Assignment 6

Task: Stereo disparity OpenCL optimization

Optimization of stereo disparity OpenCL implementation and profiling

Task description

The algorithm for "Depth estimation based on Zero-mean Normalized Cross Correlation (**ZNCC**)" should be optimized in OpenCL by exploiting the GPU architecture. The basic OpenCL implementation of stereo disparity is already explored under Assignment 5. Profiling of the optimized algorithm needs to be done and then compared with previous C/C++, OpenMP and OpenCL implementations.

Task Implementation: Stereo disparity OpenCL optimization

This task is dedicated to the implementation of the code in C/C++ in a parallel manner using more than one thread of execution and more than one processor core.Try implementing the code in a way that the most of the parameters (such as e.g. the window size) can be easily changed. This implementation will be used by you in future assignments to understand where are the opportunities for parallelization in the proposed algorithm.

This task is dedicated to the optimization of the OpenCL code in a way that is able to exploit the architectural features of the GPU. This implementation is the final one that would be mainly used for the **evaluation** of the course and grades. In addition, this phase includes the writing of the final report and the documentation of the code and coding process.

To proceed with the optimization of the code, you can follow the next steps:

- Make a copy of the implementation before proceeding to the optimization phase! Use this implementation as the basis for optimization for both desktop (and optionally mobile) implementations. Optimize your code. All vendors have their own optimization guides with good examples. Your optimizations should take into account some of the following strategies:
  - Vectorization
  - Full memory architecture utilization (local memory)
  - Memory coalescing
  - Reducing the register usage
  - …
- Report the execution times and the CPU processor load of the optimized code in your final report
- Compare the execution times and the processor load of your final implementation to the ones obtained in the previous phases of the exercise.
  - Write a reasoning about the different performance gains and their causes
  - Propose other strategies that could be made for further optimizations.

The main idea behind this task is to optimize the OpenCL implementation with respect avaialble GPU architecutre and realize their execution times. Under this implementation, you should observe significant reduction in execution times of some of the computationally expensive functions atleast under the stereo disparity.

Save the output images in a similar manner to C/C++ implementation and include them under one folder

Expected result:

A working version of the implementation, a brief report with analysis and observations (max2-3 pages), saved output images all together in the form of a compressed folder (.zip file)

The report should contain about the task solved, brief description of your implementation, comparison of profiling information and the final screenshot of your outputs asked to be displayed under the assignment.