

x86-to-C interface programming project

Started: Mar 31 at 4:47pm

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 **double-precision float**. Scalar $sdot$ is a double-precision float.

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

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 $n = \{2^{20}, 2^{24}, \text{ and } 2^{30}\}$. 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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