GPU Programming in Computer Vision: Day 4

Date: Friday, 18. March 2016

Exercise 11: Parallel Reduction (4P)

Write code to compute the sum of a float array u with n elements:

$$s = \sum_{i=1}^{n} u_i$$

Do so by performing a parallel reduction. In particular, complete the following tasks:

1. Implement a parallel reduction algorithm yourself. Calculate the sum of a `float` array with $n = 10^5$ elements to test it.

2. Use the library function `cublasSasum`. Compare the performance of your implementation with the performance of the library function.

Exercise 12: Histograms (3P)

Compute the intensity histogram with 256 bins of the input image using atomic operations.

1. Represent the histogram as an integer array of length 256 and initialize it to zero. Write a kernel where each thread performs a global memory `atomicAdd` on the bin corresponding to the intensity of that pixel.

2. Use the `showHistogram256` function to visualize the histogram.

3. Think of a way to improve the performance of your kernel by using shared memory and shared memory atomics. Compare your solution to the naive version from 1.