

# x86-to-C interface programming project

Started: Nov 13 at 2:09pm

## Quiz Instructions

\*\*Remember the academic honor pledge that you signed.

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General directions:

- 1.) If this is assigned to a group, only one member will submit. The other member will be assigned the "partner grade" C-assembly interface" assignment.
- 2.) Submission via GitHub. Place your Github link in the next question. Make sure I can access your GitHub.
- 3.) Write the name of all group members in the Github documentation.
- 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.**
- 6.) Don't forget to submit the peer evaluation.



Write the kernel in (1) C program and (2) an x86-64 assembly language. The kernel is to perform DAXPY ( $A \cdot X + Y$ ) function.

**Input:** Scalar variable  $n$  (integer) contains the length of the vector; Scalar variable  $A$  is a double-precision float. Vectors  $X$ ,  $Y$  and  $Z$  are **double-precision float**.

\*Required to use functional scalar SIMD registers

\*Required to use functional scalar SIMD floating-point instructions

**Process:**  $Z[i] = A \cdot X[i] + Y[i]$

**Example:**

$A \rightarrow 2.0$

$X \rightarrow 1.0, 2.0, 3.0$

$Y \rightarrow 11.0, 12.0, 13.0$

(answer)  $z \rightarrow 13.0, 16.0, 19.0$

**Output:** store result in vector Z. Display the result of 1st ten elements of vector Z for all versions of 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.
- 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 and scalar variable 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).
    - iv.) short videos (5-10mins) showing your source code, compilation, and execution of the C and x86-64 program
  - 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
Short video	10
not following instructions	-10 / instruction
Note: No usage of functional scalar SIMD registers and scalar SIMD instructions	grade = 0

⋮

**Question 1 90 pts**

Place your GitHub link here.

Edit View Insert Format Tools Table

12pt ▾ Paragraph ▾ ⋮

A large empty text area for pasting a GitHub link.

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A row of small icons for text formatting: a keyboard, a person, 0 words, a double arrow, a plus sign, a minus sign, a left arrow, and a three-dot menu.

Quiz saved at 11:48pm

Submit Quiz