ICS 233 – Fall 2009
Computer Architecture and Assembly Language
Programming Assignment 3

Matrix Multiplication

Write and test a MIPS assembly language program to perform matrix multiplication of *N* by *N* matrices of double-precision floating-point numbers. In your program, define the space of three 10×10 matrices, where the maximum value of *N* is fixed at 10.

The matrix data should be read from a text file in row-major order. $N \times N$ signed numbers should be read from a text file. Prompt the user to enter the name of the text file, then open and read the text file. Each number should be converted from a string to a floating-point number. You need a procedure to convert the input string character-by-character to a floating-point number. The input string begins with an optional '-' sign, followed by one or more decimal digit characters from '0' to '9', followed by an optional decimal point '.' and optional fraction digit characters.

Write a procedure to do matrix multiplication of $N \times N$ matrices, where *N* is passed to the procedure as a parameter. *All matrix operations should be done using the double-precision floating-point instructions*. The output matrix should be stored in a text file. A floating-point number should be converted to string format before writing it to a text file. Compute only *two digits* after the decimal point. MARS provides system calls for opening a file, reading from an input text file, and writing to an output text file. Test and verify the matrix multiply procedure, by examining the result matrix output.

A sample run is show below:

```
Enter the matrix size N: 5
Enter the first  matrix filename: m1.txt
Enter the second matrix filename: m2.txt
Enter the output matrix filename: m3.txt
```

The produced solution vector should be written to the output file: **m3.txt**.

Submission Guidelines:

All submissions will be done through WebCT.

Submit the source code of the program. Make sure that your program is well documented.

Grading Policy:

The grade will be divided according to the following components:

■   Input is read properly from the text file and converted to floating-point format.

■   Matrix multiply procedure works properly and produces correct results.

■   Output matrix is written properly to output text file.

■   Coding and Documentation: program is divided into procedures and well documented.