

Lab11: Image Processing with SIMD Intrinsics

Part1: 8 points

This lab has 3 files:

1. `bmp0.c` : This is a file included in the `main0.c` and it has the functions necessary to read and write bmp image files in C. Do not modify this file.
2. `marquette.bmp` : This is a colored bmp image that will be converted to greyscale.
3. `main0.c` : This is the file you will be writing code in. Note you will only need to write code inside the `vec_greyscale` function. You are not required to modify other parts of this file.

You are going to be implementing the `vec_greyscale` function where you will convert the given greyscale function to its equivalent vector function with intrinsics.

For this lab, you are supposed to be using single precision floating vector types, so the functions will be have **ps** in the end (not **pd**) like `_mm256_load_ps(...)`;

Single precision types can do **8** floating point operations at a time (and not 4).

Some of the functions you will be using are: `_mm256_set_ps`, `_mm256_load_ps`, `_mm256_add_ps`, `_mm256_div_ps`, `_mm256_store_ps`.

Also, note that your indexing should increment by **8** (and not 4), like in cases where you'd (**k=0; k<N; k = k+8**).

Hints:

Loading: `r = (*image)[R][i][j] → r = _mm256_load_ps(&(*image)[R][i][j])`

Storing: `(*greyscale_image)[R][i][j] = val → _mm256_store_ps(&(*greyscale_image)[R][i][j],val)`

Task:

1. Login to pascal, create a folder `lab11` and move the 3 files into the folder
2. Compile and Execute to verify everything is working
3. Modify the `vec_greyscale` function
4. Compile and Execute to verify everything is working

Submission:

For part 1, you are required to submit 3 files:

1. Your `main0.c` file where you have finished implementing your work
2. Screenshots from the terminal
3. The generated `marquette_vec_grey.bmp` image file

Do not zip the files. Make sure you name your files properly.