Computer Architecture Homework

October 26, 2015

Abstract

Homework for 2015/10/26

Today's homework consists of two parts: a little systems work, and a little math.

The systems work to be done is just in preparation for the homework to be done later in the semester.

1. Install the `spim` simulator for the MIPS microprocessor. There are several versions available; you may install any version that works on your PC. *We will be using this in class two weeks from now! You must have it installed and running by then!*

Okay, here's the math part:

This is the first of a string of three homeworks. There will be follow-on homework from this next week, so you must have this done by then!

Take the two matrices:

$$A = \begin{pmatrix} 1 & 0 & 3.14 & 2.72 \\ 2.72 & 1 & 0 & 3.14 \\ 1 & 1 & 1 & 1 \\ 1 & 2 & 3 & 4 \end{pmatrix} \tag{1}$$

$$B = \begin{pmatrix} 1 & 1 & 0 & 3.14 \\ 0 & 1 & 3.14 & 2.72 \\ 0 & 1 & 1 & 0 \\ 4 & 3 & 2 & 1 \end{pmatrix} \tag{2}$$

Do the following:

1. Find the matrix product AB. Do this by hand, and show your work.

2. Count

    (a) the number of real (floating point) multiplications necessary, and

    (b) the number of real (floating point) additions necessary.

3. Express

    (a) the number of real (floating point) multiplications necessary, and

    (b) the number of real (floating point) additions necessary

    as a function of N for multiplying two $N \times N$ matrices.

4. Write *pseudocode* for a program to multiply two $N \times N$ matrices.