Assignment-1
CS F364
Design and Analysis of Algorithms
Weightage: 10% Total Marks= 30 Submission Date: 7th March 2023 midnight.

Objective: Decomposing any arbitrary polygon into convex polygon is a well-studied problem. In this assignment you are required to implement the algorithm described in the following paper:

[1] Fernández, J., Cánovas, L., & Pelegrín, B. (2000). Algorithms for the decomposition of a polygon into convex polygons. *European Journal of Operational Research*, *121*(2), 330-342. https://doi.org/10.1016/S0377-2217(99)00033-8

https://www.sciencedirect.com/science/article/abs/pii/S0377221799000338#:~:text=P%E2%86%90(P%E2%A7%B9L,polygons%20is%20in%20fact%20convex.

I have uploaded the pdf copy of this paper on CMS.

Task 1: You will require a data structure to store the polygon decomposition. You will implement the Doubly Connected Edge List (DCEL) data structure. You can find useful notes on the following website:

https://www.cs.umd.edu/class/spring2020/cmsc754/Lects/lect10-dcel.pdf

You will also require to implement a small drawing application to visualize your output. This can be done in Python.

Task 2: Implement the actual algorithm [1]. Make sure it is completely coded from scratch by the team members.

Task 3: Test your code on many data sets with different kinds of polygons. Report the outputs and timing analysis of your implementation in practice. Develop HTML pages for this report.

Task 4: Use Doxygen to generate the documentation of your code automatically. Learn the commenting rules required for Doxygen.

Pay attention to the way you design your code. Use Object Oriented Language C++/Java (only) for this assignment. Refrain from using codes available on the internet.

Marking will be based on

- Code Design. [5 Marks]
- Correctness of Implementation of the data structures and the actual algorithm including visualization. [15 Marks]
- Indentation and Comments. [3 Marks]
- Report presentation (HTML pages). [5 Marks]
- Generation of code documentation using Doxygen. [2 Marks]

General Instructions:

1. This assignment will be done in groups of max four students.
2. **Code must be written in C++/Java only.**

3. There will be only one submission per group on the CMS.
4. The name of the file should be **id1_CSF364_A1.zip**, where id1 refers to the BITS ID of the sender.
5. **You can discuss with your friends but refrain from copying the code and submitting. Also please do not use code downloaded from internet. Such codes will receive 0 credits.**
6. You have to demo the code to the instructor on a scheduled date and timing after submission. **It is important to attend the demo, as absence from demo will amount to no credit for the assignment. The tentative date for the Demo will be right after the Midsem exam.**