x86-to-C interface programming project

Started: Mar 25 at 3:02pm

Quiz Instructions

**Remember the academic honor pledge that you signed.

General directions:

1.) If this is assigned to a group, only one member will submit.

2.) Ignore the file upload button in the specification question.

3.) Submission via GitHub. Place your Github link in the next question. Make sure I can access your GitHub.

4.) Follow the directions found in the specifications.

5.) Take a screenshot of your project specification for reference purposes. The first project specification is your project specification regardless of the attempts.

Question 1 — 0 pts

Write the kernel in (1) C program and (2) an x86-64 assembly language. The kernel is to perform a dot product between vector *A* and vector *B* and place the result in *sdot*.

*Required to use functional scalar SIMD registers

*Required to use functional scalar SIMD floating-point instructions

Input: Scalar variable *n* (integer) contains the length of the vector; Vectors *A* and *B* are both **single-**precision **float**. Scalar *sdot* is a single-precision float.

Process: $sdot = \sum_{i=1}^{n} a_i b_i = a_1 b_1 + a_2 b_2 + \ldots + a_n b_n$

Output: store the result in memory location *sdot*. Display the result for all versions of the kernel (i.e., C and x86-64).

Note:

1.) Write a C main program to call the kernels of the C version and x86-64 assembly language.

2.) Time the kernel portion only. Both for debug mode and release mode.

3.) For each kernel version, time the process for vector size *n* = {2^{20}, 2^{24}, and 2^{30}}. If 2^{30} is impossible, you may reduce it to the point your machine can support (i.e., 2^{28} or 2^{29}).

4.) You must run at least 30 times for each version to get the average execution time.

5.) For the data, you may initialize each vector with the same or different random value.

6.) You will need to check the correctness of your output. Thus, if the C version is your "sanity check answer key," then the output of the x86-64 version has to be checked with the C version and output correspondingly (i.e., the x86-64 kernel output is correct, etc.).

7.) Output in GitHub (make sure that I can access your Github):

a.) Github readme containing the following (debug and release mode; C and x86-64):

i.) comparative execution time and short analysis of the performance of the kernels

ii.) Take a screenshot of the program output with the correctness check (C).

iii.) Take a screenshot of the program output, including the correctness check (x86-64).

b.) Visual Studio project folder containing **complete** files (source code: C, x86-64, and all other required files) for others to load and execute your program.

Rubric:

C main program with initialization and correct call/passing parameters to C and x86-64	10
Correct output (C version)	10
Correct output (x86-64)	40
Comparative result	20
Analysis of result	10
following instructions	10
Note: No usage of functional scalar SIMD registers and scalar SIMD instructions	grade = 0

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Question 2 — 90 pts

Place your GitHub link here.

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