

Summer Semester 2014

Assignment on Massively Parallel Algorithms - Sheet 10

Due Date 16. 07. 2014

Exercise 1 (Sorting Networks, 4 Credits)

In its simplest form, bubble sort is a data independent sorting algorithm, too, like odd-even and bitonic sorting.

- a) Show the sorting network that implements bubble sort for an input of 5 elements.
- b) Sketch the parallel version of bubble sort using pseudo-code.
- c) Implement your algorithm in cuda
- d) Write a unit test for your implementation. For the CPU version, you can use `std::sort` from the standard template library.

Exercise 2 (Bitonic Sorter, 4 Credits)

- a) In class, you have learned that a bitonic sorter has depth complexity $D_S(n) \in O(\log^2 n)$. Derive the exact number of the depth complexity $D_M(n)$ of a bitonic merger (assuming that we have an unlimited number of comparators/threads at our disposal).
- b) Do the same for the depth complexity $D_S(n)$ of a bitonic sorter.
- c) You have also learned that the work complexity of the bitonic merger is $C(n) = \frac{1}{2}n \log n$. Derive the work complexity of the complete bitonic sorter.
- d) You know from class that the adaptive bitonic merger has work complexity $O(n)$. What is the overall work complexity of the complete adaptive sorting algorithm?