

AnimoSpace Support

x86-to-C interface programming project

Started: Nov 22 at 3:22pm

Quiz Instructions

****Remember the academic honor pledge that you signed. The other member will be assigned the "[partner grade] C-assembly interface" assignment.**

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.) Write the name all group members in 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.



Question 1 0 pts

Introduction

A grayscale image is internally represented as a 2 dimensional array. Size is defined by the number of pixels in a row (width), and number of pixels in a column (height). Each cell represents the pixel value. Pixel values in grayscale are represented as white, black, and shades of gray using different numerical data type representation depending on the library used.

Some Libraries represent using 8 bit unsigned integer. 0 for black, 255 for white, 64 light gray, 191 dark gray, and all other gray values in between.

Image =

64, 89, 114, 84

140, 166, 191, 84

216, 242, 38, 84

Some Image Processing Libraries represent grayscale images as having double float based pixel values between 0 to 1. 0 for black, 1 for white, 0.25 light gray, 0.75 darker gray, and all other gray values in between.

Image =

0.25, 0.35, 0.45, 0.33

0.55, 0.65, 0.75, 0.33

0.85, 0.95, 0.15, 0.33

To enable using different image processing libraries simultaneously, conversion from one format to the other has to be done. **Perform Mapping from uint8 based integer grayscale to *double precision* float representation.** Each pixel is calculated using ratio and proportion equation

$$\frac{f}{i} = \frac{1}{255}$$

Where f is the double float based pixel value and i is the integer based pixel value

Task

Implement a program that converts the grayscale image representation from int based to float based using C and x86 assembly language. Implement the function **imgCvtGrayIntToDouble()**.

*Required to use functional scalar SIMD registers

*Required to use functional scalar SIMD floating-point instructions

Input: height, width, integer pixel values

Example.

64, 89, 114, 84

140, 166, 191, 84

216, 242, 38, 84

Output: Double Float pixel values

Example.

0.25 0.35 0.45 0.33

0.55 0.65 0.75 0.33

0.85 0.95 0.15 0.33

Note:

- 1.) C is responsible for: collecting the inputs, allocating memory spaces for the images, and printing the outputs.
- 2.) Function implemented in assembly is responsible for calculating and converting the data type from the input int pixels into the output double float pixels.
- 3) Time the asm function only for input image size *width*height*= {10*10, 100*100, and 1000*1000}. If 1000*1000 is impossible, you may reduce it to the point your machine can support. You may use a random number generator to generate pixel values for the input.
- 4.) You must run at least 30 times to get the average execution time.
- 5.) For the data, you may initialize each pixel with the same or different random value.
- 6.) You will need to check the correctness of your output.
- 7.) Output in GitHub (make sure that I can access your Github):

a.) Github readme containing the following (C and x86-64):

i.) execution time and short analysis of the performance

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

iii.) short videos (5-10mins) showing your source code, compilation, and execution of the C and x86-64 program

b.) Submit all files needed to run your project. (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	25
Correct output (x86-64)	45
Performance result	20
Video	10
not following instructions	-10/instructions

Note: No usage of functional scalar SIMD registers and scalar SIMD instructions, function not in assembly grade = 0

Upload

Choose a File



Question 2 90 pts

Place your GitHub link here.

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