CS6150: Computational Geometry

Assignment 1: DCEL

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Objective: Create an input file in which the input format is first all vertices with (x,y) coordinates on separate line. Then, there is a one line with 5 # symbols. From the next line onwards the half edges given are given like this (i,j)- means that edge from the vertex in the i-th line to the vertex in the j-th line.

Using this information in two input files, each containing a planar subdivision, your program should print out the union, intersection, and difference.

Approach:

CGAL has a class template "Arrangment_2" which represents a planar subdivision induced by a set of x-monotone curves. It has two parameters "traits"(representing the type of curves) and "Dcel". So the first step is to construct the Dcel for both the polygons.

CGAL also has a "overlay" function which takes in two "Arrangment_2" structures and returns a "Arrangment_2" structure representing the overlay.

There is additional functionality in CGAL to add data to each face in a "Arrangment_2" structure and also to define the function used to find the face data in the overlay taking the data of the corresponding face's in polygon1 and polygon2 as input.

Here I defined the function as "plus". For polygon1 I set face id to 01 and for polygon2 we set it to 10. These ids are set for the bounded face (interior face).

So when compute overlay we perform the PLUS operation which gives:

01+10 = 11 intersection of both polygons

01+00 = 01 only polygon 1.

00+10 = 10 only polygon 2.

00+00 = 00 none of them.

With this information I looped over the faces with a particular Id according to our needs and output the edge list for each face.

Input used:

Polygon1 : Square of side length 4 centered at origin.

Polygon2 : Rhombus with vertices (0, 3), (3, 0), (0, -3), (-3, 0).