ACCELERATOR BASED PROGRAMMING
UPPSALA UNIVERSITY
FALL 2022

EXERCISE 5: MULTI-DIM ARRAYS IN KOKKOS

This exercise is a preparation for the forth assignment.

1. Exercise Goal. The goal of this exercise is to practice the use of multi-dimensional arrays and nested parallelism with Kokkos.

2. Tasks.

- Read the Kokkos lecture 3 on multi-dimensional loops, slides 12–21.
- Go to the exercise on multi-dimensional loops within the Kokkos tutorial, called `mdrange`, and look at the initial code in `mdrange/Begin`.
- Try to solve the requested tasks of slide 19.
- Measure the performance of the initialization of the matrix and experiment with LayoutLeft and LayoutRight on both the GPU and CPU.
- Read the Kokkos lecture 4 on hierarchical parallelism, slides 8–13.
- Extend the program from `mdrange` by adding two nested parallel reduction and benchmark the code on the CPU and GPU. Test both `LayoutLeft` and `LayoutRight`. Discuss your observation!
- Compare your implementation with the code from the Kokkos tutorials, `team_policy/Solution`.
- Compare the performance you recorded with the results reported in the Kokkos tutorial, in particular the "coalesced" versus "cached" results for `LayoutRight` versus `LayoutLeft`, respectively. Also compare with the results of the 02 exercise. Discuss the differences in terms of the hardware.
- Convert your code from `double` to `float` arrays and measure again. Compare with the experience from exercise 1 (stream_triad) .