Weekly Assignment 4
Parallel Functional Programming

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Introduction

The handin deadline is the 20th of December.

The handin is expected to consist of a report in PDF format of 4—5 pages, excluding any figures, along with an archive containing your source code. The report should contain instructions on how to run and benchmark your code.

This text is incomplete—in a few days we will update it with a second task about automatic differentiation. We will make an announcement after doing so.

Task 1: Polyhedral Transformations

This task refers to polyhedral analysis, please see `L7-polyhedral.pdf`; the task is also summarized by the last slides in said document.

Please install the `islpy` library by running `pip install -user islpy`.

Your task is to encode in the polyhedral model three code transformations:

- loop interchange (a.k.a., permutation), in file `code-handout/poly-transf/permutation.py`;
- scaling, in file `code-handout/poly-transf/scaling.py`;
- reindexing, in file `code-handout/poly-transf/reindexing.py`.

Please follow the hints and instructions in said files. Your task is to fill in the blanks—in each file—the implementation of:

- the iteration domain,
- the original (sequential) schedule,
- the read/write access relations, and
- most importantly **the transformed schedule**.

Please include in your report:

- your (full) implementation of the (i) iteration domain, (ii) original schedule, (iii) read/write access relations and (iv) the transformed schedule (i.e., only those full lines; do not include the rest of the handed out code);
- a brief explanation of the encoding of the transformed schedule (for the others, the code should be self explanatory);
- for the *permutation (interchange)* and *reindexing* transformation, can you devise a schedule that tests that the transformed loop is parallel? (If so, please report it as well.)

Task 2: Automatic differentiation

Will be published in a few days.