

CS4342 Advanced Computer Architecture

Take Home Lab 3

Due – July 9 before 11:55 PM

Learning Outcomes

In this lab we will develop a set of programs to demonstrate the usefulness of SIMD instruction set for multimedia, which is available in modern x86 processors. At the end of the lab you will be able to:

- Understand how multimedia extensions can be used to speed up a program
- Compare performance of 2 programs

Getting Started

Step 1: This is a group lab where each group has 2 students. Find your lab buddy.

Step 2: Read “High Performance Computing and Programming, Lab 4 – SIMD and Vectorization” by Marcus Holm (available on Moodle).

Step 3: Develop necessary programs for Tasks 5.1, 6.1, and 7.1 in the above lab sheet.

Step 4: Fill up the following table for different dimensions of matrixes and vectors. For each parameter setting, run the program at least 10 times and calculate the average execution time. Use the conventional C program as the basis for calculating speed up.

Task 5.1

Dimensions		Execution Time				
Matrix	Vector	C program of Listing 5	C program of Listing 6	Speed Up	SSE version of Listing 6	Speed Up
[100, 100]	[100, 1]					
[200, 200]	[200, 1]					
[400, 400]	[400, 1]					
[800, 800]	[800, 1]					
[1600, 1600]	[1600, 1]					

Task 6.1 and 7.1

Dimensions		Execution Time				
Matrix	Vector	C program of Listing 7	SSE version of Listing 7	Speed Up	Auto-Vectorized Version of Listing 7	Speed Up
[100, 100]	[100, 200]					
[200, 200]	[200, 200]					
[400, 400]	[400, 200]					
[800, 800]	[800, 200]					
[1600, 1600]	[1600, 200]					

Step 5: Comment on your observation while considering the increase in complexity of the program (i.e., number of calculations to perform). You may use graphs to better explain your findings.

What to Submit

- Source codes and instructions on how to compile and run them.
- Submit answers to questions in Steps 4 and 5. Clearly indicate group members' index numbers and names.
- Name the .zip file as lab3_<index no>.zip. Replace <index no x> with your index number.