

# Geometry Processing project report (CSE306 - Computer Graphics)

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## 1 Summary

This project was conducted in the CSE306 Computer Graphics course. It implements some of the main building blocks of a Fluid simulation. This project includes the following features:

- Basic geometry (in  $(x,y,z)$  coordinates), vectors, etc
- Sutherland-Hodgman Polygon Clipping
- Voronoï Parallel Linear Enumeration algorithm in 2D
- Power diagram
- Power diagram weight optimisation (partly)

## 2 Process and code

The code I made for this project is on my Github account [here](#).

The code is composed of a few files. *main.cpp* includes the implementations of **Sutherland-Hodgman Polygon Clipping** and the **Voronoï Parallel Linear Enumeration** algorithm in 2D. The header file *vector-polygon-svg.h* includes the useful definitions for the Vector and Polygon classes (used throughout the project) as well as the functions for SVG frame saving, provided by the teacher in his lecture notes.

We also parallelized the execution of the code, since the code is "embarrassingly parallel" as there are many points (1000 in my case, but I tried with other values too) to consider.

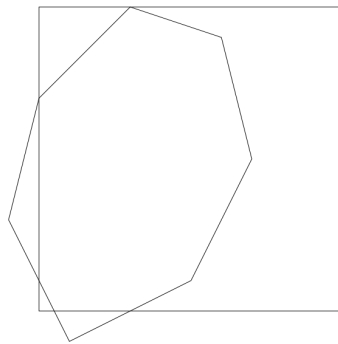
Unfortunately, I never managed to figure out the optimal transport for power diagram weight optimization using LBGFS, I was constantly getting errors that I did not manage to solve, and could not finish the project up to the fluid simulation

Lastly, the TD 5 for Color Matching is in my Github account too.

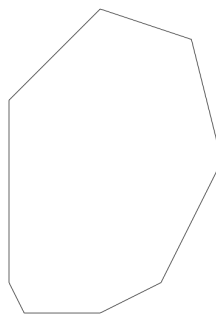
Please note that I was heavily inspired by Joshua Jacob's [LBGFS implementation](#) and [TD5](#). Despite this, I never managed to compile the project properly while using the LBGFS library, which led to me being unable to proceed further in the project after trying to for a very long time.

Below are some of the SVG outputs I obtained.

### 3 Sutherland-Hodgman Polygon Clipping

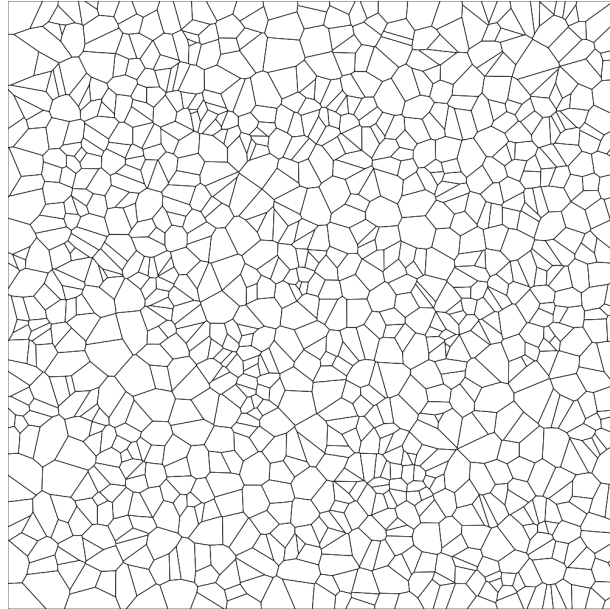


(a) Before Clipping

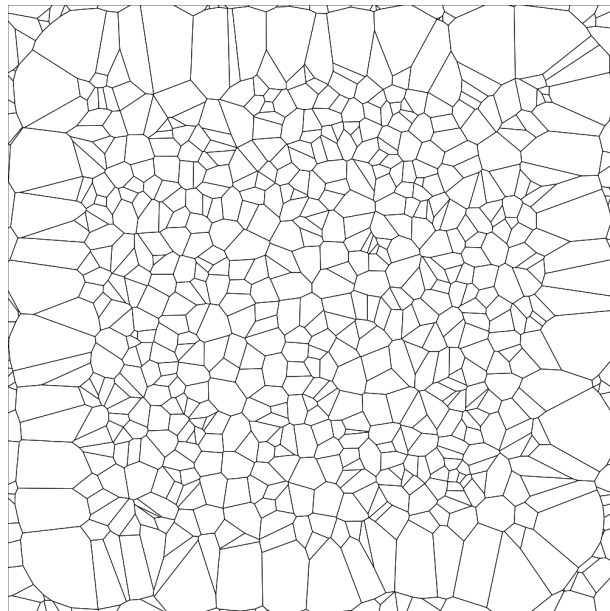


(b) After Clipping

## 4 Voronoï Parallel Linear Enumeration algorithm in 2D



(c) Basic Voronoi diagram



(d) Power diagram