

Cavity Flow

The project aims to optimize a 2D cavity flow simulation based on the Navier-Stokes equations, which is foundational in computational fluid dynamics. Starting with an existing Python implementation (see below), the goal is to create a high-performance version with C or C++ (with crucial parts done in C).

Baseline: A straightforward/unoptimized C or C++ implementation, essentially a translation of the python version linked below.

Optimized: Faster versions using what you have learned in this course.

As fast as possible: An even faster version produced with more elaborate techniques, e.g., some kind of autotuning or code generation, which should be applicable here. The use of profiling tools to analyze performance bottlenecks and to understand the behavior of the code is encouraged.

Baseline code

https://nbviewer.org/github/barbagroup/CFDPython/blob/master/lessons/14_Step_11.ipynb explains the problem in detail and implements it in Python using numpy.