Computational and Differential Geometry
Homework 2

Professor: Nicolás Avilán Vargas, Ph.D.

Indicaciones

1. Fecha de entrega: 6 de abril de 2025 hasta las 11:55 pm.
2. Único medio de entrega e-aulas.
3. Formato de entrega: Archivo **.ipynb** con códigos en python, descripciones de códigos y procesos, y respuestas a las preguntas.
4. Solo es permitido el uso de librerías "básicas" (numpy, matplotlib, seaborn, pandas, etc). En ningún caso será válida la solución lograda, total o parcialmente, por el uso de una librería especializada para resolver problemas de geometría computacional.
5. La tarea **debe** realizarse **individualmente**.
6. Cualquier tipo de fraude o plagio es causa de anulación directa de la evaluación y correspondiente proceso disciplinario.
7. Las entregas están sujetas a herramientas automatizadas de detección de plagio en códigos.
8. Las tareas no entregadas antes de la hora indicada tendrán calificación de 0.0.

Support each piece of code with a detailed explanation of its methods, techniques, functions, and tricks. Reference your sources (papers, books, tutorials, websites, etc.) and include any necessary bibliographical citations or links.
An attached file, Polygon.txt, contains a set of ordered points to assist in developing the suggested activities. As shown in Figure 1, these points represent the vertices of a simple polygon that will be triangulated.

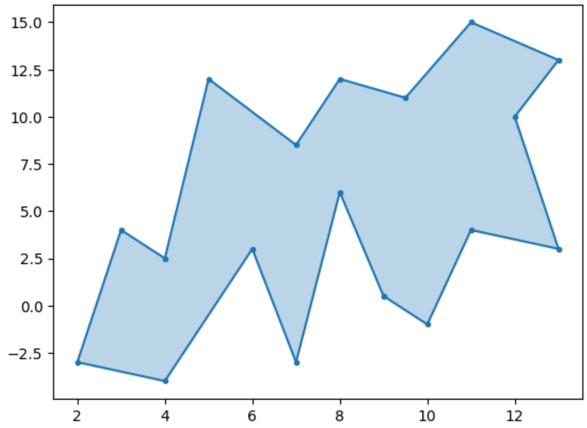

Figure 1: Simple polygon to be triangulated.

Any sweep line algorithm is an option. Please cite your source if you don't use your own code for the sweep line.

1. (1.25 points) Write down a code able to read the ordered points and create a doubly-connected edge list for the simple polygon. **Print the doubly-connected edge list related to the simple polygon.**

2. (1.25 points) Implement an algorithm able to split the given polygon into y-monotone polygons. Give your answer in terms of doubly-connected edge lists. **Plot the polygon split into y-monotone polygons**.

3. (1.25 points) Implement the triangulation procedure and apply it to each y-monotone polygon. Give your answer in terms of a doubly-connected edge list. **Plot the triangulated polygon**.

4. (1.25 points) Find the vertices from which a minimum number of cameras could be used to guard the entire polygon. **Identify and plot in the polygon the places where the cameras should be localized**.

Submit:
Upload to the platform an **.ipynb** file with answers, codes, descriptions and plots.