma omp parallel for
```

should be inserted before those time-consuming for-loops of the sequential code. Chapters 17.3 and 17.4 of the textbook are the relevant reading material.

## 2 Compilation and execution

Note that you should use the `-fopenmp` option when compiling an OpenMP C-code by the `gcc` compiler. When executing an OpenMP program on `modula.simula.no`, the number of threads can be specified in the PBS script through the `OMP_NUM_THREADS` environment variable. Suppose the executable has name `a.out`, the following PBS script is a very simple example:

```
#!/bin/bash
#PBS -j oe

cd $PBS_O_WORKDIR
export OMP_NUM_THREADS=4

./a.out
```

The PBS script, supposedly named `pbs.sh`, can be submitted to the queue system simply by

```
qsub pbs.sh
```

### 3 Performance analysis

Choose two sets of  $M, N$  values, one small and one large. Measure for each problem size the time usage of the OpenMP program on 1, 2, 3, 4 threads. The Karp-Flatt Metric, see Chapter 7.5 in the textbook, should be used to provide a rough explanation of the speedup results you've obtained.

### 4 Submission

Each student should work independently with the assignment and write a short report summarizing the measurements. In addition, you should use the Karp-Flatt Metric to analyze the results in the report. The OpenMP source code should be attached to the report.

### 5 Deadline

Friday, May 21st, 2010. Submission by email to [tomassru@simula.no](mailto:tomassru@simula.no).