

Programming Project 1

Due **10/27/10** before class

Matrix Multiplication (40 points)

Assume n is a power of 2. Implement three types of algorithms for multiplying two $n \times n$ matrices:

1. (10 points) The straight-forward $\Theta(n^3)$ matrix multiplication algorithm.
2. (10 points) Strassen's matrix multiplication algorithm.
3. (10 points) A mixture of both algorithms that is based on Strassen's algorithm: Assume some parameter a is given. For all recursive calls of Strassen's algorithm in which $n > a$ use the regular recursion by Strassen. If $n \leq a$, use the straight-forward $\Theta(n^3)$ algorithm (i.e., this is the "base case" of this algorithm).

Evaluate your different algorithms, and write a short report (word document or ASCII text file). This evaluation (consisting of report, test cases, and test algorithms) will be worth 10 points. For this, create test matrices for different values of n (you can generate matrices with random numbers, for example), and record the runtimes of your three algorithms. For the third algorithm also vary the parameter a . The range for n should reach at least $n = 256$ and a should reach at least $a = 32$. Your report should include the runtimes and should include a conclusion as to which algorithm performs best.

Turnin instructions

- You are allowed to turn in this programming project in groups of two.
- You can use Java, C, or C++ for this project. If you want to use a different programming language, check with our TA first.
- **The name of your project directory should be**
`project1_<lastName1><firstName1><lastName2><firstName2>`
- Zip up a directory with your entire project (source code and report). Turn in the zip file by emailing it to me (carola@cs.utsa.edu) with the subject "CS3343 project 1 submission".
- All projects need to compile. If your program does not compile you will receive 0 points on this project.
- Do not use any fancy libraries. We should be able to compile it under standard installs of Java, C, or C++ under linux and/or windows. You may want to include some comments how you compiled the project.