- In week 36 we covered "Single Processor Machines: Memory Hierarchies and Processor Features" and the "Case Study: Tuning Matrix Multiply". Many additional reading hints are given on the slides of this week's lecture. Additionally Chapter 2 from the "Soucebook" was put in Blackboard. The slides for week 36 were updated.
- The first mandatory assignment, where you need access to the Franklin Cluster is posted today (04.09.2009) on the course web page. Information for the account setup from the NERSC is expected to be received very soon (or you even were already contacted).
- The first tutorial is next week, please solve the exercises on the next page for that discussion session.
- Next week (37) we will start with "Introduction to Parallel Machines and Programming Models". The slides will be available very soon.

Exercises for Tutorials - 1

Parallel Computing, DM818 (Fall 2008)

Department of Mathematics and Computer Science
University of Southern Denmark
Daniel Merkle

In the lectures in week 36 we discussed two different approaches for matrix-matrix multiplication, namely the naive approach and the blocked matrix-matrix multiplication. For both of them we determined the computational intensity. The goal of this exercise is to investigate a striped version of matrix-matrix multiplication. Suppose for the product $A = B \times C$ the matrices A, B, and C (each matrix has size $n \times n$) are striped in N stripes, i.e. matrices A and C are divided in N blocks of size $n/N \times n$, and matrix B is divided in stripes of size $n \times n/N$. Let $b = n/N$ denote the block size.

$$\begin{pmatrix} C_1 \\ \hline C_2 \\ \hline \dots \\ \hline C_N \end{pmatrix} = \begin{pmatrix} A_1 \\ \hline A_2 \\ \hline \dots \\ \hline A_N \end{pmatrix} \cdot \left(\begin{array}{c|c|c|c} B_1 & B_2 & \dots & B_N \\ & & & \end{array}\right)$$

a) Write the pseudo code for this algorithm.

b) Determine the number of slow memory accesses (suppose that three blocks of size $n \times b$ fit into fast memory).

c) What is the number of arithmetic operations?

d) Determine the computational intensity.

e) Compare this computational intensity with the computational intensity of the blocked version presented in the lecture.