06-26945 & 06-26944
Distributed and Parallel Computing + Extended
Autumn Semester 2019

The University of Birmingham
School of Computer Science
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Lab Exercise 02 Block Scan — UNASSESSED

This exercise does not carry any marks but will help you explore some parallel algorithms and the use of shared memory Start a new project in nsight and, following the pattern in `vectorAdd.cu` from the previous exercise, implement:

- A Sequential version of block scan to execute on the host (`host_bscan`)

- A Sequential version of block scan to execute on the GPU using a single thread (`single_thread_bscan`)

- Non-Shared Memory (nsm) Parallel implementations of both Hillis Steele Horn and Blelloch block scans that use global memory directly instead of using shared memory (`hsh_nsm_bscan` and `blelloch_nsm_bscan`)

- Parallel implementations of both Hillis Steele Horn block (`hsh_bscan`) and Blelloch block (`blelloch_bscan`) scans that uses shared memory

- A Parallel implementation of Blelloch block scan that uses shared memory and segment sizes that are double the block size (`blelloch_dblock_bscan`)

- Test all the above using a vector of 1,000,000 integers all of whose elements are all set to 1, comparing each GPU version's results against the results calculated by the host block scan version. Use a block size of 1024. (Note that `single_thread_bscan` should also use a block size of 1024 although it should be executed with a kernel configuration of 1 block with 1 thread per block)

- Use the nvidia profiler (can be used from the command line via `nvprof` or `nvvp` or more conveniently from within nsight) to analyse the memory performance of the different versions

The following is a set of questions for the Survey "Lab Exercise 03 - Unassessed" on Canvas. Please write your answers into that survey.

Task A Please enter the CPU model and the GPU model of the machine.

Task B Run your program a number of times and enter the time and speedup of each version with respect to time of the `single_thread_bscan` (which should be the slowest)

- `single_thread_bscan`
- `host_bscan`
- `hsh_nsm_bscan`
- `blelloch_nsm_bscan`
- `hsh_bscan`
- `blelloch_bscan`
- `blelloch_dblock_bscan`

Task C Write a short description of what you have been able to discover by using the profiler