# Project Report Assignment 2

Sixtine Lyonnet

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**Abstract**

This report outlines the work carried out for the free-surface 2D fluid solver using incompressible Euler's equations. The methodology was detailed in the textbook of the course CSE 3S006: Computer Graphics

# Contents



## 1. Introduction

The code for this lab can be found in the files main.cpp (Lab 1 and 2) and fluid.cpp (Lab 3). To run the code, run the following lines on a terminal:

```
g++ -std=c++17 main.cpp lbfgs.c -o main
./main
```

and

```
g++ -std=c++17 fluid.cpp lbfgs.c -o fluid
./fluid
```

My work is based on the textbook provided to us by the professor during the course CSC 3S006: Computer Graphics. I also got help from the TA to help solve some bugs, as well as from Andreea Patarlageanu. I specified where her help was given in the code.

## 2. Lab 1

For this lab, we implemented the the Voronoï Parallel Linear Enumeration algorithm in 2D. To do so, we implemented the Sutherland-Hodgman.

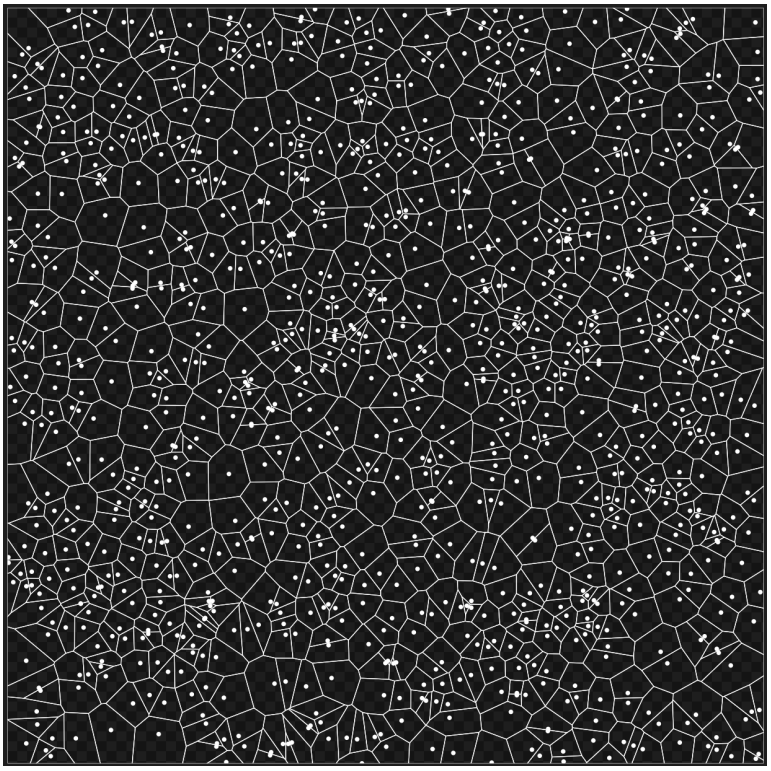

Figure 1: Voronoï Diagram with 1000 points, took 2923 milliseconds

# 3. Lab 2

For this second lab, we implemented semi-discrete optimal transport in 2d using L-BFGS between a set of Dirac weights and a uniform density f. This corresponds to adding a power diagram functionality

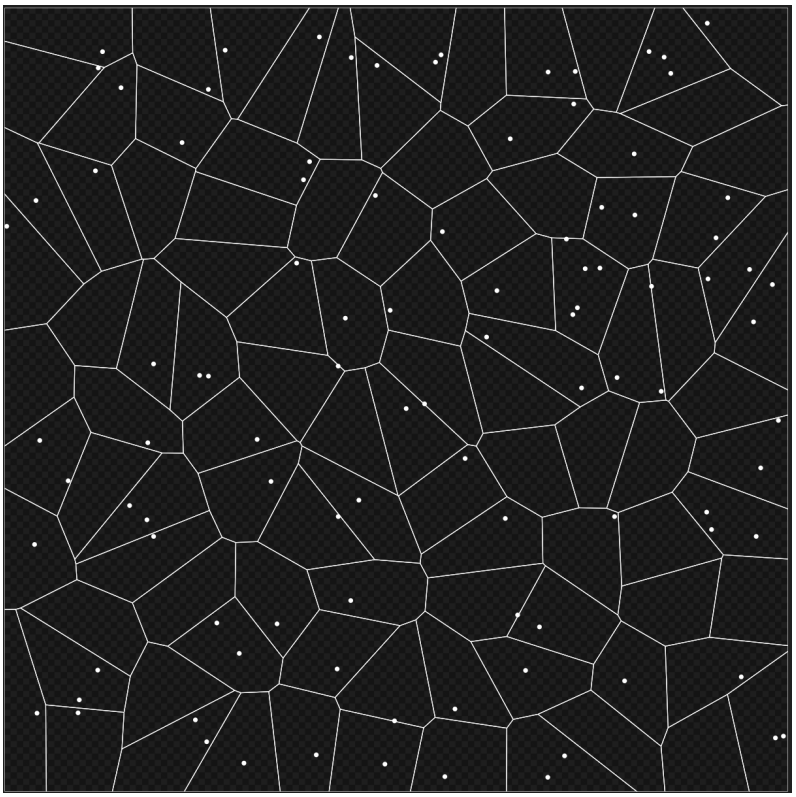

Figure 2: Equal cells with 100 points, took 2116 milliseconds

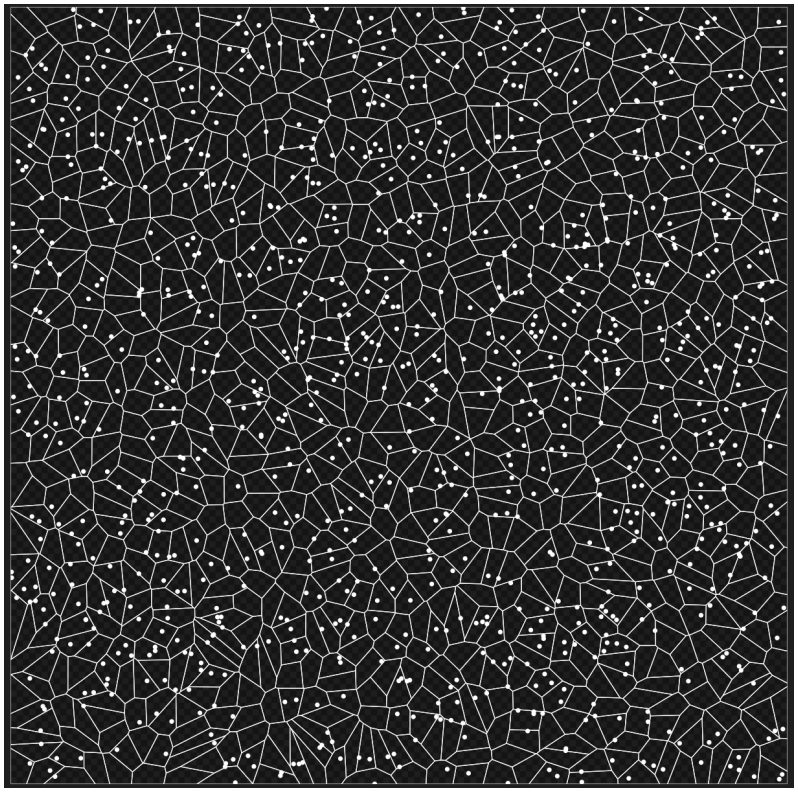

Figure 3: Equal cells with 1000 points, took 942657milliseconds

# 4. Lab 3

In the third lab, we implemented the semi-discrete optimal transport fluid simulator with free surfaces.

A video of this lab entitled Video_result_fluid.mov can be found in the GitHub. Here is the first frame of the video.

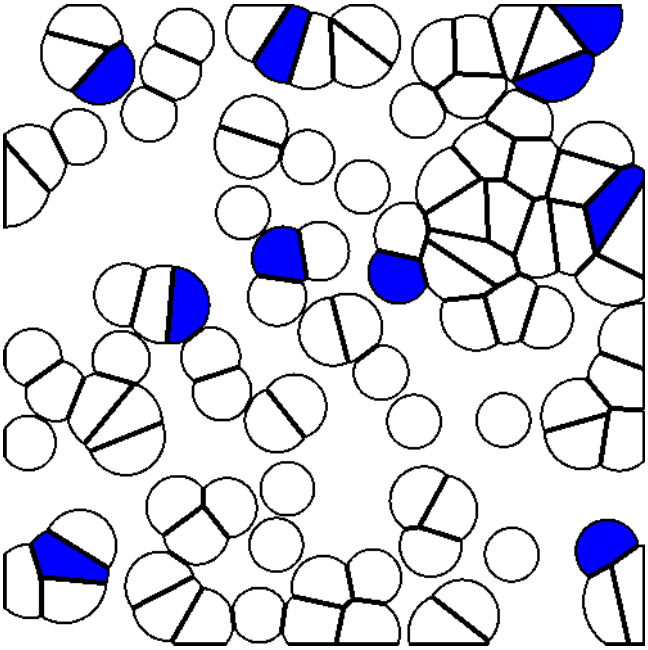

Figure 4: First frame of the fluid simulation